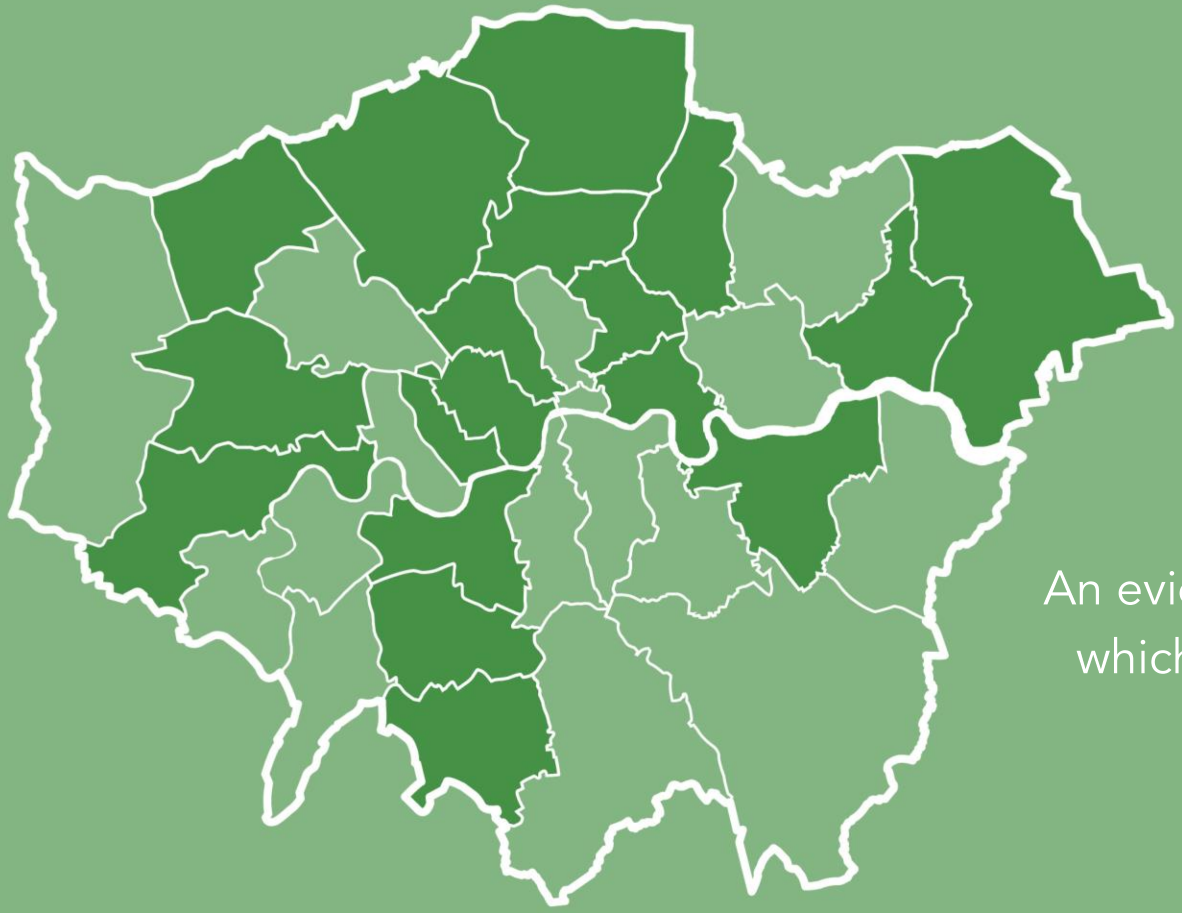


Delivering Net Zero

An evidence study to support planning policies which deliver Net Zero Carbon developments

20-min summary

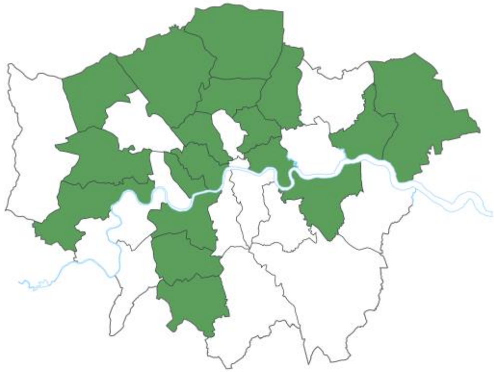
May 2023 | Rev 5

Levitt Bernstein People.Design
Introba
INKLING
Currie & Brown
Etude

Client and consultant teams

The client team included the following 18 London boroughs:

Barking & Dagenham / Be First
Barnet
Camden
Ealing
Enfield
Greenwich
Hackney
Haringey
Harrow
Havering
Hounslow
Kensington and Chelsea
Merton
Sutton
Tower Hamlets
Waltham Forest
Wandsworth
Westminster



We wanted to thank all officers for their collaboration throughout this project. Energy and carbon policies rely heavily on the tools being used to evidence that they can be achieved (technically and financially). We are very grateful for the efforts made by everyone to understand the extensive (and sometimes confusing) energy and carbon modelling results we have shared.

The consultant team includes five different organisations who have previously collaborated on a range of net zero guidance and policy work. It includes architects, engineers, cost consultants and energy specialists. It brings together a diverse set of skills with a shared ethos of collaboration, practicality, and commitment to accelerate the reduction of carbon emissions from buildings.

Levitt Bernstein People.Design	Clare Murray Gina Windley Rania Kapitani
Introba	Clara Bagenal George Zeina Krayim Iraklis Stivachtaris
INKLING	Claire Das Bhaumik Susie Diamond Marcus Haydon
Currie & Brown	Adam MacTavish
Etude	Andrea Carvajal Ed Cremin Oyin Idowu Kate Millen Thomas Lefevre

Return to contents >

Important note about this document, its purpose, its scope and its limitations

The main purpose of this document is to to constitute a technical evidence base to inform the policy making process for planning officers in the 18 London boroughs who participated in this study.

It considers two main indicative policy options in order to contribute to the development of a common and coherent policy direction, in conformity with the London Plan.

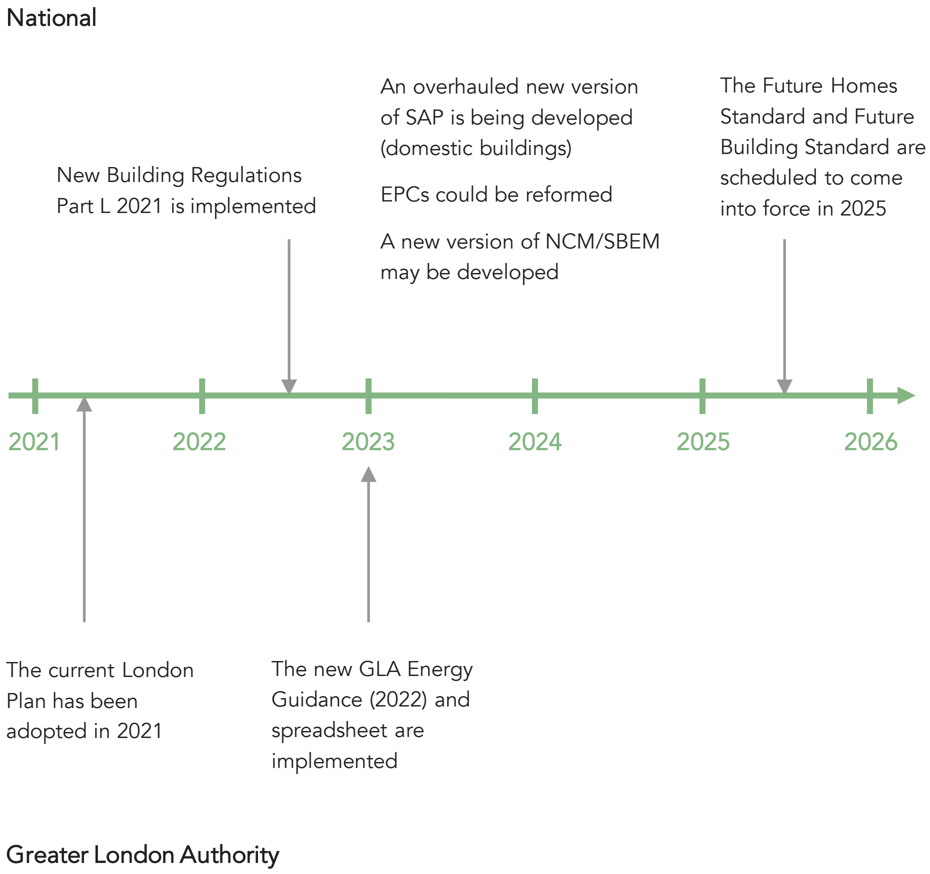
This document is about the future, not the past

This document was triggered by the latest edition of the building regulations for new buildings (Part L 2021) and the need for London boroughs to update their current energy and carbon planning policy targets. It also considers three scales of regulations/policy for which the landscape is likely to change in the next 3-4 years:

- **National level**: Part L 2021 has been introduced in 2022 and should be replaced by the Future Homes Standard and the Future Building Standard in 2025.
- **Regional level**: The GLA published new Energy Assessment Guidance in 2022. At the time of writing there is no plan to update the London Plan in the short to medium term.
- **London borough level**: each of the 18 London boroughs participating in this study are at different stages of the development of their Local Plan.

Scope and limitations

The scope of this study is to provide a robust evidence base in relation to energy use and carbon emission modelling for eight common building types in London. Although potential policy wording has been provided to assist planning policy officers in translating the technical findings into potential policy targets, this is not a policy document. It should not be used either as a criticism of current planning policy and/or to justify individual buildings' failure to comply with it. Finally, the recommendations do not limit what planning applications can deliver: some schemes will be able to go further.



New Building Regulations Part L 2021 is implemented

An overhauled new version of SAP is being developed (domestic buildings)

EPCs could be reformed

A new version of NCM/SBEM may be developed

The Future Homes Standard and Future Building Standard are scheduled to come into force in 2025

The current London Plan has been adopted in 2021

The new GLA Energy Guidance (2022) and spreadsheet are implemented

Figure 20.1 – Overview of potential changes to the national and regional policy landscape in the next 3 years

Return to contents >

New buildings and Net Zero | A very different landscape has emerged since 2019

The 2019 study

The ‘Towards Net Zero Carbon study’ undertaken in 2019 investigated how the carbon offset price could be used to incentivise new buildings to achieve greater carbon reductions on-site. The study demonstrated that due to the decarbonisation of the electricity grid, for the same specifications, a greater improvement over Part L was achieved with no extra effort/cost (e.g. ‘60% was the new 35%’ for residential developments). A stepped carbon offset price was recommended to discourage carbon offsetting as much as possible and incentivise greater carbon savings on site. A price of at least £300/tCO_2 was recommended for this purpose, but also to enable local authorities to deliver the required carbon savings off-site.

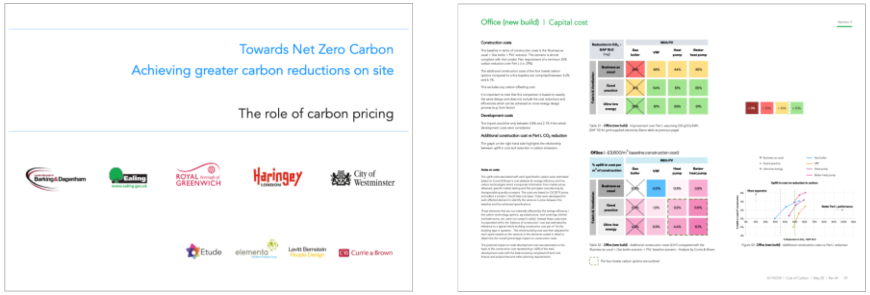
Finally, the team outlined an alternative to the Part L framework using Energy Use Intensity (EUI) and predictive energy modelling.

A very significant shift since 2019

The extent of changes over the last four years has been very significant. A new version of Part L came into force (Part L 2021), but it is mainly the shift towards Net Zero which has triggered a large number of very relevant publications and studies, from the Climate Change Committee (CCC) reports to the RIBA 2030 climate challenge, from the UKGBC framework to the LETI guides and targets, and now the emerging work on the Net Zero Carbon Building Standard

A changing landscape in London

The Mayor of London has published its updated 2030 pathway in 2022 with important underlying assumptions (e.g. ban on new gas boilers in new developments from 2025) and London Boroughs have all developed ambitious Climate Action Plans. A group of 18 boroughs have therefore commissioned this study to review and expand the analysis undertaken initially. The results and the consultants’ policy recommendations are summarised in this report with the aim of helping to inform officers’ decisions.



Towards Net Zero Carbon
Achieving greater carbon reductions on site
The role of carbon pricing

Office (new build) | Capital cost

Figure 20.2 - ‘Towards Net Zero Carbon – Achieving greater carbon reductions on site: the role of carbon pricing’ was undertaken in 2019.

ONLINE VERSION
HM Government
The Building Regulations 2010
Conservation of fuel and power
APPROVED DOCUMENT
L
Volume 1: Dwellings
Requirement L1: Conservation of fuel and power
Requirement L2: On-site generation of electricity
Regulations: 6, 22, 23, 24, 25, 25A, 25B, 26, 26A, 26C, 27, 27A, 27C, 28, 40, 40A, 43, 44 and 44ZA
2021 edition – for use in England
ONLINE VERSION

UK housing: Fit for the future?
Committee on Climate Change
February 2019

MAYOR OF LONDON
London Net Zero 2030: An Updated Pathway

LETI Climate Emergency Design Guide
How new buildings can meet UK climate change targets

RIBA 2030 CLIMATE CHALLENGE
VERSION 2 (2021)
Sign up to join the RIBA 2030 Climate Challenge at www.architecture.com/2030challenge
RIBA
Architecture.com

UK GBC
ADVANCING NET ZERO
Net Zero Carbon Buildings: A Framework Definition
APRIL 2019

Figure 20.3 - A number of very significant documents have been published since 2019

Return to contents >

New buildings and Net Zero | Two policy options for London boroughs

Adapting the current system or changing it?

London boroughs wishing to translate their climate ambitions into requirements for new buildings in the borough have the choice between two different strategic directions:

- **Policy option 1 consists of continuing to use the same system based on the Part L framework and adapting it to Part L 2021.** This system requires the applicant to use a Part L energy modelling software, and performance is measured against a single metric (i.e. % reduction in regulated carbon emissions over Part L 2021). This metric cannot be measured post-occupancy.
- **Policy option 2 is a new system focusing on absolute energy-based metrics**. It requires the applicant to use predictive energy modelling tools and methodologies. Performance is measured against a number of metrics (e.g. space heating demand, Energy Use Intensity), A significant advantage of the Energy Use Intensity (EUI) is that it can be measured post-occupancy as it generally aligns with ‘energy at the meter’.

For a responsible use of the terminology ‘Net Zero Carbon’

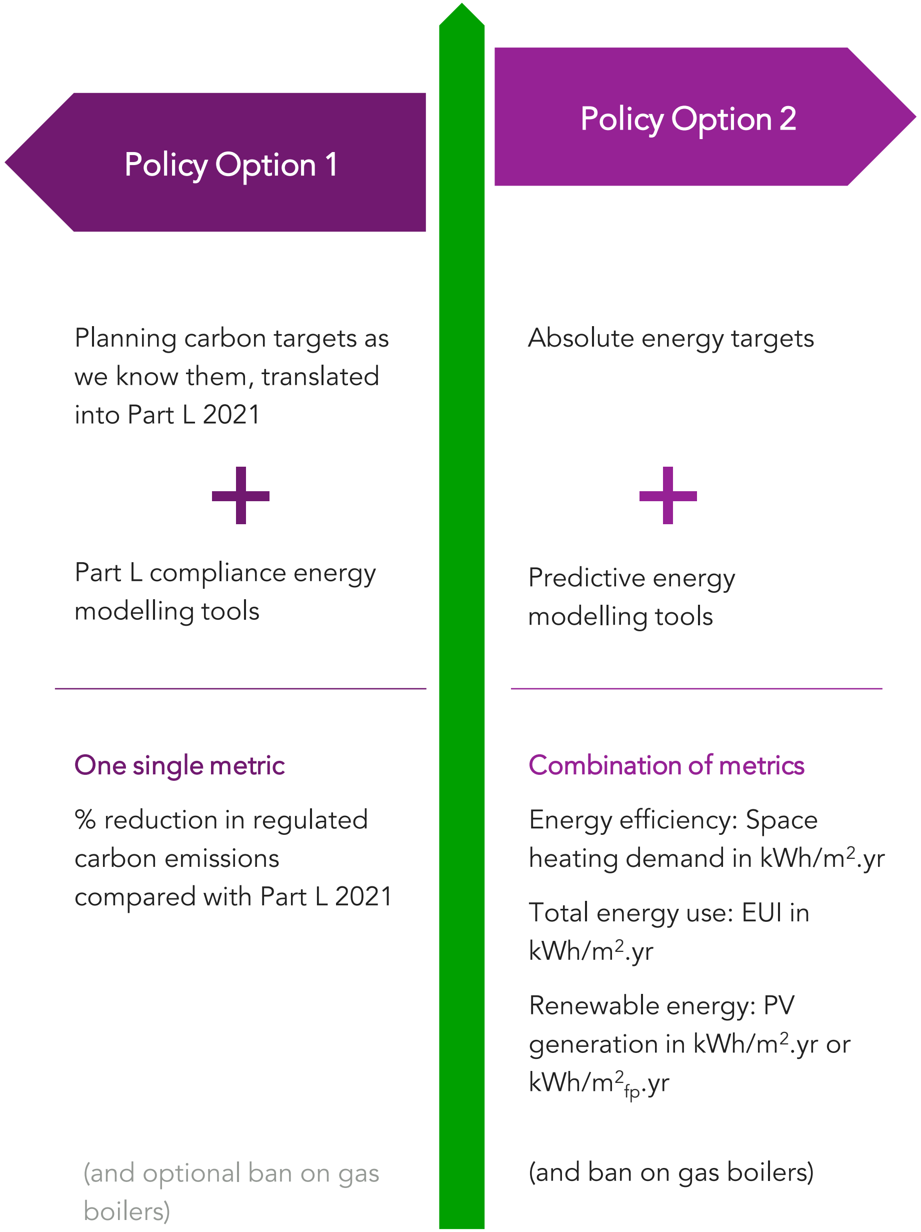
Both policy options seek to deliver ‘Net Zero Carbon’ new buildings. However, they refer to two different understandings of this term:

- **Policy option 1** generally only considers regulated energy use and allows carbon offsetting to play a significant role.
- **Policy option 2** considers all energy used in the building (except EV charging points) and seeks to achieve a balance between energy use and on-site renewable energy generation, only allowing offsetting to address a potential imbalance.

We strongly recommend that all London boroughs are clear and transparent about the definition of Net Zero Carbon they are using.

Options within each option

Different variations of each policy option are possible but for simplicity, this report considers the two main options.



Policy Option 1	Policy Option 2
Planning carbon targets as we know them, translated into Part L 2021	Absolute energy targets
+	+
Part L compliance energy modelling tools	Predictive energy modelling tools
One single metric	**Combination of metrics**
% reduction in regulated carbon emissions compared with Part L 2021	Energy efficiency: Space heating demand in kWh/m^2.yr Total energy use: EUI in kWh/m^2.yr Renewable energy: PV generation in kWh/m^2.yr or kWh/m$^2_{fp}$.yr
(and optional ban on gas boilers)	(and ban on gas boilers)

Figure 20.4 – Two types of approach are possible to go beyond the requirements of Part L 2021

Return to contents >

Building regulations form the foundations – Planning policy is a way to go further

Hierarchy of compliance

Compliance with Part L of the building regulations is mandatory for all developments. Planning policy (option 1 or 2) is then brought in to supplement regulation. Historically, building regulations Part L has always represented minimum compliance and planning policy pushed the ambition further. They also both focused on regulated carbon emissions. Therefore, planning policy could be relied upon to exceed regulation. For example, a 0% reduction in regulated CO_2 emissions would be building regulations compliant. London Plan policy would then then top it up to require a % improvement in CO_2 emissions (e.g. 35% reduction).

Introduction of new metrics and updates in Part L 2021

Part L has changed from one single criterion to a multi-criteria standard making it more complex and challenging to comply than in the past. In particular, the introduction of the primary energy metric for domestic and non-domestic buildings, and the updating of the target fabric energy efficiency (TFEE) metric for domestic buildings introduce key requirements. There is also a growing realisation in the building industry that planning policy may be more effective at delivering net zero carbon new buildings if it was to consider energy-based metrics rather than regulated carbon emissions. In summary:

1. With the introduction of Part L 2021, applicants and officers need to be satisfied that compliance with Part L 2021 will be achieved. This should be evidenced at planning stage.
2. Policy options 1 and 2 should be seen as two alternative ways to go beyond the minimum standards set by the building regulations in order to deliver net zero carbon buildings. The ability to effectively deliver this objective should be the most important considerations for each borough to inform their selection of policy option 1 or 2.

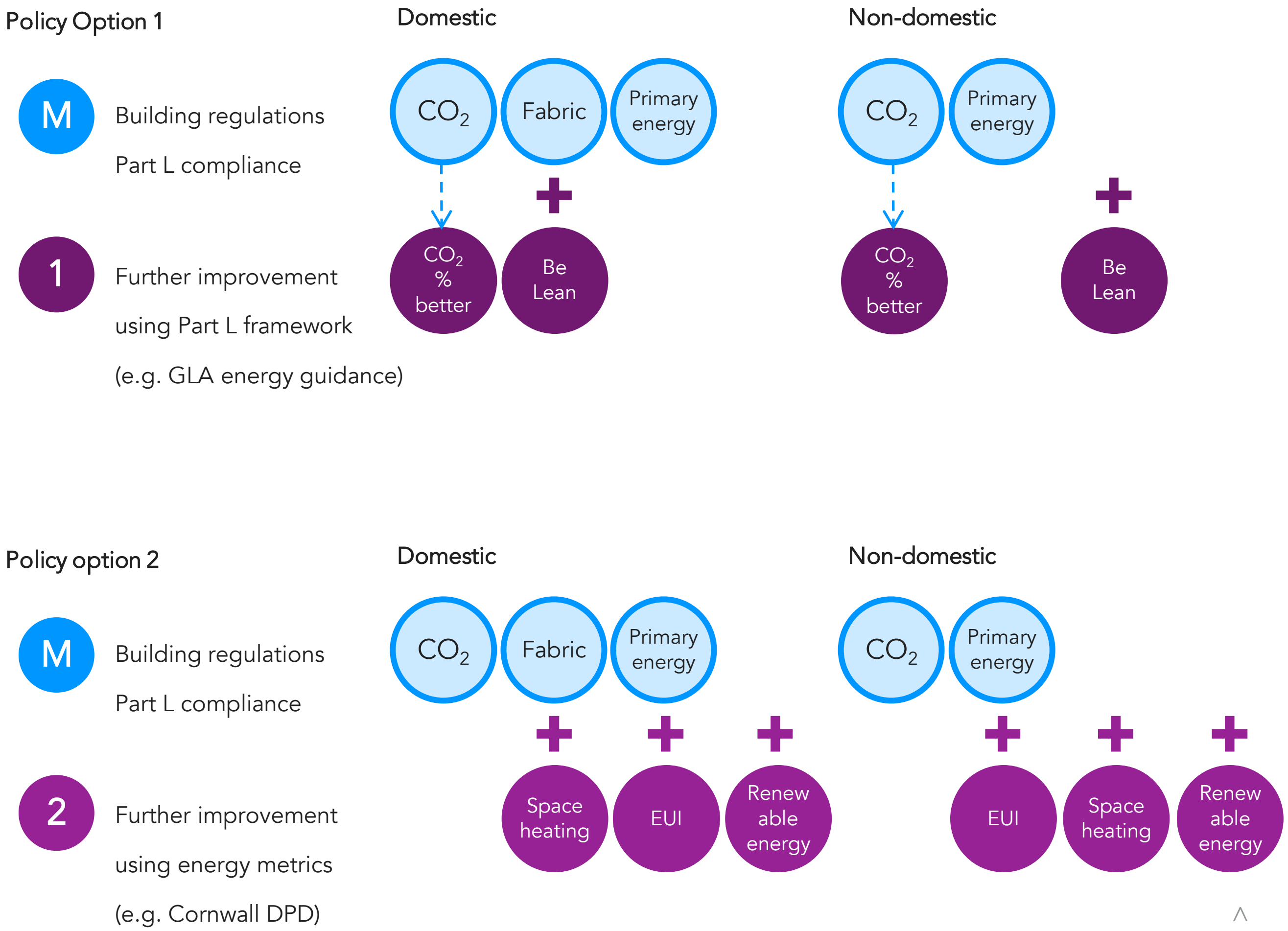


Figure 20.5 - Evidence of compliance with Part L of the building regulations should be evidenced at planning stage as it relies on compliance with several criteria. These are shown in blue above M stands for Mandatory).

Additional criteria can be set by planning policy to require the delivery of Net Zero Carbon new buildings. These are shown in purple above.

Return to contents >

Policy option 1 | Carbon improvement over the notional building using the Part L 2021 framework

After the introduction of the 'Merton Rule'[1] and its adoption by the GLA in the London Plan and Mayor's first Energy Strategy in 2004, planning policy in London has sought to mitigate the impact of new buildings on climate change primarily through requirements to achieve quantified improvement over Part L of the building regulations in terms of regulated carbon emissions. The London Plan, through its successive iterations (2008, 2011, 2016 and 2021), regularly updated these requirements and adapted them to successive versions of Part L of the building regulations (i.e. Part L 2010, Part L 2013, now Part L 2021).

Policy option 1 essentially carries on using this approach by adjusting the target (e.g. 35% improvement over Part L 2013) to Part L 2021 and ensuring that it is technically and financially viable for different typologies.

Local authorities using this framework

This is the approach currently adopted by the GLA in their latest energy assessment guidance.

Comment on the terminology 'Zero Carbon'

The Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022) states that:

"Major developments are required to achieve net zero-carbon by following the energy hierarchy (Policy SI 2). This means that regulated carbon emissions should be reduced so they are as close as possible to zero. Once on-site reductions have been maximised, the residual emissions should be offset via a payment into the relevant borough's carbon offset fund."

It is important to note that the definition of 'Zero Carbon' used by the London Plan therefore excludes 'unregulated' energy use, is based on a comparison with a notional building and relies significantly on carbon offsetting, as illustrated by the adjacent diagram.

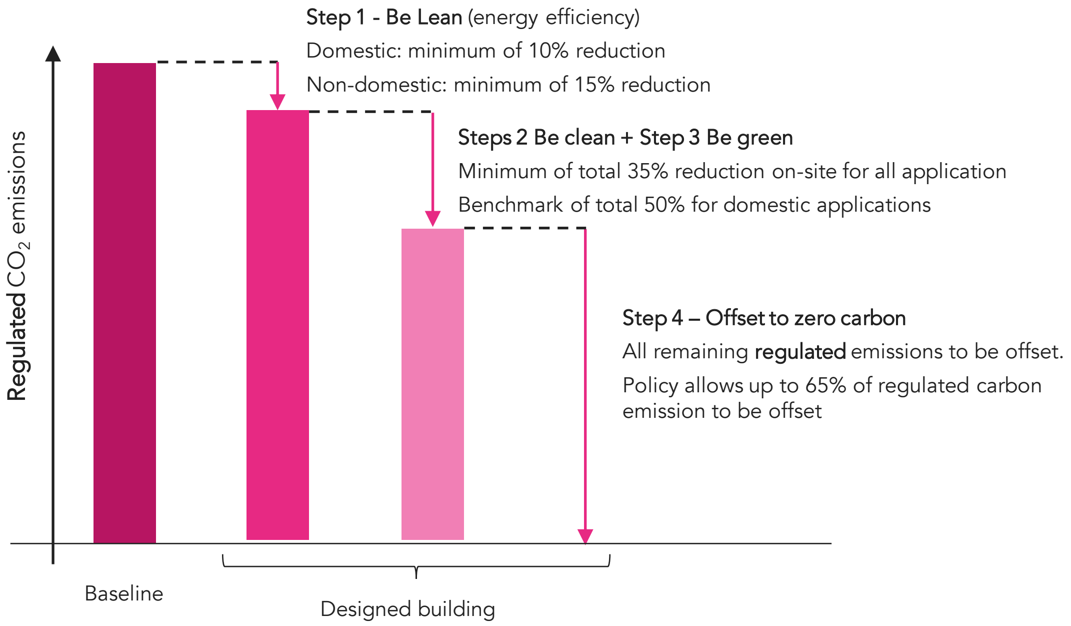
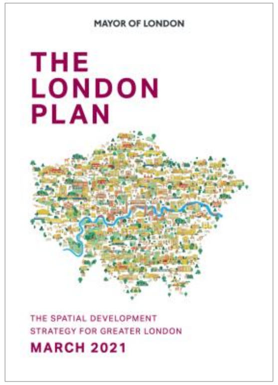


Figure 20.6 - The GLA Energy Assessment Guidance requires the above approach to carbon reduction for new buildings.



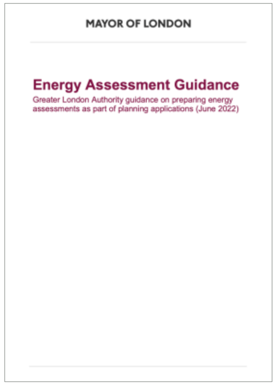
MAYOR OF LONDON

THE LONDON PLAN

THE SPATIAL DEVELOPMENT STRATEGY FOR GREATER LONDON

MARCH 2021

Figure 20.7 - GLA policy: London Plan's policy SI2 refers to Part L 2013 of the Building Regulations



MAYOR OF LONDON

Energy Assessment Guidance

Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022)

Figure 20.8 - GLA guidance: The GLA Energy Assessment Guidance (2022) is suggesting regulated carbon reductions targets against Part L 2021

Return to contents >

---

[1] *The 'Merton Rule' was a pioneering planning requirement for new developments to generate at least 10% of their energy requirements from renewable energy sources.*

Policy option 2 I Absolute energy performance targets

Policy option 2 for London boroughs is to introduce a Net Zero Carbon building policy in line with the emerging industry definition of Net Zero Carbon new buildings. This would require the introduction of the following requirements and energy performance metrics.

1. **No fossil fuels on-site**
   This would be consistent with the GLA's Accelerated Green Pathway which relies on banning new gas boilers.
2. **Space heating demand** (e.g. <15-20 kWh/m^2.yr).
   This would be consistent with the CCC's recommendations[1].
3. **Energy use intensity (EUI)** (e.g. <35 kWh/m^2.yr for domestic).
   This would be consistent with the current industry definition of Net Zero carbon new buildings in operation.
4. **Renewable energy generation** (e.g. to match the EUI or >100 kWh/m$^2{}_{\text{footprint}}$.yr). This would incentivise more renewable energy generation on new buildings and a balance with energy use.
5. **Upfront embodied carbon**
   This is not covered by this report but should become a policy.

Local authorities using absolute energy performance targets

The list below includes the names of local authorities which have already published proposed policies consistent with option 2 above: Cornwall Council (Climate Emergency DPD), Bath & North East Somerset Council (Local Plan), London Borough of Newham (Local Plan), Greater Cambridge (Local Plan), Central Lincolnshire (Local Plan) London Borough of Merton, from 2025 (Local Plan). Bath & Nort East Somerset and Cornwall Councils have adopted these policies.

GLA energy guidance (2022) and energy-based metrics

The GLA now requires applicants to report the Energy Use Intensity (EUI) and space heating demand of the development.

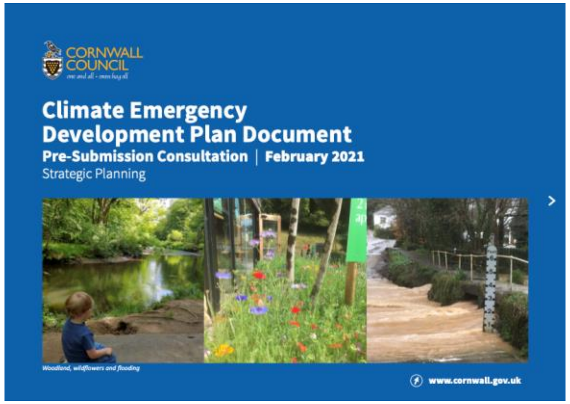
Newham London

NEW LOCAL PLAN I CLIMATE EMERGENCY

Operational energy and carbon evidence base

May 2022 I Rev H

Figure 20.9- Evidence base for the London Borough of Newham's new Local Plan



CORNWALL COUNCIL

one and all · onen hag oll

Climate Emergency Development Plan Document

Pre-Submission Consultation | February 2021

Strategic Planning

Woodland, wildflowers and flooding

www.cornwall.gov.uk

COMMITTEE STAGE VERSION

First Proposals

Greater Cambridge Local Plan

Figure 20.10 - (Left) Cornwall Council Climate Emergency DPD and associated evidence base

Figure 20.11 - (Right) Greater Cambridge New Local Plan

---

[1] *See the report 'The Future of Housing', Climate Change Committee, 2019*

Return to contents >

Key differences between Policy options 1 and 2

A relative target (Policy option 1) or absolute target (Policy option 2)

Policy option 1 is based on a further reduction in regulated carbon emissions over the 'notional building' in Part L 2021. The notional building has the same shape, orientation and, up to a point, the same glazing proportions as the actual proposed building design. For clarity, the notional building is fictional and is created by the compliance software only for building regulations purposes. Unfortunately, the % improvement over a notional building is an intangible requirement that cannot be measured, whereas energy use can be checked against metered energy in the occupied building. This makes post-construction verification and learning from a feedback loop easier.

A single metric (Policy option 1) or a suite of metrics (Policy option 2)

Policy option 1 uses a single performance metric: the reduction in regulated carbon emissions over Part L 2021 (e.g. 65% lower than Part L 2021). This amalgamates into one figure the building's efforts in terms of energy efficiency, low carbon heat and renewable energy generation. Instead, policy option 2 uses a set of metrics to separately measure each of the key attributes needed to achieve Net Zero: space heating demand for energy efficiency, EUI for total energy use (including systems' efficiencies), and energy balance or total renewable energy generated for renewable energy generation.

Part L energy modelling (Policy option 1) or Predictive energy modelling (Policy option 2)

Part L does not cover unregulated energy and is not meant to predict energy use. It has mistakenly been used for this purpose for a long time . Predictive energy modelling would be 'fit for purpose'.

Our recommendation

Due to the differences summarised above, the consultant team would recommend Policy option 2 over Policy option 1. The modelling results summarised in this study also support our recommendation.

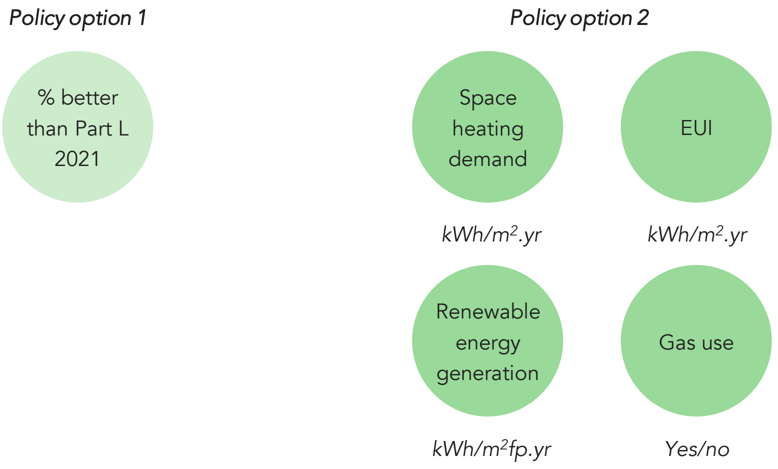


Figure 20.12 – Key metrics used in Policy options 1 and 2

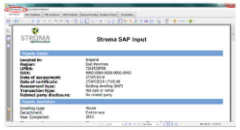
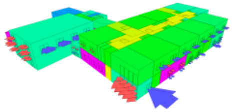
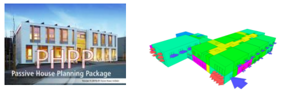
	Part L modelling	Predicted energy use modelling
Domestic	 SAP (Part L1A)	 PHPP
Non-domestic	 NCM (Part L2A)	 PHPP or DSM (TM54)

Figure 20.13 - There is a significant difference between Part L modelling currently used to demonstrate compliance with planning policy and predicted energy use modelling.

Return to contents >

This evidence base | Energy and cost modelling undertaken

Purpose of energy and cost modelling

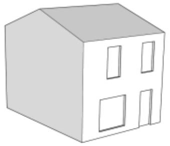
Energy and cost modelling constitutes the core of this technical evidence base. Its purpose is to investigate how different building archetypes would perform against the metrics in Part L 2021, Policy option 1 and Policy option 2, using different combinations of specifications. These results can then be used to inform the process of target setting by officers and constitute the evidence that the associated policies are technically achievable. Finally, the cost modelling can be used to identify the additional cost of these policies above minimum building regulations compliance (Part L 2021).

8 archetypes and 24 different and specific scenarios for each

Fair and balanced sets of specifications which considered various levels of performance for fabric and ventilation, heating systems and renewable energy provision were modelled. The performance of these scenarios ranged from 'business as usual' approaches to more ambitious 'exemplary' levels. We selected a specific set of building fabric, ventilation, heating and renewable energy specifications tailored to each archetype that would represent this spread of performance and be practical to build. Specific assumptions for all eight building archetypes can be found in the Appendices of the report.

Fabric and Ventilation	Heating system	Solar PVs
Business as usual*	Gas boiler	No
Good practice	Direct electric	PV Max
Ultra-low energy	Less efficient heat pump	
	More efficient heat pump	

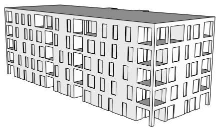
Domestic archetypes selected



Terrace house

95 sqm

This building represents the generic **Terrace house** new build typology

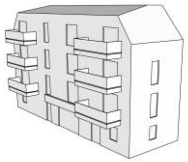


Mid-rise

5 storeys

3,200 sqm

This building represents the generic **Mid-rise apartment building** new build typology

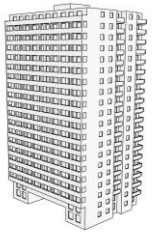


Low-rise

3/4 storeys

641 sqm

This building represents the generic **Low-rise apartment building**-new build typology



High-rise

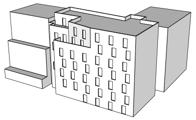
15 storeys

15,500 sqm

This building represents the generic **High-rise apartment building** new build typology

Please note that the findings will be very similar for a high-rise of 40-50 storeys

Non-domestic archetypes selected

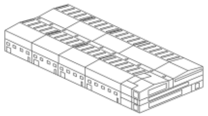


Office

7 storeys

4,000 sqm

This building represents the generic **office building** new build typology

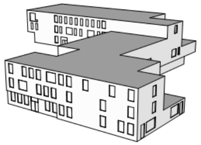


Industrial

2 storeys

9,000 sqm

This building represents the generic **industrial building** new build typology

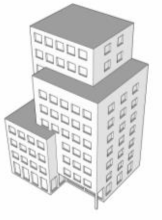


School

3/4 storeys

6,000 sqm

This building represents the generic **school building** new build typology



Hotel

11 storeys

3,900 sqm

This building represents the generic **hotel building** new build typology

Figure 20.14 – Graphical representation of the 8 buildings chosen as archetypes

Return to contents >

Part L energy modelling for Policy option 1 | Summary of approach and how to read the results table

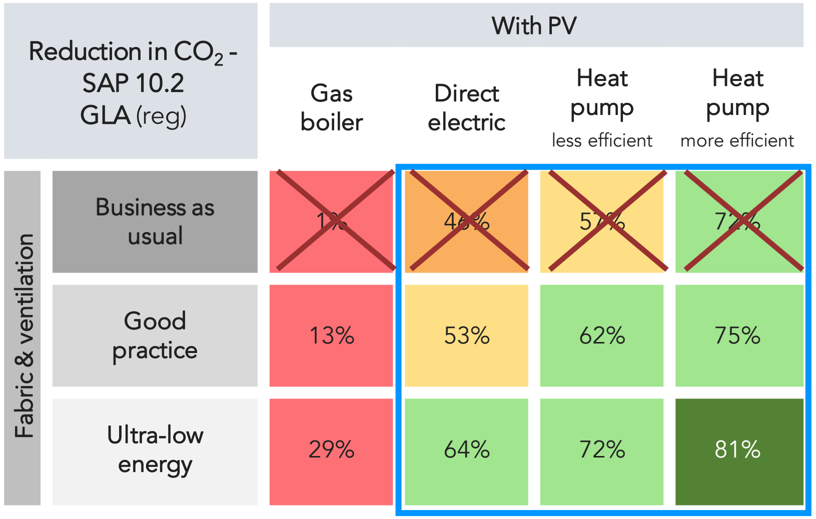
Policy option 1 uses the Part L framework, and in particular its CO_2 metric to go beyond the requirements of Part L 2021 of the Building Regulations. Demonstration of compliance with these requirements is evidenced by the use of Part L modelling.

The report provides, for each archetype, the performance of each case against the CO_2 requirement of Part L 2021. This enables to see which cases comply with the 35% CO_2 reduction over Part L 2021 currently required by the GLA energy guidance (2022). It also enables to see which cases would not comply and which ones would perform significantly better.

The results are colour coded using a clear key ranging from dark red (i.e. over the Part L 2021 CO_2 limit), through light red (better than the Part L 2021 CO_2 limit but not compliant with the 35% requirement) to dark green (>80% reduction over the Part L 2021 CO_2 limit). Cases which comply with the 35% requirement are circled in blue on the tables.

Compliance with all criteria in Part L 2021 with the CO_2 reduction over the Part L has also been overlaid on this table. Cases which do not comply with all Part L 2021 criteria are identified with a dark red cross.

This enables the reader to see whether and how planning policy option 1 would be successful at incentivising the design and construction of better buildings, which additional 'filter' Policy option 1 would effectively apply.



Reduction in CO_2 - SAP 10.2 GLA (reg)		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	~~1%~~	~~46%~~	~~57%~~	~~72%~~
	Good practice	13%	53%	62%	75%
	Ultra-low energy	29%	64%	72%	81%

Table 20.1 – Performance of each case in terms of CO_2 against the Part L 2021 limit

✗ Would not pass all metrics of Building Regulations Part L 2021

35% compliant	< 0%	< 35%	< 50%	< 60%	60-80%	> 80%

Return to contents >

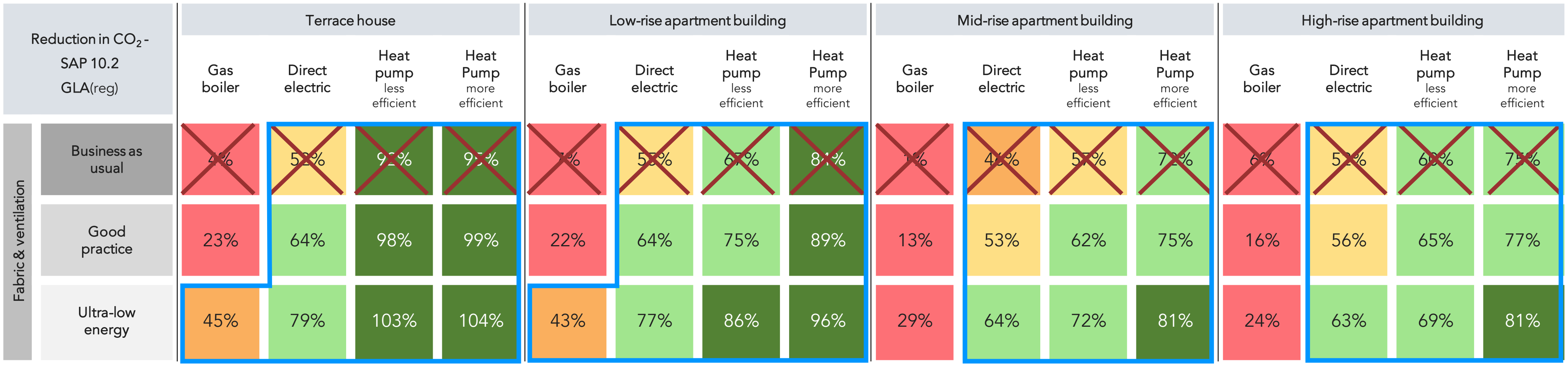
Part L energy modelling for Policy option 1 I Domestic buildings I Summary of findings

In summary, domestic Part L modelling undertaken for Policy option 1 indicates the following:

- This report finds that the GLA's new 35% improvement target against Part L 2021 appears broadly effective in encouraging applicants to use low-carbon energy sources, such as heat pumps, or ultra-low energy fabric combined with direct electric.
- Requiring a more ambitious level of on-site CO_2 reduction compared with Part L 2021 would however incentivise even better designs and would be technically feasible.
- In addition, it appears that the 'Be Lean' 10% fabric improvement requirement is now less effective at incentivising improvements to the building fabric than it did when it was applied to Part L 2013. This is partially because Part L 2021 now includes waste water heat recovery (WWHR) in the 'notional specification' of the target emission rate (TER). The use of the Fabric Energy Efficiency (FEE) metric in Part L 2021 may be a useful alternative.

✗ Would not pass all three metrics of Building Regulations Part L 2021

< 0%	< 35%	< 50%	< 60%	60-80%	> 80%



Reduction in CO_2 - SAP 10.2 GLA(reg)		Terrace house				Low-rise apartment building				Mid-rise apartment building				High-rise apartment building			
		Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient
Fabric & ventilation	Business as usual	✗ 4%	✗ 52%	✗ 92%	✗ 95%	✗ 7%	✗ 55%	✗ 67%	✗ 84%	✗ 1%	✗ 46%	✗ 57%	✗ 72%	✗ 6%	✗ 52%	✗ 60%	✗ 75%
	Good practice	23%	64%	98%	99%	22%	64%	75%	89%	13%	53%	62%	75%	16%	56%	65%	77%
	Ultra-low energy	45%	79%	103%	104%	43%	77%	86%	96%	29%	64%	72%	81%	24%	63%	69%	81%

Table 20.2 - Performance of each case in terms of CO_2 against the Part L 2021 baseline

Return to contents >

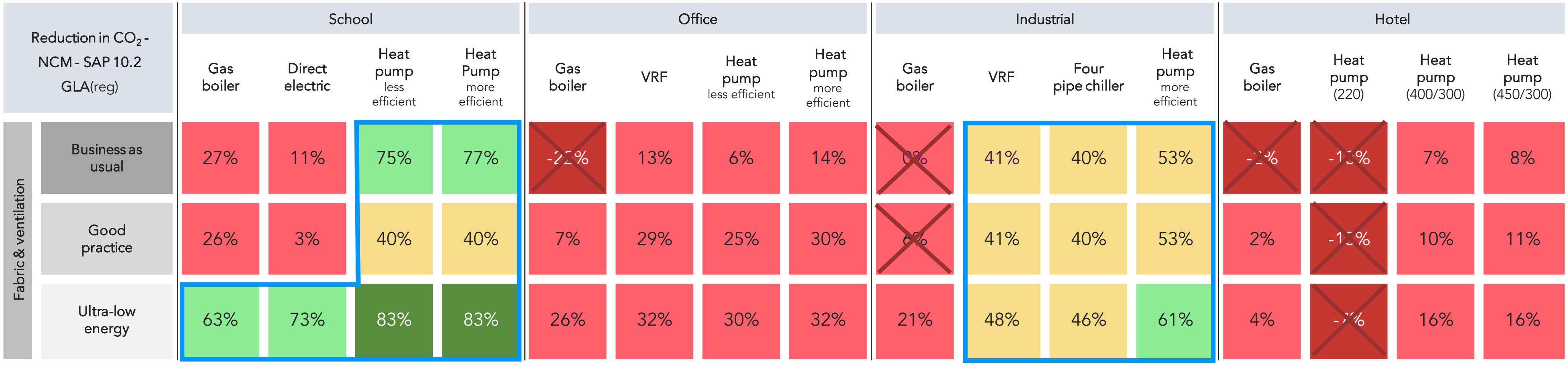
Part L energy modelling for Policy option 1 I Non-domestic buildings I Summary of findings

In summary, non-domestic Part L modelling undertaken indicates the following:

- The results indicate a large range of CO_2 emissions reductions depending on the building typology.
- The results of the modelling suggest that a 35% reduction beyond Part L 2021 is only achieved for two of the non-domestic building types investigated. This suggests that the 35% target is challenging to achieve in all non-domestic scenarios. Setting different policy targets across building types could be an appropriate solution.
- All results are highly reactive to the amount of PV provision, partially due to the fact that heating energy use tends to be significant underestimated.
- In addition, It has not been possible to achieve the 15% Be Lean reduction target in the majority of the scenarios investigated, even with typologies that have greater potential for CO_2 reductions. This is partially because it is challenging to improve on the notional building performance with better building fabric and ventilation.

✕ Would not pass both metrics of Building Regulations Part L 2021

35% compliant	< 0%	< 35%	< 60%	60-80%	> 80%



Reduction in CO_2 - NCM - SAP 10.2 GLA(reg)		School				Office				Industrial				Hotel			
		Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	VRF	Heat pump less efficient	Heat pump more efficient	Gas boiler	VRF	Four pipe chiller	Heat pump more efficient	Gas boiler	Heat pump (220)	Heat pump (400/300)	Heat pump (450/300)
Fabric & ventilation	Business as usual	27%	11%	75%	77%	-22% ✕	13%	6%	14%	0% ✕	41%	40%	53%	-[illegible]% ✕	-1[illegible]% ✕	7%	8%
	Good practice	26%	3%	40%	40%	7%	29%	25%	30%	6% ✕	41%	40%	53%	2%	-1[illegible]% ✕	10%	11%
	Ultra-low energy	63%	73%	83%	83%	26%	32%	30%	32%	21%	48%	46%	61%	4%	-[illegible]% ✕	16%	16%

Table 20.3 - Performance of each case in terms of CO_2 against the Part L 2021 baseline

Return to contents >

Part L energy modelling for Policy option 1 | Summary of approach and how to read the results table

Policy option 2 uses energy-based metrics to go beyond the requirements of Part L 2021 of the Building Regulations. Demonstration of compliance with these requirements is evidenced by the use of predictive energy modelling.

This report provides, for each archetype, the performance of each case against two key energy-based metrics: space heating demand (SHD) and total energy use (also referred to as energy use intensity or EUI).

The results are colour coded using a clear key ranging from dark to light orange for space heating demand and from dark to light purple for energy use intensity EUI)

Compliance with all criteria in Part L 2021 with the CO_2 reduction over the Part L has also been overlaid on this table. Cases which do not comply with all Part L 2021 criteria are identified with a dark red cross.

Space heating demand

Worst	Best

Fabric & ventilation	Space heating demand - Predictive (kWh/m^2/yr)
Business as usual	~~38~~
Good practice	33
Ultra-low energy	14

Table 20.4 - Performance of each case in terms of space heating demand

Energy use intensity

✗ Would not pass all building regulations Part L 2021 metrics

Worst	Best

Fabric & ventilation	EUI - Predictive (kWh/m^2/yr)	Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
	Business as usual	~~78~~	~~65~~	~~37~~	~~34~~
	Good practice	67	59	34	31
	Ultra-low energy	47	41	27	25

Table 20.5 - Performance of each case in terms of energy use intensity (EUI)

Note: the above four heating options are not exhaustive. Other options (e.g. low carbon heat networks with low distribution losses) may perform well.

Return to contents >

Predictive energy modelling analysis for Policy option 2 I Domestic buildings I Summary of findings

Energy modelling using PHPP software was undertaken to estimate space heating demand and the total energy use (EUI) for the different domestic typologies.

- **Space heating demand seeks to improve energy efficiency.** As it can be seen from the adjacent table, the results are fairly consistent and would enable to use a particular level for policy (e.g. 15 or 20 kWh/m^2.yr in line with the recommendations of the CCC). The Terrace house has the widest range of space heating demand per floor area (GIA) relative to the other typologies and the high-rise apartment building has the narrowest.
- **Energy Use Intensity (EUI) seeks to reduce total energy use.** As it can be seen from the table below, the results are fairly consistent and would enable to use a particular level for policy (e.g. 35kWh/m^2.yr). The benefit of introducing a heat pump is clearest for the terrace house, reducing the EUI by 49% in the business-as-usual scenario and 43% for the ultra-low energy scenario.

Space heating demand – Predictive (kWh/m^2/yr)

		Terrace	Low Rise	Mid Rise	High Rise
Fabric & ventilation	Business as usual	38	35	28	24
	Good practice	33	28	22	20
	Ultra-low energy	14	12	10	10

Table 20.6 – Summary of space heating demand results ranges for each domestic typology and each different level of fabric and ventilation specifications

Space heating demand

Worst	Best

Energy use intensity

Worst	Best

EUI - Predictive (kWh/m^2/yr)		Terrace House				Low rise apartment building				Mid rise apartment building				High rise apartment building			
		Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient
Fabric & ventilation	Business as usual	73	65	37	34	71	61	43	31	55	53	38	31	45	42	30	24
	Good practice	67	59	34	31	65	54	39	28	49	48	35	29	41	39	28	22
	Ultra-low energy	47	41	27	25	48	37	31	23	43	39	32	26	36	32	25	20

Table 20.7 - Energy use intensity result ranges for each case of each domestic typology

Ret

Predictive energy modelling analysis for Policy option 2 | Non-domestic buildings | Summary of findings

Energy modelling using TAS and IES software in conjunction with CIBSE TM54 was undertaken to estimate space heating demand and the total energy use (EUI) for the different non-domestic typologies.

- **Space heating demand seeks to improve energy efficiency.** As it can be seen from the adjacent table, the results are fairly consistent and would enable to use a particular level for policy (e.g. 15 or 20 kWh/m^2.yr). The school and office typologies have the widest range of space heating demand per floor area (GIA) relative to the other typologies.
- **Energy Use Intensity (EUI) seeks to reduce total energy use.** As it can be seen from the table below, the range of results is very wide and would require specific EUI targets for the different typologies. The benefit of introducing a more efficient heat pump is clearest for the hotel which has the highest EUI.

Space heating demand – Predictive (kWh/m^2/yr)		School	Office	Industrial	Hotel
Fabric & ventilation	Business as usual	37	23	17	30
	Good practice	12	12	12	24
	Ultra-low energy	4	4	10	15

Table 20.8 – Summary of space heating demand results ranges for each non-domestic typology and each different level of fabric and ventilation specifications

Space heating demand

Worst	Best

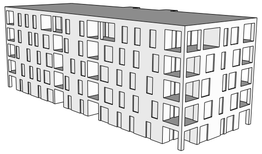
Energy use intensity

Worst	Best

EUI - Predictive (kWh/m^2/yr)		School				Office				Industrial				Hotel			
		Gas boiler	Direct electric	Heat pump less efficient	Heat Pump more efficient	Gas boiler	VRF	Heat pump less efficient	Heat pump more efficient	Gas boiler	VRF	Four pipe chiller	Heat pump more efficient	Gas boiler	Heat pump (220)	Heat pump (400/300)	Heat pump (450/300)
Fabric & ventilation	Business as usual	96	92	65	64	104	82	87	81	50	34	34	32	233	159	174	158
	Good practice	72	71	62	62	83	72	74	72	41	30	31	29	222	152	166	152
	Ultra-low energy	60	60	57	57	71	66	67	66	36	28	28	27	206	143	154	142

Table 20.9 - Energy use intensity result ranges for each case of each non-domestic typology.
For the hotel the assumed Seasonal Coefficient of Performance (SCOP) of the heat pump systems for heating and hot water is provided in brackets)

Using this evidence base to set quantified targets for Policy option 1 or 2 | Mid-rise apartment building



The main aim of this section in the report is to derive some indicative policy suggestions for each archetype

It also enables a comparison between the likely effects that policy options 1 and 2 would have, i.e. which combination of specifications would find it more challenging to comply.

☐ Compliant with proposed policy option
1 on the left
2 on the right

⬚ Compliant with one of two metrics for option 2

✗ Would not pass all 3 building regulations Part L 2021 metrics

Policy option 1 (% over Part L)

Reduction in CO$_2$ - SAP 10.2 GLA (reg)		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	1%	46%	57%	72%
	Good practice	13%	53%	62%	75%
	Ultra-low energy	29%	64%	72%	81%

Table 20.10 – Performance of each case in terms of CO$_2$ overlaid with compliance with all Part L 2021 criteria and compliance with indicative policy target for option 1

Indicative policy requirement:

- **65% improvement over Part L 2021.**
- This threshold drives better energy efficiency by capturing the cases which marry good fabric requirements with efficient heating systems. It pushes schemes with direct electric to have an even better level of fabric and ventilation performance than 'ultra-low energy' and more PVs.
- It could be raised to 70% for the mid-rise apartment building but this would make it inconsistent with the 'high-rise' apartment building.

Policy option 2 (Space heating demand and EUI)

	Space heating demand - Predictive (kWh/m²/yr)
Fabric & ventilation: Business as usual	28
Good practice	22
Ultra-low energy	10

Table 20.11 – Performance of each fabric and ventilation specification level in terms of space heating demand overlaid with compliance with the FEE criterion in Part L 2021 criteria and compliance with indicative policy target for option 2

Indicative policy requirement:

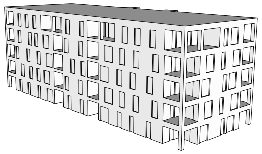
- SHD < 15 kWh/m^2.yr
- EUI < 35 kWh/m^2.yr
- These are in line with the industry definition of Net Zero Operational Carbon for residential buildings

EUI - Predictive (kWh/m2/yr)		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	55	53	38	31
	Good practice	49	48	35	29
	Ultra-low energy	43	39	32	26

Table 20.12 – Performance of each case in terms of energy use intensity (EUI) overlaid with compliance with all criteria in Part L 2021 criteria and compliance with indicative policy target for option 2

Return to contents >

Part L modelling vs Predictive energy modelling | Mid-rise apartment building



There are significant differences between the assessment of energy use between Part L energy modelling and predictive energy modelling. For example, in the case of the mid-rise apartment building:

- **Space heating** appears to be significantly underestimated in Part L modelling, which means that changes to U-values, windows, airtightness will have less effect, thereby not encouraging better fabric and better design.
- **Domestic hot water** appears to be grossly overestimated in Part L modelling. As heat pumps are generally less efficient when producing hot water, this also negatively affects their performance and may reduce the difference between a 'less efficient' and a 'more efficient' heat pump system.
- Part L has a simple and standardised calculation for estimating **'unregulated' energy use** (shown dashed in graph). This is hugely overestimated.
- The '**regulated**' portion of the energy use in Part L (heating, hot water, lighting, auxiliary) exceeds even the total energy use (including unregulated loads – equipment) for the predictive model.

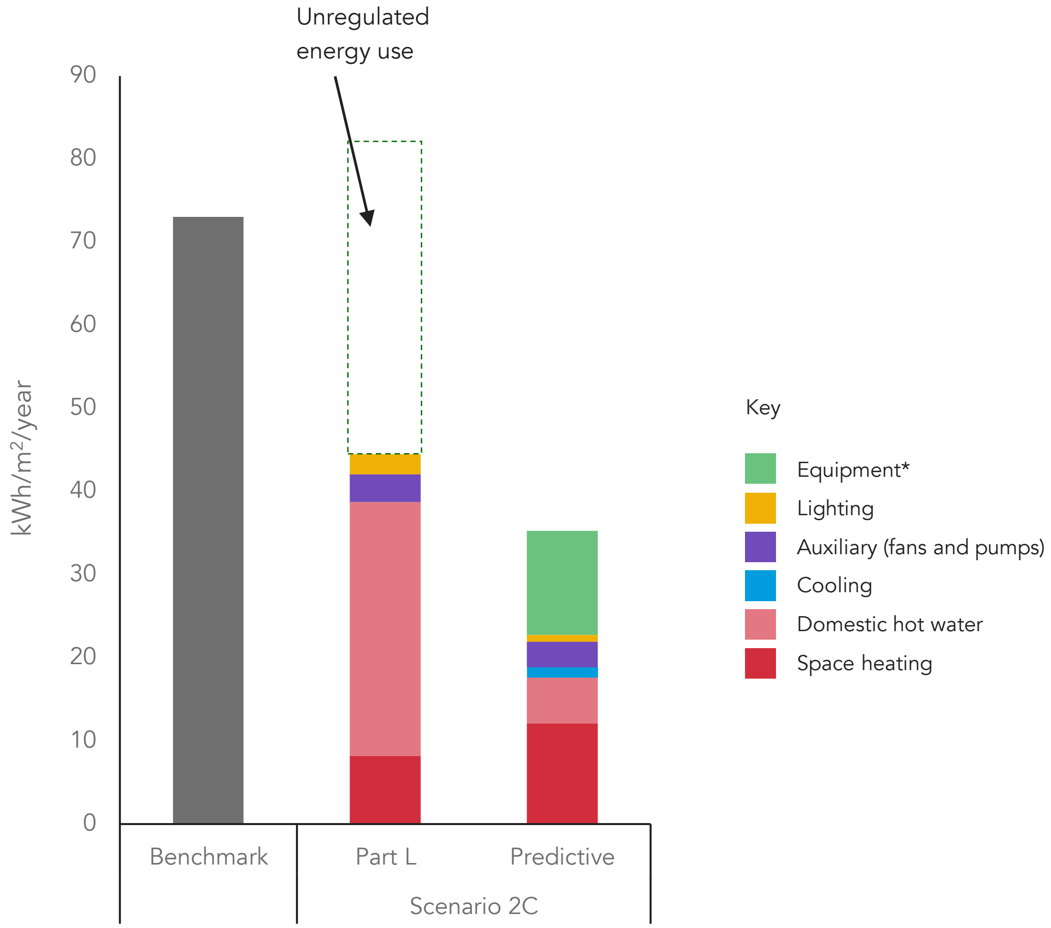
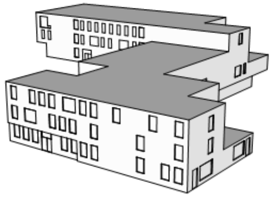


Figure 20.15 – Comparison between the results of the Part L energy model and the Predictive energy model, per separable energy use, for a typical 'good practice' scenario with a heat pump

** Note that the Part L equipment (cooking and appliances) is not currently an output from SAP 10.2 software.*

Return to contents >

Using this evidence base to set quantified targets for Policy option 1 or 2 | School



☐ Compliant with proposed policy option
1 on the left
2 on the right

⬚ Compliant with one of two metrics for option 2

✗ Would not pass all 3 building regulations Part L 2021 metrics

Policy option 1 (% over Part L)

Reduction in CO$_2$ - NCM - SAP 10.2 GLA (reg)		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	27%	11%	75%	77%
	Good practice	26%	3%	40%	40%
	Ultra-low energy	63%	73%	83%	83%

PV area covering 25% of the building footprint area

Table 20.13 – Performance of each case in terms of CO$_2$ overlaid with compliance with all Part L 2021 criteria and compliance with indicative policy target for option 1

Indicative policy requirement:

- **35% improvement over Part L 2021.**
- Heat pump scenarios can comply relatively easily and direct electric would only comply with an 'ultra-low energy' fabric and ventilation.
- Unfortunately, a gas heating system would still be possible with an 'ultra-low energy' fabric and ventilation. Other policy mechanisms are recommended to prevent new fossil fuel heating systems to be granted planning permission.

Policy option 2 (Space heating demand and EUI)

Space heating demand - Predictive (kWh/m^2/yr)		
Fabric & ventilation	Business as usual	37
	Good practice	12
	Ultra-low energy	4

Indicative policy requirement:

- **SHD < 15 kWh/m^2.yr**
- **EUI < 65 kWh/m^2.yr**
- These are in line with the industry definition of Net Zero Operational Carbon for school buildings

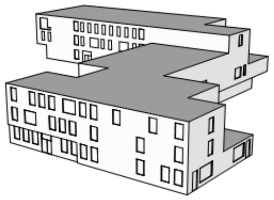
Table 20.14 – Performance of each fabric and ventilation specification level in terms of space heating demand overlaid with compliance with the FEE criterion in Part L 2021 criteria and compliance with indicative policy target for option 2

EUI - Predictive (kWh/m2/yr)		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	96	92	65	64
	Good practice	72	71	62	62
	Ultra-low energy	60	60	57	57

Table 20.15 – Performance of each case in terms of energy use intensity (EUI) overlaid with compliance with all criteria in Part L 2021 criteria and compliance with indicative policy target for option 2

Return to contents >

Part L modelling vs Predictive energy modelling | School



There are significant differences between the assessment of energy use between Part L energy modelling and predictive energy modelling. For example, in the case of the school building:

- **Space heating** appears to be significantly underestimated in Part L modelling, which means that changes to U-values, windows, airtightness will have limited effect, thereby not encouraging better fabric and better design.
- Part L estimates **'unregulated' energy use** (shown dashed in graph) but does not include it in the reported emissions. The predictive modelling allows greater scrutiny of equipment loads and has found that equipment energy use is likely to be lower than Part L calculates. This goes some way to explaining the very low space heating load, as equipment heat gains in the spaces act to reduce the heating load.
- The combination of the above and the overestimation of fan power means that **MVHR** could be discouraged using Part L modelling. The predictive modelling has found that the auxiliary energy use is likely to be much lower than is assumed by Part L.

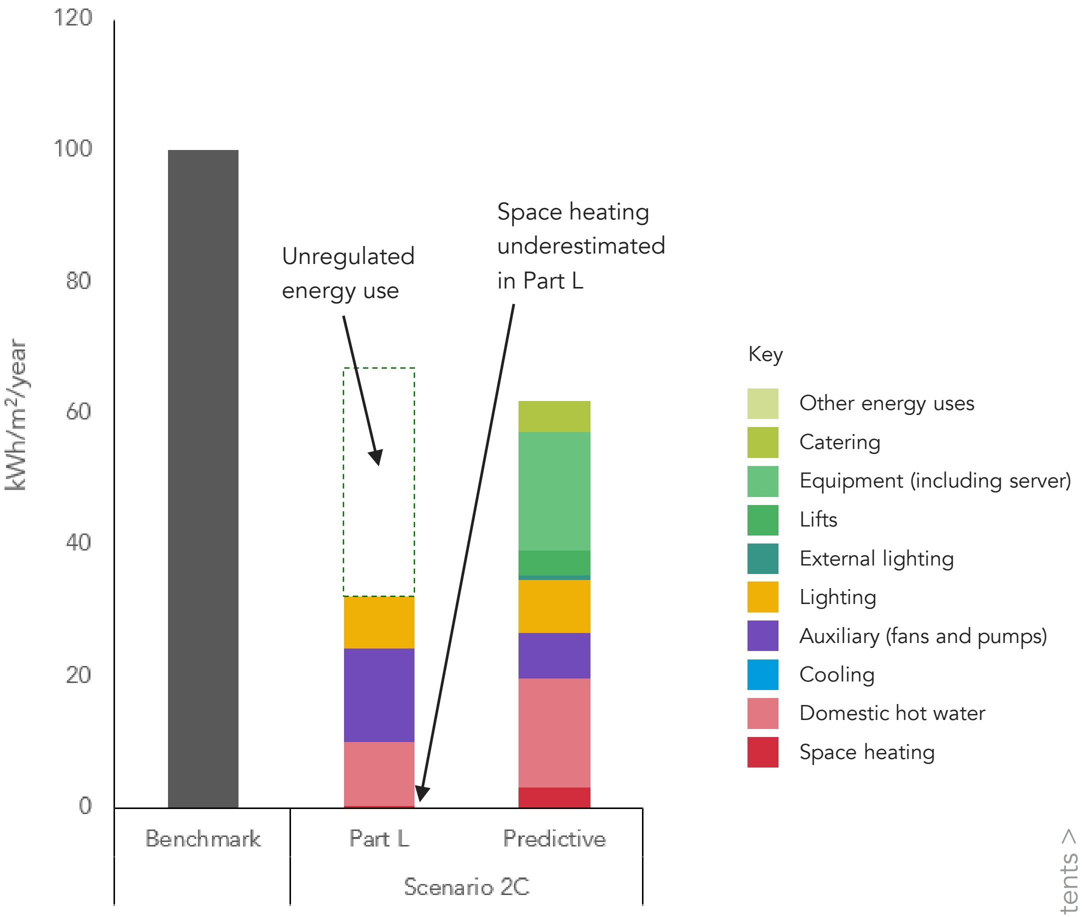


Figure 20.16 – Comparison between the results of the Part L energy model and the Predictive energy model, per separable energy use, for a typical 'good practice' scenario with a heat pump

Return to contents >

How would heat networks perform under Policy options 1 and 2?

One generic term, very different types of heat networks

The terms 'district heating' or 'heat networks' cover a wide range of realities in London. A review of the existing and planned heat networks showed a wide range of heat networks varying in terms of:

- **Heat generation**: e.g. gas-fired CHP, gas boilers, heat pumps, waste heat or Energy from Waste. Existing fossil fuel based heat networks may have plans to decarbonise and therefore change their heat generation mix.
- **Status**: hat networks may be working at capacity with no plans to expand or they may want to expand further.
- **Scale**, ranging from a few blocks to heat networks spanning over different London boroughs.
- **Supply temperature:** most heat networks circulate water at a temperature of 80°C or above but there is a drive towards lower temperatures.

It is therefore not possible to model a 'generic heat network' in London. However, three conclusions emerged:

1. As the focus of this study is new buildings, we sought to model the type of networks which are seeking to expand as they are the ones to which the Council is likely to mandate connection.

2. Energy from Waste systems (and particularly waste incineration plants) are currently considered by the UK Government as strategically important for management of municipal waste, with heat being a by product of this process. This was therefore considered as the first heat network scenario (DH1).

3. Some networks using fossil fuels (e.g. Olympic Park, Citigen) are seeking to grow and decarbonise. Therefore a heat network still using gas-fired CHP and boilers but relatively well advanced on its way to decarbonisation (40% heat pumps) was also modelled to see how it would perform.

DH1 I Energy from Waste

Figure 20.17 - Energy from Waste heat networks are centred around using heat that is produced by the process of waste incineration (above the North London Edmonton incinerator) distributing that heat to homes

Example: North London Edmonton incinerator (Photograph: pxl.store/Alamy)

DH2 I Fossil fuel based heat network seeking to grow and decarbonise

Figure 20.18 - The vast majority of large existing heat networks burn fossil fuels in an Energy Centre (through CHPs and gas boilers). In order to decarbonise, they will seek to generate a growing proportion of their heat with heat pumps. DH2 represents a network targeting a 40% proportion of heat from heat pumps.

Example: Olympic Park District energy Scheme (OPDES) (Equans)

Return to contents >

How would heat networks perform under Policy options 1 and 2?

The main aim of the TNZC study is to establish an evidence base to inform and support the development of new energy and carbon policies for new buildings in each of the 18 London Boroughs.

Heat networks are a key part of current GLA policy for heating, so it was necessary, as part of the study, to investigate how they would perform under Policy option 1, and to explain how they would be assessed (and perform) using Policy option 2.

Summary of conclusions

- Because the carbon content of grid electricity has rapidly reduced and heat pumps have become the first choice for local heating systems, the reduction in emissions that may be delivered by heat networks should be re-evaluated against this new baseline.
- Part L 2021 energy modelling used for Policy option 1 assess DH1 (Energy from Waste) favourably but not DH2, particularly in terms of carbon. It performs worse than a local heat pump system, which seems logical.
- It is possible to evaluate the performance of heat networks using the EUI metric (Policy option 2), with the additional information from the network providers. Including heat generating plant efficiencies and actual predicted system losses.
- Distribution losses are an inevitable feature of all heat networks. These system losses should be evaluated for each application, rather than estimated based on a factor of the heat delivered.

	Reduction in CO$_2$ – SBEM (reg)	With PV					
		Gas boiler	Direct electric	Heat Pump less efficient	Heat pump more efficient	DHN 1	DHN 2
Fabric & ventilation	Business as usual	27%	11%	75%	77%		
	Good practice	26%	3%	40%	40%		
	Ultra-low energy	63%	73%	83%	83%	112%	75%

Table 20.16 – Policy option 1: performance of DH1 and DH2 (assuming an ultra-low energy building) in terms of CO$_2$ compared with all other cases. Please do not that the results above are based on the Part L models and therefore that sleeving has not been considered.

	EUI - Predictive (kWh/m2/yr)	Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient	DHN 1	DHN 2
Fabric & ventilation	Business as usual	96	92	65	64		
	Good practice	72	71	62	62		
	Ultra-low energy	60	60	57	57	44	67

Table 20.17 – Policy option 2: performance of DH1 and DH2 (assuming an ultra-low energy building) in terms of energy use intensity (EUI) compared with all other cases

Return to contents >

Summary costs per m^2 of construction | Domestic

These tables indicate, for each archetype, the comparative construction costs of each combination of specifications compared to a 'cost reference scenario' or 'baseline' selected on the basis that it is Part L 2021 compliant.

The costs are shown as savings (shades of blue) or additional costs (shades of pink), and they are indicated both in % and £/m^2.

A red cross has been added over the scenarios which would not comply with Part L 2021 of the building regulations.

Terrace house (~ £2,020/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	~~-1.5%~~	~~-3.5%~~	~~-0.2%~~	~~0.7%~~
	Good practice	0.0%	-2.0%	1.4%	2.3%
	Ultra-low energy	3.0%	1.0%	4.4%	5.3%

Mid-rise apartment (~ £3,200/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	~~-2.0%~~	~~-4.8%~~	~~-0.4%~~	~~1.2%~~
	Good practice	0.0%	-2.8%	1.6%	3.2%
	Ultra-low energy	1.6%	-1.3%	3.2%	4.7%

Low-rise apartment (~ £2,500/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	~~-2.4%~~	~~-4.5%~~	~~-0.3%~~	~~2.3%~~
	Good practice	0.0%	-2.3%	2.1%	4.7%
	Ultra-low energy	2.4%	0.2%	4.5%	7.1%

High-rise apartment (~ £3,400/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	~~-1.0%~~	~~-2.9%~~	~~-0.1%~~	~~1.1%~~
	Good practice	0.0%	-1.9%	1.1%	2.1%
	Ultra-low energy	0.8%	-1.2%	1.9%	2.9%

Table 20.18 – Summary of all domestic relative costs (£/m^2) compared to the '0' baseline, overlaid with compliance with all Part L 2021 criteria

Return to contents >

Summary costs per m^2 of construction | Non-domestic

Office building (~ £4,050/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	VRF	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	~~-0.9%~~	-2.9%	-0.2%	3.0%
	Good practice	0.0%	-1.6%	0.4%	2.7%
	Ultra-low energy	1.8%	0.6%	2.0%	3.7%

Industrial building (~ £1,300/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	VRF	Four pipe chiller	Heat pump more efficient
Fabric & ventilation	Business as usual	~~-6.5%~~	3.8%	5.2%	7.1%
	Good practice	~~-2.2%~~	3.8%	4.7%	5.8%
	Ultra-low energy	0.0%	5.5%	6.2%	7.3%

Primary school (~ £3,400/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	Direct electric	Heat pump less efficient	Heat pump more efficient
Fabric & ventilation	Business as usual	-1.1%	-3.1%	0.0%	3.3%
	Good practice	0.6%	-1.0%	1.1%	2.9%
	Ultra-low energy	2.9%	-1.4%	2.9%	3.6%

Hotel (~ £4,250/m^2 baseline construction cost)

% uplift in cost per m^2 of construction		With PV			
		Gas boiler	Heat pump (220)	Heat pump (400/300)	Heat pump (450/300)
Fabric & ventilation	Business as usual	~~-0.8%~~	~~-2.2%~~	-0.3%	0.8%
	Good practice	0.0%	~~-1.3%~~	0.5%	1.6%
	Ultra-low energy	1.4%	~~-0.8%~~	1.9%	2.8%

Table 20.19 – Summary of all non-domestic relative costs (£/m^2) compared to the '0' baseline, overlaid with compliance with all Part L 2021 criteria

Return to contents >

Policy option 1 | Carbon offsetting

1

Set the minimum on-site Part L improvement at the right level to minimise residual (regulated) carbon emissions

Minimum levels for each typology could be considered*. For example:

- 65% better than Part L 2021 for domestic buildings
- 25% better than Part L 2021 for offices
- 35% better than Part L 2021 for schools
- 45% better than Part L 2021 for industrial buildings
- 10% better than Part L 2021 for hotels

2

Include unregulated carbon in the zero carbon definition to encourage reductions

In the absence of a quantified target on unregulated carbon, the carbon offset mechanism could be used to incentivise its reduction.

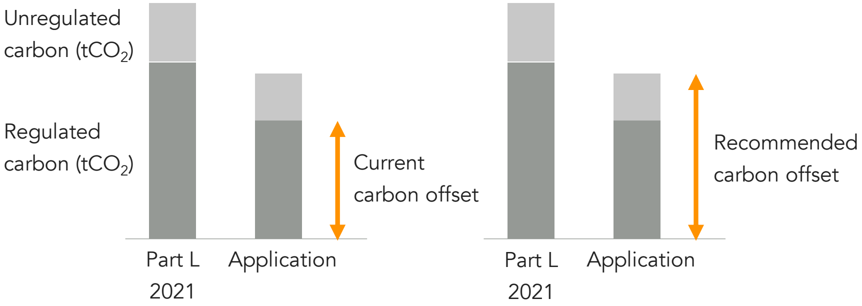


Figure 20.19 – Carbon offsetting should not only cover all regulated CO_2 emissions

3

Set the carbon offset price at a level sufficient to incentivise greater carbon savings on site rather than offsetting

The following page suggests that this level at £330-840/tCO_2 for 30 years to make sure it is less economical than to install additional PVs

4

Set the carbon offset price at a level sufficient to be able to save the same amount of carbon elsewhere

The following page suggests that this level is either at £330-840/tCO_2 for 30 years for PVs or £370/tCO_2 for 30 years for retrofit.

**Councils may also wish to consider an approach that uses a mid-point percentage uplift for all non-residential typologies.*

Policy option 2 | Energy offsetting

1

Option A - **Set the EUI requirement at the right level to minimise energy use and require PVs to match the EUI**

These levels should be specific to each typology, e.g:

- 35 kWh/m^2_{GIA} for domestic
- 70 kWh/m^2_{GIA} for offices
- 65 kWh/m^2_{GIA} for schools
- 35 kWh/m^2_{GIA} for industrial buildings
- 160 kWh/m^2_{GIA} for hotels

Option B - **Set a renewable energy generation requirement at the right level to maximise renewable energy generation**

2

Work out the difference between the energy used by the development and how much renewable energy it will generate

Any shortfall of renewable energy generation will lead to an energy offset payment

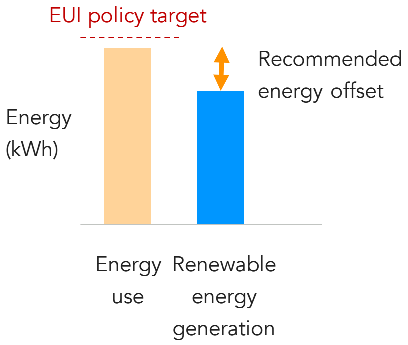


Figure 20.20 – Energy offsetting (option A)

3

Set the energy offset price at a level sufficient to incentivise greater renewable energy generation on site rather than offsetting

The analysis suggests that this level should be £1.32/kWh.

Return to contents >

Policy option 1 | Summary of indicative targets and wording

Carrying on with the current framework

Some London boroughs may want to carry on using the Part L framework to go beyond the requirements of Part L 2021 and drive the design and construction of better buildings in their boroughs. This system has the advantage of being broadly consistent with the current approach in the GLA energy assessment guidance (2022) but it also has a number of weaknesses evidenced in this report (e.g. the single metric approach does not incentivise energy efficiency or renewable energy generation significantly, Part L energy modelling is not a prediction of energy use, etc.).

Different targets for domestic and non-domestic

Part L 2021 works very differently between domestic and non-domestic buildings, driven mainly by the different Part L energy modelling calculation methodologies: SAP for domestic buildings and NCM/SBEM for non-domestic buildings. Based on this analysis we would recommend requiring different levels of on-site carbon performance for domestic and non-domestic buildings.

Policy targets for non-domestic buildings

National and regional planning policy has previously set one emissions reduction target for all non-domestic buildings, due to a lack of evidence available to justify setting specific targets for different building types. This study sets out detailed evidence for a range of non-domestic buildings and, based on this new evidence, recommends distinct policy targets for each building type thereby maximising potential carbon savings.

Councils may also wish to consider an approach that uses a mid-point percentage uplift for all non-residential typologies

No more ‘be lean’ requirement

The ‘be lean’ requirement is challenging to achieve for non-domestic buildings and and, for domestic buildings, has little added value compared with the FEE requirement in Part L 2021.

Indicative policy wording for Policy option 1

Overarching policy

All developments must achieve Net Zero Carbon according to the Building Regulations framework, i.e. a 100% improvement over Part L 2021 and offset their residual emissions.

On-site carbon reduction

All developments must reduce carbon emissions on-site as much as possible.

In terms of regulated emissions, the minimum level of on-site performance required is:

- *Domestic buildings: 65% better than Part L 2021*
- *Office buildings: 25% better than Part L 2021*
- *School buildings: 35% better than Part L 2021*
- *Industrial buildings: 45% better than Part L 2021*
- *Hotel: 10% better than Part L 2021*
- *Other non-domestic buildings: 35% better than Part L 2021 (tbc)*

Buildings must also comply with the other requirements of the Building Regulations Part L 2021, e.g. Fabric Energy Efficiency criterion for domestic buildings and Primary Energy criterion for all buildings and demonstrate compliance at planning stage.

Applicants must undertake Part L 2021 modelling to demonstrate compliance.

Unregulated emissions must also be reduced as much as possible.

Carbon offsetting

On-site carbon reductions should be maximised as far as possible before any remaining emissions are offset. If the Council is satisfied that the development has maximised on-site reductions but the development is still short of achieving Net Zero Carbon, the developer is expected to make a cash-in-lieu contribution to the Council's carbon offsetting fund at a price of £880/tCO_2 per year over a period of 30 years.

Return to contents >

Policy option 2 I Summary of indicative targets and wording

Using a different policy framework

The consultants' recommendation is to adopt Policy option 2.

A suite of policies are proposed.

This document focuses mainly on the space heating demand, Energy Use Intensity (EUI) and Offsetting (as last resort) policies. However, policy wording is also suggested for the other policies.

Indicative policy wording for Policy Option 2

Overarching policy

All new buildings should be designed and built to be Net Zero Carbon in operation. They should be ultra-low energy buildings, use low carbon heat, contribute to the generation of renewable energy on-site and be constructed with low levels of embodied carbon.

This is an overarching policy. Compliance with it relies on compliance with the following policies.

- *Space heating demand policy*
- *Low carbon heat policy*
- *Energy Use Intensity (EUI) policy*
- *On-site renewable energy generation policy*
- *Assured energy performance policy*
- *Offsetting (as last resort) policy*
- *Embodied carbon policies (see separate document)*

Buildings must also comply with the other requirements of the Building Regulations Part L 2021, e.g. Fabric Energy Efficiency criterion for domestic buildings and Primary Energy criterion for all buildings and demonstrate compliance at planning stage.

Indicative policy wording for Policy Option 2

Space heating demand policy

- *All dwellings should achieve a space heating demand of less than 15 kWh/m^2$_{GIA}$/yr.*
- *All non-domestic buildings should achieve a space heating demand of less than 15 kWh/m^2$_{GIA}$/yr.*

Energy Use Intensity (EUI) policy

Domestic buildings *- All dwellings should achieve an Energy Use Intensity (EUI) of no more than 35 kWh/m^{2}GIA/yr.*

Non-domestic buildings *- Non-domestic buildings should achieve an Energy Use Intensity (EUI) of no more than the following (where technically feasible) by building type or nearest equivalent:*

- *Student or keyworker accommodation, care homes, extra care homes – 35 kWh/m^2$_{GIA}$/yr*
- *Warehouses and light industrial units – 35 kWh/m^2$_{GIA}$/yr*
- *Schools – 65 kWh/m^2$_{GIA}$/yr*
- *Offices, Retail, HE Teaching facilities, GP surgeries – 70 kWh/m^2$_{GIA}$/yr*
- *Hotels – 160 kWh/m^2$_{GIA}$/yr*

Offsetting (as last resort) policy

Offsetting will only be accepted as a means to achieving planning policy compliance a last resort if the building is compliant with all other Net Zero carbon buildings policies.

In these circumstances, the applicant should establish the shortfall in renewable energy generation to enable the annual renewable energy generation to match the Energy Use Intensity in kWh. The applicant should pay into the Council's offset fund a sum of money equivalent to this shortfall.

Other indicative policies have not been considered in detail in the report, but an example of wording is provided for the low carbon heat, on-site renewable energy generation and assured energy performance policies.

Return to contents >