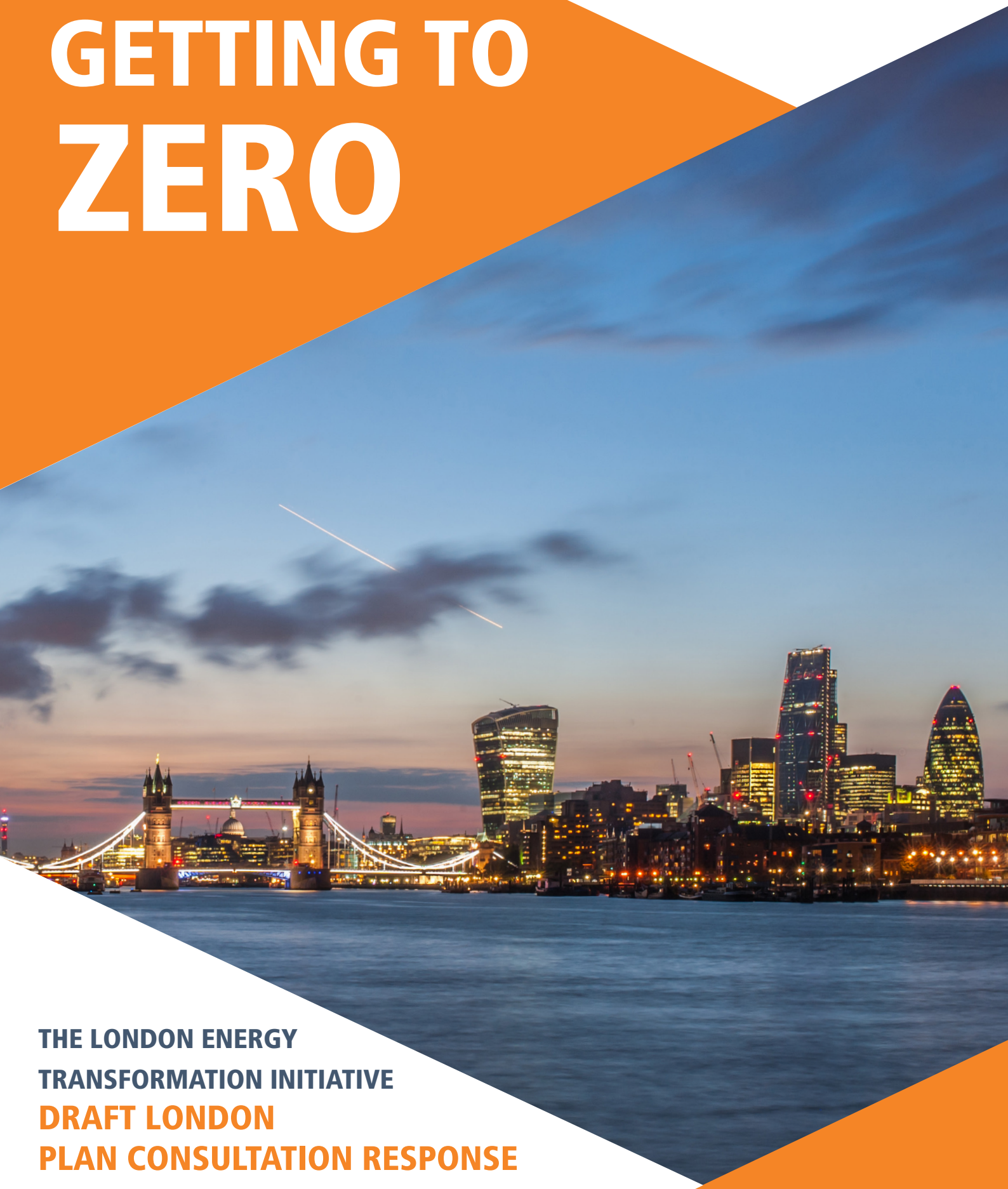
GETTING TO ZERO



THE LONDON ENERGY TRANSFORMATION INITIATIVE

DRAFT LONDON PLAN CONSULTATION RESPONSE

FEB 2018

Acknowledgements

Members of LETI coordinated and facilitated the 'LETI draft London Plan consultation workshop'. The workshop was led by Stephen Kent with support from Clara Bagenal George, Chris Twinn, Clare Murray and the LETI London plan consultation response team.

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Clara initiated the process of collaboratively developing energy policy recommendations, which led to the development of the London Energy Transformation Initiative. She was recognised as the UKGBC Rising Star of 2017, partly in recognition of her work on energy policy and low energy building design, and is a Mayor's Design Advocate for Good Growth.

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Chris is a renowned sustainability specialist with a particular interest in where we go next for the built environment and the communities it serves. His background is in integrated building design, planning and implementation, running his own independent consultancy after 28 years with Arup as director and Arup Fellow.

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Stephen is involved with delivering commercially focused sustainability advice across all stages of a building's lifecycle. He firmly believes in working collaboratively with the property industry to influence the development of planning policy that leads to operationally zero carbon buildings. He has been involved with LETI from the early stages and coordinated the London Plan consultation workshop.

A special thanks to the below for their input in the LETI London Plan consultation response team, facilitating or notekeeping at the workshop, and their input in this report:

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Member of Integral Group

Elementa Consulting created the London Energy Transformation Initiative in 2017 in response to the frustrations they experienced as building services engineers applying current energy policy. Avoidable climate change and air quality impacts were being encouraged by a policy framework that was no longer delivering on its objectives. LETI was founded from Elementa's belief that the pathway to a Zero Carbon London can only be defined through robust dialogue and open collaboration - between policy makers and the broadest possible cross-section of built environment professionals.

Executive summary

LETI supports the London Plan's objective of achieving a fully Zero Carbon London by 2050, meaning that all buildings will have to operate at zero emissions by 2050. With our broad support base across the industry we believe this target is not only possible, practical and achievable, but it will also further support London's prosperity and skills growth. Drawing on our collective experience gathered from both the UK and abroad, LETI's research shows that meeting this objective will require an ambitious trajectory of milestones and ratcheting targets that must be included in the London Plan.

LETI believes a key milestone is ensuring all new buildings operate with zero emissions by 2030. This reflects parallel thinking in Europe[1], the USA[2,3] and the World Green Building Council[4] and is due to the fact that:

1. Currently each new building represents an increase in London's total carbon emissions, a figure which needs to be greatly reduced.
2. Achieving operational zero emissions for new builds will require a shift in how we design, construct and operate buildings. This change will not happen overnight, these principles will need to be applied to new builds as soon as possible and then rolled out to existing buildings.
3. We must ensure that buildings we construct in the next few decades do not add to the large number of buildings that will have to undergo major retrofit to achieve operational zero emissions by 2050.

The London Plan must set out details of the wider context of delivering operational zero carbon new buildings by 2030. Achieving this target will mean departing from the current national policy framework, in order to shift the industry away from 'design for compliance' by implementing performance outcome based policies.

Policy is seen as the primary driver of a step change to zero carbon, arguably the most far reaching sustainable issue affecting London's future. Unless the GLA, advised by industry experts, can enact and support ambitious policy change there is little hope in meeting zero carbon targets. In light of long term serious implications from climate change, "viability" must be seen with a long term lens to secure London's future as a vibrant global city.

Why LETI believe that current policies will not deliver zero carbon buildings:

1. New buildings are not performing as calculated, on their claimed carbon reductions by a significant margin.
2. The 'Zero Carbon' definition that the GLA currently uses, based on a % reduction on Part L, falls well short of operational zero carbon buildings.
3. Low energy solutions are being positively hindered by Building Regulations Part L calculation methodology. For example, outdated carbon intensities are driving unintended lock-in to fossil fuel and combustion air pollution.
4. Grid-decarbonisation is being delivered by energy providers. This will benefit the construction industry but should not be seen as its own achievement.
5. The construction industry needs to make its own contribution to national carbon reductions by reducing energy used on-site and minimising peak demand.

Click here for the GLA definition of zero carbon

LETI believes that the following policy changes are required to deliver operational Net Zero Carbon for new buildings by 2030:

1. 'Operational Zero Carbon' by 2030 for all new buildings - this moves beyond the current definition of a 'design prediction' using a 'percentage CO_2 reduction', to deliver actual operational and measured zero carbon buildings.
2. An absolute kWh metric - to allow the full range of stakeholders involved in the design, operation and delivery of our buildings to understand and therefore fully contribute to reducing energy consumption.
3. Adding a 'Be Seen' stage to the energy hierarchy - we fully support the inclusion of energy monitoring, this is seen as fundamental to achieving operational zero emissions and thus should be elevated into policy SI 2 A.
4. Energy strategies to demonstrate future-proofing to 'Operational Zero Carbon' on-site by 2030 - we support clause 9.2.10 i of the draft London Plan, but believe leaving it until 2050 will only encourage further lock-in to fossil fuel and urban combustion pollution.
5. Addressing whole life embodied carbon to be explicitly included in Policy SI 2 - to drive innovation addressing what will become the largest building carbon emissions challenge once operation carbon is reduced.
6. A zero emissions by 2030 transition plan to be provided for all district heat/energy networks, alongside disclosing energy usage and efficiency data to ensure that networks are part of the solution to delivering operational zero emissions.
7. The heating hierarchy to be renamed and rearranged to emphasise the changing priorities of a trajectory to a zero carbon London.
8. The importance of minimising energy demand peaks to be strengthened.
9. 'Mayor's Energy Advocates' to be available for boroughs to assist in ensuring sustainable design is embedded, as a parallel to the Mayor's Design Advocates.

1. https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings/nearly-zero-energy-buildings, 2. http://architecture2030.org/, 3. British Columbia Step Code http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/reports/step_code_sciwg_report_final.pdf, 4. http://www.worldgbc.org/advancing-net-zero

Contents

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5 Workshop Focus Areas

1. **Path to Zero Carbon**
2. **Energy Monitoring**
3. **Heating Hierarchy**
4. **Demand Management**
5. **Embodied and Whole Life Carbon**

Introduction

The London Energy Transformation Initiative (LETI) is a network of over 200 built environment professionals that are working together to put London on the path to a zero carbon future. This voluntary group is made up of developers, engineers, housing associations, architects, planners, academics, sustainability professionals, contractors and facilities managers, with support and input provided by the GLA and London boroughs. LETI was established to work collaboratively to put together evidence-based recommendations for two pieces of policy – the new London Environment Strategy and the rewrite of the London Plan.

Click here to access previous LETI reports

This report summarises the outcomes and recommendations of LETI's consultation response on the draft London Plan. The GLA invited LETI to host a consultation workshop for the London Plan focusing on zero carbon, energy monitoring, the heating hierarchy, demand management and embodied carbon.

A workshop was held in January 2018 at City Hall with more than 60 industry contributors to review the draft policy in Chapter 9,'Sustainable Infrastructure', focusing on SI 2, 'Minimising greenhouse gas emissions' and SI 3, 'Energy infrastructure'. Attendees included developers, engineers, architects, planners, sustainability professionals and facilities managers. The purpose of the workshop was to analyse and test these policies in detail to determine whether they need to go further to meet the overarching sustainability aims of the GLA. The outcomes of the workshop have been summarised in this report, providing feedback on the wording of the polices, suggestions for Supplementary Planning Guidance (SPG) content and advice for the GLA to help support the policy implementation at borough level. LETI is in support of the new Draft London Plan objectives and seeks to assist in developing policy wording to ensure it achieves them. Most of LETI's concerns are readily acknowledged by policymakers, as well as the wider industry, which include the unintended consequences of industry practices, previous policy and regulation constraints. Lack of transparency in process, responsibility and final delivery also hinder progress further.

LETI's vision is for a planning process and set of policies that focuses all stakeholders on verified operational building outputs, aligned with genuine zero carbon targets and the longer-term infrastructure limits. Evidence from industry bodies suggests that a more transparent process would also help deliver less complex and less costly buildings. The focus areas of this report have evolved from previous LETI work and further discussion with the GLA.

LETI 2018 - get involved

As well as advising policy makers on policy changes, we must also implement the LETI principles within our everyday work and advocate that others do the same. LETI is therefore running three workstreams in 2018 that look to move us closer to a zero emissions London.

Advancing Net Zero

Developing a Zero carbon framework with the UKGBC

As part of the global Advancing Net Zero campaign, this project will develop a framework for net zero carbon buildings for the UK market which builds on existing initiatives and standards.

Leading By Example

Developing a LETI appendix for energy statements

How can the industry go further than the standard energy statement. This could involve providing additional information (e.g. kWh/m^2), or proposing an alternative approach to compliance e.g. adopting "Design for Performance".

LETI Legacy

Implementing the LETI principles

How we can practically implement the positive outcomes of LETI over the long-term and to keep the programme active beyond the London Plan consultation. For example it may be that we form an advisory panel that could assist local authorities.

Register to get involved with the LETI 2018 workstream at www.leti.london

Path to Zero Carbon

Click here to access previous working group report on energy strategy targets. See pages 12-13

LETI believes that current policy relating to carbon emissions in buildings in London will not deliver Net Zero Carbon for new buildings by 2030. We therefore recommend the following changes are made to strengthen and reinforce the policy.

Draft policy wording

Policy SI 2 - Minimising green house gas emissions

"A. Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy: ...

C. ~~In meeting the zero-carbon target~~ a minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should ~~aim to~~ achieve 10 per cent, and non-residential development should ~~aim to~~ achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided:

1) through a cash in lieu...

2) off-site..."

Supporting text - 9.2.10

As a minimum, energy strategies should contain the following information:

"i. Proposals explaining how the site has been future-proofed to achieve zero-carbon on-site emissions ~~by 2050~~."

In LETI's view, all new buildings should be zero carbon emissions in operation by 2030. This differs from the GLA definition of net zero carbon.

Remove "in meeting the zero carbon target". This over-represents the impact a 35% reduction beyond Building Regulations would have on achieving operational zero carbon.

Remove "aim to" and introduce "a minimum of" to provide a clear level of performance.

Alter wording to include a 2030 zero carbon requirement.

Our suggested wording

Policy SI 2 - Minimising green house gas emissions

A. Major development should have zero carbon emissions in operation by 2030. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy

C. [text removed] A minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should [text removed] achieve a minimum of 10 per cent, and non-residential development should [text removed] achieve a minimum of 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided:

1) through a cash in lieu...

2) off-site... "

Supporting text - 9.2.10

i. Proposals explaining how the site has been future-proofed to achieve zero-carbon on-site emissions in operation by 2030.

Suggested SPG content

- In LETI's view, all new buildings should have zero carbon emissions in operation by 2030. The full meaning of zero carbon and a long term action plan will need to be formed to ensure this goal is achieved. This differs from the GLA net zero carbon definition. The SPG should contain clarity on a long term plan to achieve zero carbon emissions in operation.
- Provide a link to the most up-to-date carbon factors for consultants to use in energy reports alongside the dated Building Regulation Part L values.
- Request the use of an alternative kWh/m^2 metric for comparison of energy demand between developments. Seek to adopt a kWh/m^2 metric in future policy.
- Request the calculation of unregulated energy/CO_2. Building Regulation Part L and planning carbon targets currently ignore unregulated carbon.
- Request that applications consider: plant space; demand response readiness; energy storage; natural ventilation readiness; glazing tech/fabric upgrade readiness; design for low temperature systems including larger radiators, underfloor heating and use of heat pumps, etc.
- Quantitative demonstration of future proofing should be encouraged.

Actions for GLA to support policy implementation

- Develop a more accurate and ambitious approach to energy and carbon calculations in London. LETI believe that London should first and foremost make the right choices to deliver its own carbon targets rather than being concerned with consistency with a national context (Building Regulations Part L methodology), which is not delivering a true picture of carbon emissions reductions. Refer to page 3 of this report to see why LETI believe that current policy will not deliver zero carbon buildings.
- Energy Advocates could be used to help write SPG's and assist local authorities with technical skills required to appraise applications. (similar to the Mayors Design Advocates program),
- Provide more clarity on what happens to cash-in-lieu offset payments.

Energy Monitoring

LETI believe that only when buildings are monitored and measured can we understand if they are performing as intended or calculated. Therefore, we propose that the introduction of energy monitoring is strengthened in policy and added as a bold new fourth step in the energy hierarchy.

Draft policy wording

Policy SI 2 - Minimising green house gas emissions

A. Major development... in accordance with the following energy hierarchy:

1) Be lean...

2) Be clean...

3) Be green...

B. Major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and ~~will be expected~~ to monitor and report on energy performance

Supporting text - 9.2.9

"The move towards zero-carbon development requires comprehensive monitoring of energy demand and carbon emissions to ensure that planning commitments are being delivered. Major developments are required to monitor and report on energy performance~~, such as by displaying a Display Energy Certificate (DEC) and reporting~~ to the Mayor for at least five years via an online portal to enable the GLA to identify good practice and report on the operational performance of new development in London."

Supporting text - 9.2.10

As a minimum, energy strategies should contain the following information:

"h. ~~Proposals~~ for how energy ~~demand~~ and carbon emissions post-construction will be monitored annually (for at least five years)."

Remove "will be expected to", to prevent ambiguity.

move monitoring into the energy hierarchy and re-phrase to include the word "verify".

Swap the word "demand" for "consumption".

Move clarification on monitoring and reporting techniques to the SPG as these may change over time thus shouldn't be in policy

Remove "proposals for" and ask design teams to "demonstrate".

Swap the word "demand" for "consumption".

Add the words "monthly and reported" for clarification.

Our suggested wording

Policy SI 2 - Minimising green house gas emissions

A. Major development... in accordance with the following energy hierarchy:

1) Be lean...

2) Be clean...

3) Be green...

4) Be seen: monitor, verify and report on energy performance in use.

B. Major development should include a detailed energy strategy to demonstrate: how the zero-carbon target will be met within the framework of the energy hierarchy; and [text removed] to monitor and report on energy performance

Supporting text - 9.2.9

The move towards zero-carbon development requires comprehensive monitoring of energy consumption and carbon emissions to ensure that planning commitments are being delivered. Major developments are required to monitor and report on energy performance [text removed] to the Mayor for at least five years via an online portal to enable the GLA to identify good practice and report on the operational performance of new development in London.

Supporting text - 9.2.10

h. Demonstrate how energy consumption and carbon emissions post-construction will be monitored monthly and reported annually (for at least five years).

Suggested SPG content

- A clear list of required figures for applicants to monitor, collect and submit. This should include frequency of data collection and submission.
- Proposals for energy monitoring of major new developments during the first five years of operation should measure the following, in order of priority:
  1. **Base building energy use**: regulated energy uses defined by Building Regulations. This correlates with the responsibilities of the developer, their designers, contractors and building managers.
  2. **Whole building energy use:** regulated and unregulated energy uses to capture the total carbon footprint relating to London's objective to become a zero carbon city.
  3. **Energy used directly by each occupier in a multi-let non-domestic building:** this is the difference between the whole building energy use and base building energy use; measuring it gives agency to non-domestic tenants to manage their contribution to the total carbon footprint. For domestic buildings this is dealt with as part of the base and whole building energy use.
- Examples of data collection methods for non-domestic buildings such as display energy certificates (DEC) and landlord energy ratings (LER). Note that DECs mask the activities of individual tenants in multi occupier buildings, so should be complemented by base building ratings and individual outputs from each tenant.
- Request data on efficiency and energy usage to be disclosed from heat networks specifically.
- Request the reporting of energy and carbon per person and per m^2.
- Refer to current Islington Council policy for examples of monitoring in practice.

Heating Hierarchy

Click here to access previous working group report on district heat networks. See pages 14-17

LETI supports the need for a unified policy on energy infrastructure, for which heating and cooling networks are of particular importance. To reflect the complexity of implementing energy infrastructure, we have combined the detailed discussions of the established LETI decarbonising heat working group with the outcomes of the January 2018 London Plan workshop.

Draft Policy wording

Policy SI 3 - Energy infrastructure

"D. Major development proposals within Heat Network Priority Areas should have a communal heating system.

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a. *connect to local existing or planned heat networks*

b. *use available local secondary heat sources (in conjunction with heat pump, if required, and a lower temperature heating system)*

c. *generate clean heat and/or power from zero-emission sources*

d. *use fuel cells (if using natural gas in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)*

e. *use low emission combined heat and power (CHP) (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)*

f. *use ultra-low NOx gas boilers."*

Swap clauses a. and b. and re-phrase to include energy sharing and efficiency measures.

Merge clauses c. and d.

Merge clauses e. and f. and re-phrase.

Our suggested wording

Policy SI 3 - Energy infrastructure

D. Major development proposals within Heat Network Priority Areas should have a communal heating system.

1) the heat source for the communal heating system should be selected in accordance with the following low carbon heating hierarchy:

a. connect to an energy sharing network through the capturing and using of waste heat and/or use of available local secondary heat sources.

b. connect to a local existing or planned heat network where it is demonstrated to be running efficiently, the cost of heat to occupants is comparable to national average heating fuel costs, and there is a zero emissions transition plan in place to ensure that the development achieves zero carbon emissions in operation (if it is not already fossil fuel free).

c. generate clean heat and/or power from zero-emission sources (examples include: solar technologies, heat pumps and energy storage powered by renewables).

d. use low emission combined heat and power (CHP) (where suitable for size and demand of development) or ultra-low NOx gas boilers (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler). If the development uses fossil fuels then a zero emissions transition plan must be in place to ensure that the development achieves zero carbon emissions in operation by 2030.

Suggested SPG content

- Promote efficient low or zero carbon solutions for each development size and type. This will change over the lifetime the technology is installed for. The inclusion of heat networks should not override all other decision making processes.
- Provide guidance on appropriateness of heat networks to new development that is outside heat network priority areas or has low heat demand. Guidance could suggest applicants skip to part c. of the heating hierarchy where applicable.
- Ask applicants to be clear on assumed local air quality impacts/ limits and estimate likely annual energy costs to see if they represent a risk in terms of fuel poverty.
- Request the disclosure of heat network carbon factors used for calculations and during the lifetime of the operation of the plant. This is essential to understand the assumptions made by applicants and whether they are realistic.
- Provide links to guidance on low temperature heat networks and energy sharing within and between developments.
- Where heat pumps are proposed by applicants, encourage a shift away from high global warming potential (GWP) refrigerant use.
- Where LETI's suggested policy wording (above) is adopted, include a definition of an 'energy sharing network' and the requirements of a 'zero emissions transition plan'.

Actions for GLA to support policy implementation

- Update the London Heat Maps to include current plant and in-use efficiency data on heat networks.
- Create strategic plans with local authorities for heat network opportunity areas. This should not be left to developers to determine, there is a strategic role here.
- Lobby government to class heat network infrastructure as a nationally recognised utility.
- Provide support for local authorities to follow-up on zero emissions transition plans and ensure implementation.

Demand Management

LETI feel the prescriptive measures outlined in the draft policy wording do not in themselves constitute a demand response or management measure. While smart meters, smart grids and micro grids could lead to a reduction in peak demand, this is not necessarily always the case.

As an overarching point, we believe that the words 'demand response' in policy should be replaced with 'demand management'. This is because we feel that demand should be proactively managed rather than responded to.

Demand management is a fast moving industry, so we have suggested that technological responses which could quickly become redundant are not listed in policy, but reserved for the SPG.

Draft policy wording

Supporting text - 9.2.10

As a minimum, energy strategies should contain the following information:

"g. Proposals for demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible."

Reword text to encourage variety and innovation in applications and remove proscriptive technologies

LETI strongly feel the word 'response' should be replaced with the word 'management'

Our suggested wording

Supporting text - 9.2.10

g. To anticipate infrastructure capacity challenges for a growing London, submit proposals for energy demand management and reductions in peak energy demand.

Suggested SPG content

- Suggested building components and measures for addressing demand management could be listed alongside both potential and adopted measures. These should consider the effect on the national energy network, local energy network and end user.
- Apply caution where developers/installers offer smart meters, smart grids and micro grids without putting in place energy management facilities for when the building is completed and in-use.
- Applicants could be asked to compare demand response measures to a base case building and should be measurable rather than a vague statement, for example:
    - Evidence should be provided that peak energy demand does not occur during certain defined summer and/or winter months when infrastructure capacity is particularly constrained (now or in the future). This could be progressed to a percentage reduction target and eventually time of day reductions once further data is available.
    - List annual peak demand and peak demand for each month both in absolute and per square metre metric for regulated and un-regulated energy, including shared building services, plant and car charging to allow data to be gathered and inform further refinement of this policy.
- A demand response hierarchy could be developed to guide applicants.
- Request applicants to discuss capacity and effects of development to the local electrical substation.
- For unregulated loads, provide specific requirements to demonstrate they have been reduced. Consider measures that influence consumer behaviour and better targeting of demand management.
- Long term effects of demand management measures should be considered, such as the effect of domestic half-hourly billing and an increase in renewables (e.g. wind) during winter months.
- Consider measures for future proofing buildings, in particular, how vulnerable residents will be protected from market changes, such as the introduction of high cost kWh tariffs during periods of peak grid demand.

Actions for GLA to support policy implementation

- A clear methodology must be outlined – this will make it easier to enforce while also providing simple recommendations.
- References to standards and accepted calculation methodologies should be made where available.
- Guidance should be made as to how technological changes will be dealt with.
- Simple compliance options could be developed and made available.
- Refer to examples such as Californian Building Code, which reduces allowable grid demand during peak grid demand months.
- Assist local authorities in collecting data at a borough level and collate to outline typical profiles and examples of best practice.

Embodied and Whole Life Carbon

Requiring embodied carbon calculations within the London Plan would enable the collection of data so that benchmarking can be undertaken in the future. This would assist in creating a shift in the industry so that developers, consultants and clients become used to undertaking these assessments on projects.

Ultimately the aim is to start the behavioural change around embodied carbon within the construction industry and firm support from the London Plan will support this. Our recommendation is to consider Whole Life Cycle Carbon in parallel to Operational Carbon within policy SI 2 as both are complex issues on their own and key to achieving Net Zero carbon buildings.

Draft policy wording

Supporting text - 9.2.10

As a minimum, energy strategies should contain the following information:

"k. Proposals to minimise the embodied carbon in construction"

Strengthen wording to take into account the whole life cycle of materials as well as the the embodied carbon.

Consider bringing life cycle carbon into policy though the addition of a clause in policy SI 2.

Our suggested wording

Supporting text - 9.2.10

k. Proposals to demonstrate actions taken to minimise whole life cycle carbon

Policy SI 2 - Minimising green house gas emissions

E. Referable schemes should quantify whole life carbon through a nationally recognized Carbon Life Cycle Assessment (Carbon-LCA) & demonstrate actions taken to reduce lifecycle carbon informed by this analysis.

Suggested SPG content

- Carbon lifecycle assessments can identify significant scope to reduce carbon impacts, through design, reuse, recycling, sourcing, disposal and substitution of materials with lower carbon or more durable alternatives. These factors should be considered in demonstrating actions taken to minimise whole life carbon.
- BS EN:15978 provides an appropriate methodology to quantify the whole life carbon in a development (including embodied carbon). In November 2017 RICS published a guide "Whole life carbon assessment for the built environment, first edition" which sets out consistent principles and practical guidance on the application of EN 15978.
- The SPG must set out scope boundaries and a reporting framework so that it is clear what elements of life cycle carbon have been included. This should include:
  - Which building elements to be included (1.1 substucture, 2.1 frame etc as per BCIS definition)
  - The reference service life- eg 60 years
  - Lifecycle boundary information- ie product stage, transport, operational energy and disassembly
  - If disassembly of existing buildings that are to be demolished as part of the development are to be included
  - If biogenic carbon storage (CO_2 content locked in wood) is included
  - The format of the calculation and how this is itemised
  - Embodied carbon data should be taken from Environmental Product Declarations (EPDs) to EN 15804 or ISO 14025 where available, or other reputable databases where EPDs are not available
- Explain the relevant definitions:
  - Embodied carbon – the carbon emissions from sourcing raw materials, processing and fabrication, transportation and assembly on-site.
  - Whole life carbon – the carbon emissions from embodied carbon and carbon emissions associated with operation, repair, replacement and disassembly.
  - Operational Carbon – the carbon emissions from the systems used in the operation of the development ie, HVAC domestic hot water and lighting.

Actions for GLA to support policy implementation

- It is noted that local authorities can only enforce elements of the plan which are policy. Therefore, it is recommended that embodied carbon/ whole life carbon is included within policy SI 2.
- Given that the aim at this stage is to collect data to enable benchmarks in future, it is recommended that the GLA provides a central repository for this information to collect the embodied carbon calculations from all boroughs. This will also reduce the burden on local authorities.
- A simple online tool or spreadsheet could be provided by the GLA for applicants to complete. This would speed up data collection and ease comparison.
- LETI members have working examples of embodied carbon and whole life cycle carbon emissions calculation and are available to provide further advice for the SPG.

Referable schemes

"An application is referable to the Mayor if it meets the criteria set out in the Mayor of London Order (2008). The criteria includes:

- *development of 150 residential units or more*
- *development over 30 metres in height (outside the City of London)*
- *development on Green Belt or Metropolitan Open Land".*

Click here to access the Major's full definition of referable schemes

Appendix

This appendix documents the outputs generated by each of the five working group tables at the January 2018 LETI London Plan workshop at City Hall.

Workshop Notes

This section contains the notes of the discussions of each workshop table group:

1. Path to Zero Carbon
2. Energy Monitoring
3. Heating Hierarchy
4. Demand Management
5. Embodied and Whole Life Carbon

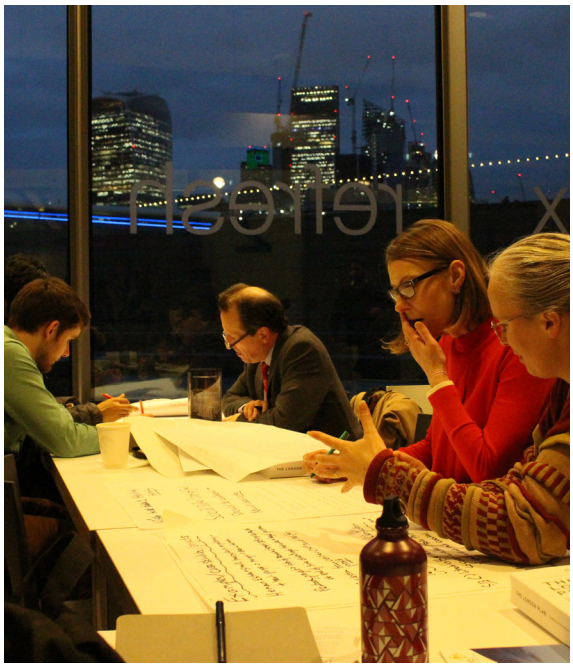
During the workshop each table worked though a series of discussion points and questions relating to their topic and applicable London Plan draft

poilcy. The questions were designed to draw out the effectiveness of the draft policy, whether any amendments to wording changes should be suggested and what guidance should be provided in supplementary planning guidance (SPG's)

Each table included a facilitator to ensure the talking points of the table were addressed and a note keeper to record the key points that would inform this report.

After the workshop an initial draft of the findings was written up by the notekeeper and facilitator. The participants of each table were then given the opportunity to comment on the draft notes to ensure that the whole discussion was captured.

The notes shown in this appendix do not necessarily represent the views of LETI but are a record of the conversations of the LETI consultation workshop.



1 – Path to Zero Carbon

Participants

Facilitator: David Barker - Elementa Consulting

Note keeper: Nuno Correia - XCO2

Chris Granger - Greater London Authority

Davinder Ranu – Woods Bagot

Helen Payne – BWB Consulting

Jennifer Juritz - David Morley Architects

Juergen Koch – 4 Green Architecture

Samantha Crichton - Ecuity Consulting

Stephen Gallacher - WSP

Susie Diamond - Inkling

Thomas Lefevre - Etude

Tom Dollard - Pollard Thomas Edwards

Tom Randall - Verco

Wayne Head - Curl la Tourelle Head Architects

Specific recommendations

1. Update CO_2 factors to current values.
2. In SI 2 C, remove "aim to" to provide a clear level of performance, rather than inciting "excuses". New wording would be "residential development should achieve 10%, and non-residential development should achieve 15% through energy efficiency measures".
3. In SI 2 B ,remove "be expected to" with regard to monitoring and report. Again, clear direction and removing the ambiguity of the sentence. Also replace "monitor" with "verify" which will encourage designers to model their buildings in such a way that operation energy can be measured and compared/ benchmarked.
4. In SI 2 C, remove "in meeting the zero carbon target" at the start. This over-represents the impact that a 35% reduction beyond Building Regulations would have on achieving zero carbon. Subsequent reference to residential and non-residential developments in the paragraph may need reference to being "major developments" as noted in SI 2 A.
5. SPG inclusions for future proofing (9.2.10-i):

- Submissions should consider:
  - Plant space
  - Demand response readiness
  - Energy storage
  - Natural ventilation readiness
  - Glazing tech/fabric upgrade readiness
  - Design for low temperature systems, including larger radiators or underfloor, use of heat pumps, etc.

- Submissions could be based on a tick list (maybe with hierarchy), with justification of why elements have not been implemented.
- Training for planning officers to understand the above and consider decisions beyond 'the offset'.
- Quantitative demonstration of future proofing should be encouraged. For example, future PV allowance and carbon benefit. Or a comparison to a fixed kWh/m^2 benchmark for the given building typology.

Broader recommendations

- Adopt a kWh/m^2 metric.
- Include consideration of unregulated energy/CO_2. The definition of zero carbon in the London Plan glossary purports to include all "activities" that release CO_2 and green house gases to the atmosphere. But our metrics and targets ignore unregulated carbon.
- Benefits of an approach similar to NABERS:
  - More detailed and accurate modelling, including unregulated energy and controls, which focuses design efforts on realisable carbon reduction measures.
  - Mandatory disclosure allows market forces to drive innovation and building performance.
  - Consideration of operational energy in-use and its measurement. And commitment agreement to achieve performance.
- Step change required.
- There was agreement that zero carbon targets are unlikely to be met with business as usual London Plan with a few small tweaks and additions.

What does zero carbon mean and what should the long-term timelines be to achieve zero carbon? Is it clear what is meant with 'zero carbon target' in policy SI 2 B and zero-carbon on-site emissions' from 9.2.19 i.?

- Defining zero carbon is crucial. There is ambiguity within the London Plan as to the consideration of operational carbon and embodied carbon.
- A percentage reduction is not clear – kwh/m^2 would be a better metric.
- The carbon offset is misrepresented with a small portion in the supporting graphic, when in reality it means 'passing the buck' and accounts for a much large proportion of the carbon calculation. Needs to be clearer.
- Case studies would be helpful.

What needs to be implemented to achieve zero carbon can these be implemented through the current wording of the London Plan?

- Key word missing is 'operational'.
- Everything is connected to Part L calculations, which are not a reasonable representation of building performance in operation. This means policy ties designers' hands to deliver buildings that do not necessarily result in zero carbon operation.
- More detailed models would be helpful (NABERS, TM54) to reflect operational energy more accurately – also allowing developers to explore other options for energy/carbon savings.
- There needs to be more detailed modelling but it will need to be robust enough not to go too far at design stage. Approach needs to be simplified.
- BREEAM is going the operational modelling route which will help for non-domestic developments.
- Carbon factors need to be fixed/updated over time, starting with an immediate update to current carbon factors. GLA in agreement with this so far.
- Post-occupancy is required to close the performance gap.
- London Plan is too BAU (business as usual) and a bigger step change would be required (eg. operational modelling).
- Overheating TM59/52 requirement is great – something similar could be done for operational energy.
- Could we target specifically saving for fabric and not services? Current design tools might have unintended impacts for things like overheating/ventilation when pushing fabric too far.

Provide changes to wording of Policy SI2 B and of 9.2.10 i and other instances that discuss zero carbon targets

- "…expected" > "will be required to monitor"; "monitor" > "verify".
- Section C. could remove "in meeting zero carbon".
- Clarify difference between monitoring energy and monitoring carbon.
- Section C. "should aim" > "should achieve a minimum of".

Provide recommendations on the content of an SPG that provides guidance on how to write this future ready on-site zero emission statement in an energy strategy

- Modelling needs to be an iterative process to refine predictions at design stage through to operation.
- Clear guidance on designing buildings to be demand response ready/mixed mode ready.
- Guidance on considering what will happen in the future and reconsider what's being done now.
- Most key plant will last only 20 years. Plant space is key – flexibility needs to exist.
- Need to design for recycling building components as this allows for upgrade/change. How does the role of BIM influence this?
- What carbon factor do we use for a 2050 prediction if quantitative?
- Consideration of using new/better glazing with BIPV in the future?
- Consider Bill Gething's 'Design for Future Climate'.
- Guidance that calls only for a narrative response may lead to 'standard' narratives that do not effect change. Quantitative calculations can help designers think about their designs more thoroughly.
- BREEAM Wst06 could help.
- Future-ready narrative/calculations could be hierarchical as for cooling, or potentially be a list with tick box options.
- 'Boiler plus' for lowering flow temp in the future. e.g. larger radiators, space for heat pumps.
- Future proofing should consider future climates.
- kWh/m^2 target should be part of future proofing calculation.

What should a Planning Officer look for in a submitted energy strategy to demonstrate ZC will be met (recognising that a borough planning officer may well not be an energy specialist)?

- A quantitative response, rather than just a standard narrative. However, care must be taken, as a quantitative approach probably does not preclude loopholes as assumptions can be tweaked (eg. CO_2 factors).
- Need monitoring and KPIs for next 30 years – road map.
- Mandatory DECs.
- Commitment agreement as per NABERS could help.
- Reduce focus on the offset payments. Education and resources for LPAs is required.
- Denmark is example of focusing on grid and district energy and not so much on energy efficiency.

2 – Energy Monitoring

Participants

Facilitator: Nick Gazanis - A-Studio

Note keeper: Siobhan McVie - WSP

Ed Garrod - Elementa Consulting

Helena Bradford - Tuffin Ferraby Taylor

Joe Jack Williams - FCB Studios

Michelle Wang - CIBSE

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Paula Morgenstern - StART (St Ann's Redevelopment Trust), Harringay

Rita Dimitri - Linkcity

Robert Cohen - Verco

Ronan Leyden - Bioregional

Discussion - why is it important to have energy use monitoring and reporting?

- The monitoring and reporting of building energy data will have several major benefits, but essentially it will put in place accountability and hopefully drive improved design, installation and operational performance. League tables will both create competition while also 'naming and shaming' poor performers throughout the supply chain. While developers may see this as an increase in risk, this would in turn provide better confidence to purchasers of new homes and buildings that the property would be more likely to perform as advertised. In time, certain developers may also use this as a differentiator within the market and want to report back good performance within their portfolio to stakeholders. This may in turn encourage users to continue using the platform beyond the minimum reporting period.
- This system would also allow tenants to hold landlords to account for poorly or under-performing systems; forcing them to make improvements and potentially resulting in reduced utility costs for tenants while allowing future tenants to better predict utility costs. It is likely that further information will need to be made available to the wider public as to what 'zero-carbon' homes really mean for the user, as this reporting will likely expose a lack of benefit.
- The provision of this data would in theory help the industry to better understand the difference between predicted and actual building performance (such as changes in occupancy and tenant behaviour), help improve predictions and reduce the 'performance gap'. Deviations from planning targets can be

identified and best practice can be extracted and disseminated to facility managers and other industry professionals.

- Whilst the draft policy requires reporting for 'major' applications (e.g. >10 units or 1,000m^2), this still constitutes around 80% of new developments and so this level may need to be adjusted initially. Similarly, the policy also suggests that Display Energy Certificates may provide adequate information within this online portal; however these are known in the industry to be poor indicators of actual performance.
- In practice, there are a number of practical/technical considerations which will need to be outlined before such a system can be implemented. These include:
  - Who will be the governing body for the online portal?
  - Confirmation of metering interval; would the data be half hourly, daily, monthly format etc.?
  - Confirmation of reporting interval; how often will the information be reported?
  - What metrics do we want to be reported? Should regulated and unregulated loads be metered separately?
  - How should multi-occupancy buildings be shown and split out? Can different use types and occupancy levels be shown?
  - What additional infrastructure/metering will be required for this metering to take place?
  - How will domestic and non-residential buildings differ in their reporting requirements? It is likely that obtaining information for the former may be more onerous
  - Will the portal be integrated or linked to the smart meter roll-out?
  - What will be the output? Is there value in a single label or score metric similar to your credit score?
  - Should data be provided directly by energy suppliers? This would provide a level of robustness and consistency which may not be possible if left to individuals to upload.
  - Are there any data confidentiality issues? This will likely not be the case for the majority of users, but an allowance for this eventuality may be required. What data (if any) should and should not be made available to the public/industry? This is an issue already managed by schools when reporting on energy use.
  - Could this data be exploited by energy companies or others? What safeguards need to be put in place to prevent this from happening?

  - When should reporting begin? At handover, or 6/12 months later when systems have been tested and settled?
  - What are the penalties for not reporting? Should they be named and shamed?
  - Should there be penalties for under-performance? Maybe a restriction on sales/new lettings after an initial grace period (similar to MEES). This could raise further questions regarding apportioning blame and responsibility. Who is to blame for poor performance after handover?
- Discussions also included examples from Australia where buildings are targeted to be zero carbon and performance modelling has improved accuracy. Here, a developer lodges a Commitment Agreement with the government to empower them to market a building with a committed NABERS target – and that is significant for the market there. The performance target and process is included in contractual documentation. NABERS rating performance failure is treated as a contract defect, and typically the contractor will rectify it. Such events are rare as developers set conservative targets. In the UK, there is the opportunity for developers to lodge a Commitment Agreement with the planning authority, so energy monitoring data after occupation can be compared with targets.
- In the US, California and some other States require electric and gas utilities to maintain records of the energy consumption of all the non-residential buildings they supply, and to upload this monthly data to the Energy Star Portfolio Manager platform, following one-off authorisation from the customer.

Recommendations for the SPG

- The participants agreed that the London Plan policy wording should be general with more detail provided within the SPG; which is more likely to be updated regularly. Further detail should be contained within a guidance document on how the reporting should be undertaken (data required, format, best practice, metering examples etc.) and regulated.
- While the policy currently suggests the use of Display Energy Certificates (DECs), this is not recommended. A DEC is the

established operational rating for non-residential whole building performance and is especially suitable for buildings with a single occupier. In order to provide better reporting and control, base building performance must also be measured and reported along with potentially individual tenant ratings, to give each party the data they need to take responsibility for the energy uses they are able to control directly (as is enabled by NABERS in Australia).

- Clarification should also be provided on when the information should be provided e.g. within a specific reporting window or continually. The SPG should also clarify the penalties associated with not reporting.

Recommendations for policy wording

- The following recommendations were considered for the policy wording:
  - The policy should be more committal on the language used in policy 9.2.10. This should state "Demonstrate how…" not "proposal how…".
  - The term 'zero-carbon' developments should be better defined and language provided to demonstrate a shift to zero-carbon in use also.
  - The reference to 'Display Energy Certificates' should be removed as it is too specific (only applying to non-domestic schemes) and does not on its own provide sufficient information to be useful. Instead this could be replaced with more general words such as "a robust recognised methodology" which can be defined more precisely within the SPG. It is also recommended that the wording be revised to capture the benefits of measuring both base building performance (e.g. an LER) as well as whole building performance (DEC), to use the NABERS vocabulary. Although DECs are sufficient for single occupier buildings, they produce very limited agency for buildings with multiple tenants.

  - Further details should be made available as to when this requirement would come into force and how it should be phased in.
  - Participants suggested that five years was not a sufficient time frame for monitoring. Once a scheme is registered onto the system there is marginal cost associated with continuing to report/monitor for an extended period.
  - It is proposed that monthly data be provided (not just annually), with reporting annually as a minimum.
  - Also suggested is that a development must be mandated to store information for a minimum number of years in addition to the requirements for the online portal.
  - Confirmation on the definition of 'major developments' is required.
  - In order to facilitate this monitoring, smart meters must be installed for all new developments which allow for automatic monitoring/reporting.

What information should be input and displayed on the online portal for everyone to see

- A simple rating system for quick building comparisons.
- Reporting of energy in terms of kWp, kWh and tCO_2 in absolute values as well as per m^2 and per person. This should be split by fuel type and include typically electricity, natural gas and water.
- Monthly data should be provided.
- A single point of contact for each development.
- Open access to the public.
- Optional registering of minor applications as well (e.g. beyond compliance).
- Sub-metered data (regulated/unregulated).
- Sub-metered heating and cooling.
- Generic building data (occupancy, use etc.)
- Data to be provided automatically via the energy supplier.
- Scheme to be extended to existing buildings as well in the long term.
- Building relative cost savings.

Examples of how energy demand monitoring can be put into practice for different building types

- Some examples include: Australian NABERS, Passivhaus, Yale University, Bath University, Californian Universities, FM perspective on monitoring, Carbon Buzz.

3 – Heating Hierarchy

Discussion - what is the purpose of the heating hierarchy?

The notes below represent what the group thought the purpose was in its current format rather than what the purpose should be.

- The purpose is to create a centralised approach that provides clear guidance.
- The proposed hierarchy is a carbon one not an environmental one. For example what happens to other environmental issues including air quality?
- Is a hierarchy necessary with the lower carbon electricity grid?
- Is the hierarchy necessary for new build or is it better for retrofits?
- Do high heat grids rule out other low carbon solutions?
- The hierarchy is intended to provide a ranking so that better solutions move to the top. Suggested options are in order so that designers do not bypass those placed highly by the GLA. The purpose of ranking them in order is to focus on those options which cut the most carbon and fit in with the strategic direction of GLA policy - currently district energy combustion orientated networks.
- Why should the approach be based on a specific technological specification? It does not promote full analysis of the potential options. This could lead to the promotion of out of date technology or techniques and currently does not promote designing the proposed system for future technology upgrades.
- Should there be an assumption that all technologies will improve? There should be planned improvements in the carbon performance of heat networks over their lifetime.
- The approach to support a particular technology is out of date. This was needed ten years ago but not now.

Participants

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Note keeper: Alina Congreve - Climate KIC

Chris Turner - Cundall

Clare Murray - Levitt Bernstein

Daniel Raymond - Useful Projects

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Philip Exton - Greater London Authority

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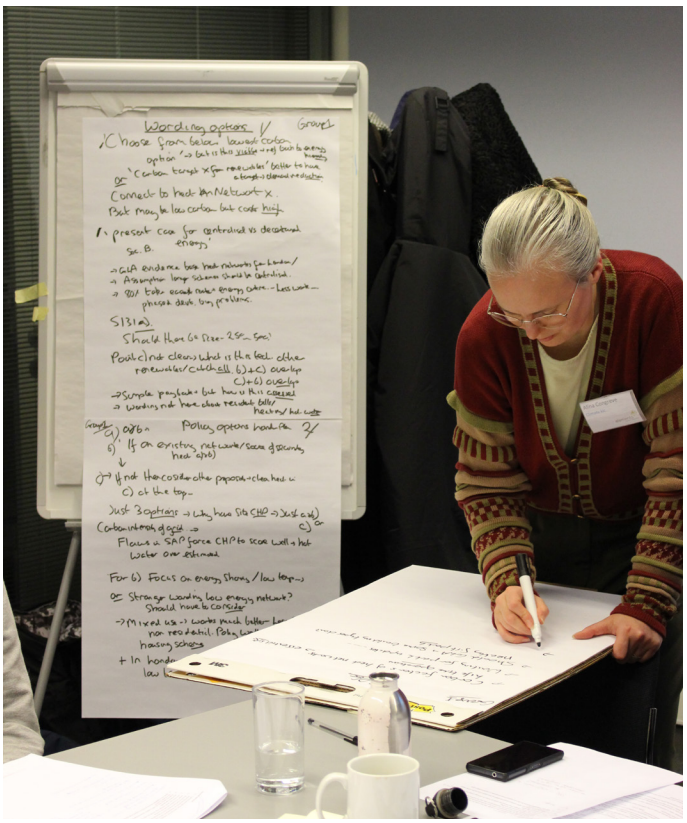
Take four scenarios - what heating systems should be installed in each in order achieve the long-term lowest operational carbon emissions?

- A 20 unit Passivhaus-type residential development:
  - The working assumption was a London apartment building, but in other parts of the country be single family homes.
  - There are issues getting into homes to service the heat interface network. There is no statutory right for access.
  - This type of development does not need a heat network. It is best served by other technologies including solar or air source heat pumps.
  - The cost to residents including potential fuel bills/ maintenance costs need to be considered as well as knowledge implications. For example a CHP could be expensive to maintain, and there is the potential for occupants to adjust the settings which could disrupt water supply to other residents further along the pipes.
  - The main primary heat requirement is for hot water so this should be the main focus.
- An office development:
  - The policy is not very well worded for offices and appears orientated to residential development.
  - Offices need a small amount of heat input at the start of the day but it is more about cooling dominant loads and associated technologies. The hot water load is not significant. A heat pump would be a good solution with point of use electric water heating, but the hierarchy leads you down a CHP route which is high temperature and high heat loss. The focus should be on using electricity as the grid decarbonises. There are issues about the complexity of the system installed and maintenance costs.
- A mixed use development featuring residential, school, office, leisure and retail:
  - Heat transfer and an ambient loop makes much more sense. e.g. a very different type of district energy sharing network again with a move away from combustion on site.
- Predominantly residential-led estate regeneration scheme:
  - The main issue is the long build out time of these projects – 20 years or more. Phasing is incredibly important, alongside system flexibility to change. The scheme must also be socially equitable. Central plant and infrastructure must be modular if it is implemented, and based on performance analysis rather than compliance tick-boxing which often results in systems that are two to four times oversized.



From the points of view of the different stakeholders, assess the limits of the possible outcomes of the current hierarchy

- A developer who is interested in viability, return on investment and liability post-handover.
  - The council should have a strategic plan, it's not up to developers.
  - The policy is mainly relevant for residential developers rather than those dealing with commercial development.
  - Residential developers and their consultants are being forced to govern the delivery of heat networks – their expertise and business model is as housing developers, not infrastructure developers. There could be reputational risks and associated costs to mitigate this if supplies of heating/ hot water were unreliable under a CHP scheme.
  - It is likely that non-operationally focused developers will tick boxes and pass on the issues and risk, which eventually has a negative affect on the occupants.
- A landlord who is interested in sustainability credentials of the building, assurance on future investment, lease/fit out clauses, maintenance/running costs.
  - Landlords are being pushed down a particular route – MEES. Landlords could be concerned their customers are put off the property by a district heating scheme.
  - There is an impact on cost to the tenant. It should not just be about supporting the grid or a network at others' cost. However, in the current market (especially domestic), it will be possible to rent an apartment even if some potential tenants view CHP negatively, as the benefit of having a home outweighs it. In the commercial sector there is even more concern about the tenant. If a commercial property does not have significant hot water use, then the case for CHP or even combustion based heating is not strong at all with good envelope design – in the domestic sector it is critical and raises safety and welfare concerns. There is the concern about high bills if not in control of the network and the role is handed over to a third party such as an ESCo. This can cause reputation risk for a development.
- An engineering consultant/facilities manager who is interested in the long term lowest operational carbon emission and an engineering consultant who wants to use innovative technologies to achieve the lowest long-term operational carbon emissions.
  - It is additional, often unappreciated, work to put together the case for anything other than CHP. The

alternative compliance routes are also not representative of real carbon, energy or technology data profiles.
- Without long term full option and carbon appraisals, the easy option is to head for district CHP. This also does not encourage the district energy providers' to improve or look forward themselves. Fundamentally, this does not promote innovation or free thought.
- There is a lack of information on alternative heat sources. Clients are reluctant to be guinea pigs although there are some robust, well-proven alternative options. Developers want to see the cheapest option. There is a perceived risk for consultants who break with business as usual.
- There are impacts on space – risers (positive and negative), radiators size increase etc. all needing more thought, consideration and coordination. The current process has become a tick box exercise eliminating the consideration of further options. The policy wording is not strong enough to promote designers to do better and for them to then convince developers to change.
- Particularly in the commercial sector, agents do not like change from the 'standard' solutions, which can push clients away from being forward thinking and actually hurt the value of the development longer term.
- Lack of real robust cost data is also used as an excuse to hold back change. Often inflated prices are given to systems that professionals and contractors do not understand, which would have little variance if assessed correctly.

Should a heating hierarchy exist for developments that are not within heat network priority areas?

- The wording should promote assessment of the lowest carbon options and the flexibility of those options to be modified to reflect changes in policy and technology over the life of the system/network.
- We questioned whether the hierarchy was (a) appropriate and (b) in the correct order. Should there be a list of compliance guidance options rather than a hierarchy?
  - Proposals should show how they have considered a range of low carbon solutions and prioritise those that have the best long term feasibility and best socio-economic impact in respect to the development
  - District networks do not need to be combustion based.
  - A lot of investment has gone into heat networks and there are interests in maintaining that consistency in some way shape or form, so promotion of ongoing carbon improvement should be necessary under the policy at appropriate intervals.
- The hierarchy is a carbon hierarchy and we are not clear where air quality and fuel poverty feature. Air quality and NOx would be better dealt with in specific combustion district energy design guides or as part of the planning conditions.
  - Integration of the socio-economic effect on the residents of these large outsourced heating provisions should be part of the option appraisals process.
- We questioned:
  - How appropriate is it to new build when zero carbon and combustion is being built in/future proofed?
  - Should the network have to demonstrate how it reduces carbon over its lifetime – e.g. heat pumps, biomass, biomass with CCS?
  - Should the hierarchy be re-ordered – a) and b) swapped around? The local grid may already have waste heat in it. Should c) be first?
- It feels like the wording and policy is currently heavily focused on residential development and must be more flexible and generally inclusive of all typologies.

Are there any other changes that should be made to Policy SI 3 'Energy infrastructure' and associated paragraphs?

- One option is to have a list, the consultant must carry out an appraisal which highlights the lowest carbon option of the development within the context of the site.
- Could a carbon or energy use index (EUI) be included – including both renewables and demand reduction with a realistic assessment of plug load?
- There should be direct mention of the heating and hot water costs to the tenant in policies that require connecting to a particular heat network. Connection could be low carbon but the costs to tenants could be high.
- Include the clause 'present a case for centralised vs decentralised energy solutions' within the design development.
- It is not clear what c) is talking about – what technology is this? Is it a renewables catch all? b) and c) also overlap. Clarity is required.
- Simplify hierarchy to:
  - If a) and b) apply - where there is an existing heat source or heat network, if not then start with c).
  - Just three options - a) and b) together or c).
- There needs to be stronger wording that is supportive of ultra low temperature energy networks which designers should have to consider.

General:

- GLA needs to provide a stronger evidence base about heat networks in London and there success/pitfalls.
- There is the assumption that all larger schemes should be centralised. 80% of projects take the easiest approval route which is an energy centre/CHP. This is less work but in large phased developments causes problems and is heavy on infrastructure.
- Should there be a minimum size of 250 or 500 homes for district energy consideration? Problem with this is developers putting in applications based on or below the trigger points (or splitting them).
- How is payback fairly assessed and who enjoys the benefit?

- THe flaws in SAP that are making CHP schemes score well – hot water and heating demand is often over estimated, inflating the carbon savings and systems in association. A mechanism is also needed to keep compliance analysis up to date with grid carbon factor updates required at much more regular intervals.
- The GLA allows different calculation methods from the SAP but these are penalised with unrealistically poor carbon factors, pushing designs towards CHP. This in association with local authorities not having the technical knowledge to consider anything different, creating a one option approach.
- The policy is currently written for predominantly housing focused schemes and should better reflect large scale mixed use schemes, where alternative district energy networks can have more positive impact.

Does the group have any SPG content recommendations that might cover some of the detail not included in policy?

- SPG to outline how carbon factors for heat networks be calculated for the lifetime of the development.
- Address those building types that can't fit neatly into Part L methodology. Ensure innovation and free thought is promoted.
- The aim of the SPG should be to produce lower carbon outcomes, not to provide combustion focused heat networks at any cost.
- The SPG should give careful consideration to the relative benefits and disadvantages of air source heat pumps vs CHP. This will change over the lifetime the technology is installed for.
- The high level statement about 2050 should be more practically embedded in policy.
- For larger schemes it is critical that an improvement strategy is considered over the life of the development with some level of reasonable future proofing/flexibility.

Note any suggested actions for GLA to support local authorities in implementing policy

- GLA leadership is needed to help with capacity issues in local authorities and their skills.
- The cluster maps/heat maps are out of date at borough level.
- The strategic plans for opportunity areas should not be left to developers and there is a strategic role here.
- There is a lack of technical skills at borough level to review and many schemes are still not reviewed by the GLA.

Examples of projects

- Heman Estate – small housing development in planning. Includes heat pumps as no mains gas.
- A housing scheme where one tenant had a heating engineer who changed the settings, which were then posted on social media and other tenants followed suit. People were then left without heat and that was a clear problem with the legal position.
- Adleston town centre CHP not for profit scheme.

Questions for technical clarification

- S1 3 (c) – some definition around the zero emissions expectations would be of benefit. What is a zero emission source? Does it mean solar water/PV, which is zero carbon if embodied carbon zero?
- Is there a definition of a secondary heat source – river, ground, industrial etc?
- Why is air quality raised in relation to fuel cells? This is an issue for CHP or combined engineer and fuel cell technology, but not sure why it is connected to fuel cells and why fuel cells warrant separate mention.

4 – Demand Management

Discussion - why demand response is important for inclusion in the London Plan

- Demand response typically involves the reduction (but also the increasing or shifting) of electricity demand during periods of high/low demand. For commercial users this may coincide with periods when electricity costs are higher than at other times. The National Grid also offers incentives at a national level to reduce or shift demand during grid stress events.
- However these time-of-use tariffs are not as common for domestic customers (for many a single flat rate is normally applied regardless of when the energy is used). Economy-7 or Economy-10 tariffs are also used to incentivise (by way of reducing electricity costs) the shifting of loads to the night. Whilst this is a form of demand response, further enhanced capabilities are expected once smart meters have become prevalent, with expected increased usage of time-of-use tariffs to better mirror hourly changes in demand.
- By identifying load flexibility early on in the planning of a development, the impact on the local grid infrastructure may be minimised and future opportunities more likely to be exploited, when they become technically and commercially viable.
- Demand Side Response (DSR) is needed for a number of reasons. These can be broadly broken down into three levels; at a national level, at a local energy network level and at the End-user level.
    - National: DSR can aid national infrastructure during periods of grid stress, both daily as well as in response to specific triggers (e.g. sporting or cultural events). It can also help manage transmission faults or power plant

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Additional Comments:

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outages, leading to fewer disconnections across the country.

- Local energy network: managing faults and grid stress is a necessary part of ensuring local blackouts are isolated and resolved with minimum impact. Reducing the local peak demand will also reduce the number of grid upgrades required, removing barriers to development; this would also reduce barriers to further electrification of heating and transport.
- End-user: leveraging and building energy flexibility into a scheme from the early planning stage will allow users to participate in demand response activities, allowing them to exploit an additional revenue stream in the short term. Longer term, as variable energy pricing comes into play, giving users the ability and information they need to manage their demand will help them avoid high peak charges.

- DSR benefits us by reducing the need for extra generation plant and distribution capacity to cope with relatively short demand peaks often provided by plant, which is traditionally high carbon; this measure therefore should typically result in a reduction in carbon savings.
- DSR is also important as currently time-of-use tariffs at different prices are not as prevalent (especially at the domestic scale).
- For commercial users, demand response is often employed to reduce costs by shifting demand away from more expensive periods of the day. Aggregators are also used to exploit specific incentives operated by the National Grid. Providing provision for flexibility further encourages participation.
- DSR is expected to increase in prominence as electricity demand increases specifically due to the switch to electricity for providing heat and through the increased use of electric vehicles.
- Currently there is limited incentive for limiting the capacity of the connection to buildings at the planning stages, leading to over-specification and crowding of the local network infrastructure.
- It was also noted that there is an intrinsic link between the peak demand and base load demand; as such measures to reduce the base load must also be pursued.
- Calculations should attempt to take into account (though it is acknowledged that this has its difficulties) how carbon intensity of electricity changes at different times of the day, and therefore may be less when charging compared to when discharging. This would avoid penalising the use of batteries which are otherwise beneficial to the grid.

What are the methods?

Heating and cooling systems:

- Use of thermal storage such as buffer vessels, ice storage systems (and possibly phase change materials going forward) to shift demand to low demand periods of the day.
- Heat pumps not direct electric results in higher coefficients of performance. Direct electric systems are still favoured by developers due to low capital costs.
- The electrification of heat poses an interesting challenge. This can necessitate reinforcement of grid infrastructure and therefore end up penalising early adopter.

Reducing base load:

- By reducing the base load of the development, the peak load is also likely to be reduced.

Fabric:

- Use of room exposed thermal mass or similar to smooth both heating and cooling peak demands. Note this is not necessarily the case for all buildings and therefore the addition of thermal mass should be carefully considered.
- Examples of the use of additional standards such as Passivhaus plus and Passivhaus premium were presented. In general, the implementation of standards such as Passivhaus and EnerPHit are encouraged.

Grid:

- On-site generating energy reduced draw from the grid.
- Currently few incentives exist for peak demand reduction / limitation day-to-day. Currently balancing services offered by the National Grid are aimed only at the worse stress events.
- Pricing signals can be further explored to reduce peak draw.
- Considerations should be made to the local network and how to reduce local substation peaks in respect to other consumers on the network.

Controls:

- Time-of-use tariffs are expected to increase in use in line with the adoption of smart meters.
- Limiting electricity draw from certain appliances (recent examples include vacuum cleaners and kettles).
- Reduction (at planning stage) of the installer capacity for buildings (e.g. the National Australian Built Environment Rating System).
- Improved control of plant (chillers, heaters, pumps, etc.) and other large building loads would create opportunities for flexibility and demand reduction.
- Using open control standards allows equipment to communicate and be controlled easily, making energy management systems more straightforward to maintain as well as reducing the upfront cost of developing flexibility opportunities.

Storage:

- Use of battery storage
- Fuel cells
- Hot water storage
- Aquifer Thermal Energy Storage (ATES).

Taking learnings from exercise one, consider the key areas for finalising the wording of paragraph g if needed to ensure that the desired outcomes are achieved

- 9.2.10 – g –"Proposals for demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible."

To

- 9.2.10 – g –"To anticipate infrastructure capacity challenges for a growing London, proposals for demand-side response and minimising peak energy demand should be submitted."

Explanation:

The proscriptive measures outlined in the current wording do not in themselves constitute a demand response measure. Whilst smart meters, smart grids and micro grids could lead to a reduction in peak demand, this is not necessarily the case. Caution should be used if developers/installers offer these technologies without the energy management facilities provided once the building is completed and in use. As this industry is fast moving, we have shied away from suggesting alternative examples which could quickly become redundant.

As the London Plan is less likely to be regularly updated, specific details should be contained within the SPG, which is more likely to be revised.

Provide recommendations on the content of an SPG that provides guidance on how to write this demand response statement in an energy strategy

- Lists of suggested building components and measures should be listed alongside both potential and adopted DSR measures:
  - Any adopted DSR measures should consider the effect on 1)national, 2)local energy network and 3)user levels (see earlier explanations).
- These measures may be contrasted against a notional building and must be measurable rather than a vague statement:
  - This may initially be using Part L, but in time may shift to also consider a typical London building of a similar use type once this information is available.
  - Hence one way a planning applicant could show it has satisfied 9.2.10 – g is by demonstration that the building peak grid energy demand does not occur during critical months as defined by the GLA (e.g. Dec and Jan – for existing grid peak, and July and August for future grid peak) using the Part L energy modelling.
  - In future, moving from critical months to smaller units of time (such as critical half-hourly periods in a day) should be considered as better models become available.
- Evidence should be provided that peak demand does not occur during certain summer and/or winter months when infrastructure is particularly constrained. This could be reverted to a percentage reduction once further data is available.
- Energy strategies should require buildings to list annual and peak demand for each month both in absolute and per square metre metric e.g. kW (for both regulated and un-regulated energy) to allow data to be gathered and inform further refinement of this policy.
- A demand response hierarchy may be developed in line with the London energy hierarchy.
- Reference should be made to best practice and specific standards that can be referred to. Example of what good practice looks like.
- Control systems which give end users better access to wider demand response (current and future) should be the norm.
- The capacity and effects of development to the local substation should be discussed.
- Comments should be made on how unregulated loads have been considered. This may include discussions on how to influence consumer behaviour and better targeting.
- Long term effects of these measures should also be considered. In particular the effect of domestic half-hourly billing for domestic users and increase renewables (e.g. wind) during winter months.
- The future proofing of the building may also be discussed. In particular, how vulnerable residents will be protected from market changes, for example the introduction of high cost kWh tariffs during periods of peak grid demand.
- Space should be available within the policy to encourage variety and innovation.

Provide guidance as what support the GLA needs to give the boroughs to evaluate this demand response statement

- Potential use of a DSR hierarchy.
- A clear definition of 'critical periods' where demand response should be implemented (see previous comments), which should be updated over time.
- A clear methodology must be outlined – this will make it easy to enforce while also providing simple recommendations.
- A checklist is one approach, but also has limitations.
- An example should be provided "One way of considering this is…but equivalent methodologies are also acceptable".
- References to standards and accepted calculation methodologies should be made where available.
- Guidance should be made as to how technological changes will be dealt with.
- Simple compliance options may be made available – simple, no regret options:
  - Refer to best practice / Californian building code (which reduces allowable grid demand during peak grid demand months).
- How data will be collected at a borough level and subsequently collated to outline typical profiles and examples of best practice.

5 – Embodied and Whole Life Carbon

Participants

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Discussion - why is it important to think about embodied carbon

- The industry is keen to understand how embodied carbon is going to be measured and monitored.
- We believe embodied carbon is a global issue. There is a lot of it and it seems we are not thinking about it.
- There is a general perception that we are not talking about it nor counting it or including it.
- The industry is interested to review what do we know about embodied carbon.
- It seems embodied carbon is the big missing piece. The carbon we use in construction appears not to be accounted for in either building regulations or planning requirements.
- Up to now, embodied carbon has not beenmeasured in policy.
- To achieve operational savings, we need to account for embodied carbon cost. If we don't understand the costs of embodied carbon, how could we talk about carbon savings?
- Embodied carbon is the key ground of the circular economy and how we may be deconstructing buildings in future. From a design and planning perspective, this is an evolutionary jump into the unknown. But actually, that is quite key to start looking into deconstruction and how to make it easier for future generations.
- Maybe the issue is that we don't frame embodied carbon directly, or it is not directly labelled as such. However, all measures on green construction materials; reducing construction waste, monitoring energy and water use on construction sites, all count towards reducing embodied carbon.

- However, the table reached quite an agreement that embodied carbon is not directly measured in the current policy. There was a consensus that we do measure operational energy, but this does not capture embodied carbon.

What elements of a development contain the most embodied carbon?

- At practical completion the biggest single element would be the structure, but if we look over time, it will be the fixture and fittings. Embodied carbon is a whole life cycle issue.
- The majority of CO_2 over the whole life depends on use and type of building.
- Recyclable materials that are not easily recycled will eventually have higher life cycle carbon.
- Elements with most embodied carbon:
  - Skin, façade and structure major elements for embodied carbon.
  - Building services, construction and demolition all impact on embodied carbon.
  - Internal finishes (e.g. paint) required over the life of the building.
  - Structure (big savings up to a certain stage).
  - Sourcing of construction materials (location of source and transport).
  - Production of construction materials. (e.g. concrete, steel).
- It is very context dependent e.g. there will be big differences between low rise housing and high-rise buildings, or housing and high-end fitted-out commercial offices, etc.:
  - Depends on life cycle.
  - HVAC may have high embodied carbon and short cycle, but most of its components are easily recyclable materials.
  - High rise buildings will have more foundations.
  - High end offices will have more kit.

What factors do you take into consideration when calculating Whole life carbon?

- Substructure
- Frame
- Upper Floors, Roof,External Walls
- Windows and External Doors
- Internal Walls and Partitions
- Wall, Floor and Ceiling finishes
- Prefabricated Buildings and Building Units
- Sourcing
- Transport
- Fabrication
- Construction
- Repair/replacement
- Operational energy
- Deconstruction/demolition
- Re-use/recycling
- Reducing first and foremost the amount of materials used
- Life of building: how often a 'material' has to be recycled across the life of the building. - Recommended to use a service life of 60 years

- This London Plan is an opportunity to start measuring and demonstrating embodied carbon. There is the need to start assessing real options.
- There was a suggestion to separate embodied carbon from the energy strategy calculation and report, (GLA said this may not be realistically possible).
- Are there any other methodologies?
  - There is already a guidance on this matter publicly available (EN15978) which seems impractical. The standard is great in principle, but everybody is interpreting it in their own way.
  - There is also a RICS guide: 'Whole life carbon assessment for the Built Environment'.
  - The RICS guidance is attempting to answer all those wobbly bits of interpretation and tell applicants what to do. In practice, in three to five years, hopefully this guidance will be re-written.
- We have guidance, but this is not a planning policy, therefore not enforceable.
- Planning teams struggle with energy policy. Simple guidance is needed for embodied carbon.
- It is important that Lifecycle Boundary Information to be included, as defined by BS EN 15978:
- Clarity on starting point. What is the benchmark?

From the points of view of the different stakeholders asses the extremes of what a development might include in their statement on embodied carbon

- Embodied should not be separated from operational. After all, you are looking at the whole life of the building.
- There is a relation between operational and embodied carbon. These are not separate issues. For example façade performance: the way we design the elements of a façade and its performance in operation and embodied terms are completely interlinked and there must be a form of rewarding the fact of thinking about this. If we bring time to this, we have a whole life picture which is where we should be focusing.
- Interesting question about the time value of carbon. When we take that operational value, if we propose a solution where we use one less structural beam to reduce the embodied carbon, and we compare that for 60 or 80 or 120 years' we are saving that carbon now.
- At planning stage, where there are no builders on board it is difficult to know about the materials that will be used and where they will come from, so the assumptions on embodied carbon are quite considerable.
- However, in the same way that you can do a financial budget, based on assumptions, you can also do a carbon budget, by making assumptions and using scenarios.
- If you have operational carbon, at planning committee you get an energy statement saying this is what we think the operational energy is going to be. If you deviate from this, you need to resubmit. But with embodied carbon, if you commit to a strategy and then deviate from it, would you be expected to resubmit for the planning committee to reconsider?
- This could be a two-stage process. The first stage, in any development plan, features a statement where people should be calculating possible embodied carbon in accordance with the RICS guidance. The second stage would be in a few years' time, when applicants will need to go back to their proposed target zone or have a similar policy to operational energy otherwise people must provide information. But an aim to start

this straight away would probably be a big ask.

- What we need is more confidence in embodied carbon and whole life carbon assessment. Consistency in reporting is required.
- How to calculate bottom-line embodied carbon?
- Time span RICS guidance assumes 60 years for a building and 120 years for infrastructure.
- An owner occupier is thinking long term whilst a lot of developers focus on the short term and have different priorities.
- Tenants may demand environmentally friendly buildings. How much would that cost?
- Project teams change through project stages.
- Initial embodied carbon strategy, then the project deviates from it.

Are there any other changes that should be made to the embodied carbon wording?

- Embodied carbon should be counted at design and construction separately over the life of the building.
- Comment to the planning guidance - it needs to have something about what scheme should be used to demonstrate embodied carbon.
- Nothing in the policy in relation to embodied carbon at the moment.
- Energy hierarchy is about of energy use. Where is the embodied carbon?
- SI 2 is not intended to be related to embodied carbon, SI 7 is.
- Sentence K could be brought into SI 2?
  - K should be in SI 2 and this must introduce a methodology for embodied carbon OR
  - K should relate directly to SI 7.
- There is some degree of ambiguity in the policy.
- It would be clearer if SI 2 either introduced a methodology to account for that construction carbon and whether that is site carbon or embodied carbon.
- SI 7 is circular economy. SI 7 is the wrong place for embodied carbon because circular economy is more about general recycling.
- Embodied carbon is about minimising greenhouse gas emissions.
- For a new building, the anticipated lifetime for resources is going to be more embodied than operational.
- Net zero talks about operational energy but we need to know the embodied consequences of achieving net zero carbon, and therefore developers need to put in proposals to minimise the embodied carbon over the lifetime of a building.
- SI 2 should be separated so there is an operational and embodied (or construction and demolition) life cycle.
- This policy shall aim to collect data over time and then after sufficient amount of data has been collected, set benchmarks and future targets.
- It seems there was a consensus that embodied carbon should be part of SI 2.
- Could we ask for the assessments to be at the early stages of the planning subject to assumptions, and then updated at post-construction?
- Should embodied carbon be in policy SI 2? Table agreed yes.
- Include it in a form which is not necessarily about targets but is about doing it (reporting data).
- K Proposal 1: "Referable schemes should undertake nationally recognised embodied carbon assessment and demonstrate that reductions of the carbon impacts of the built asset has been implemented and set out through the design, construction, service strategies and future demolition plans". This would go in SI 2 as E.
- K Proposal 2: "A calculation to report and provide proposals to minimise life cycle carbon".
- Address embodied carbon either more comprehensively with methodology in SI 2 OR take out of SI 2 and address in policy SI 7.
- Policy does not require measure of embodied carbon. We need to require strategic development to undertake embodied carbon assessment in policy guidance for others.
- Embodied should be separated from operation due to complexity of assessment.
- Policy SI 2: Remove "Construction" from A. Introduce an "E" separately for construction.

Recommendations for the SPG

- Whole life cycle assessment.
- Simple guidance (e.g. measures to reduce embodied carbon, expected lifetime of the building, embodied foot print, baseline embodied carbon). This could be easily assessed, easily understood and shows thought has been put into this issue.
- Benchmarks, minimum and maximum embodied carbon, but not this detail for planning.
- Operational energy measured as an anticipation for the future.
- The point about embodied and the life cycle is that you are now asking the same thing, this time with embodied.
- Put side by side the future operational and future embodied carbon. A question for operational carbon has already been made, this would be asked about embodied carbon as well.
- Make assumptions and write them down e.g. what the building is capable of being in the future.
- Ability of the development to do the right thing (the plan you're putting in is the sort of plan that would last 15 to 20 years, indicating the choices you have made at that time of submission).

- 60 years' lifetime / timber 500 years (this is given).
- How often will you be changing the services (equipment/ plant)?
- How often are you replacing the façade? What kind of materials will you be using? Are you choosing the more expensive, higher quality materials that will last longer? Or those that would need to be replaced more often?
- Do you think something is needed that is beyond the RICS Document?
  - RICS document may be too onerous for small developments.
  - The RICS guidance has an entry level. Reduced scope.
  - If the referable scheme is forced then the requirement will impact a lot of the main contractors, and so subcontractors have to start looking at this, which will drive change even if you are not covering a lot of the details.
- What would the policy be trying to do? Finding out the information? Or trying to create a big change in the decisions people make? Probably both.
- First create a market place by asking questions about embodied carbon. These will give an indication on where we currently are.
- Second find out about best practice and data about embodied carbon data.
- Next steps would be to set a benchmark and future percentage reduction requirements, something like operational carbon.
- What we need to target with embodied carbon is resource efficiency.
- Measuring embodied carbon is cost effective in the long term.
- Dismantling could generate a secondary market.
- Economic logic when measuring embodied carbon.
- By requiring people to measure embodied carbon, people will learn that this is actually a positive in their life and then it will become a behavioural change for the good.
- No need to have a benchmark or target yet.
- Looking at the supply chain, often the cheaper option is the environmental one, if we create a supply chain now, by the big schemes, that does have a knock on down the line, which will mean that the next situation when we deal with major developments, then probably the industry would not push back. Because they would have the supply chain already there and they will understand what are we asking.
- Sourcing material from abroad. Distance of travel shall be captured. Ship is much better in terms of carbon foot print in comparison to a lorry as long as it is near the cost in China.
- The table agreed that the industry have a guidance to work with (RICS. What was controversial was the scale of project this should be applied to.
- Do the right thing, calculate embodied carbon in the supply chain.
- Validate the embodied carbon design intent against the actual embodied carbon in construction (this may be of significant cost).
- Validating the design intent is a much more expensive and valuable process than the initial process of going to planning with a simple data sheet. Asking a small unit to do RICS is a substantial ask.
- Taking the issue further, making sure that embodied carbon is validated in construction, this has never been done before.
- Asking stage by stage validation is a significant ask.
- Referable projects should implement the standard (RICS guidance).
- Initially make assumptions at stages 2 and 3 based on the cost plan information and then as you get further down the line, when the architects have chosen the materials, then the assumptions may change.
- Embodied carbon details won't be known until later stages.
- Ask for embodied carbon on referable schemes.
- Embodied carbon software packages out in the market can give you basic numbers.

Recommendations provided by Architype- by correspondence

- The SPG must set out scope boundaries and a reporting framework so that it is clear what elements of life cycle carbon have been included.
- Where Carbon-LCAs are required (for referable schemes) these should be carried out in accordance with BS EN:15978 as a partial Carbon-LCA with the following minimum scope boundary, and for a reference service life of 60 years:
- A1-A3 Product Stage
- A4 Transport
- B4 Replacement
- B6 Operational Energy Use (taken from Part L compliance)

Construction has been excluded as this is hard to quickly quantify and is generally not covered in EPDs. Dissasembly has also been excluded as data on this is vary varied in EPDs and hard to predict. We believe this would be beyond the ability of the profession generally. Alternatively you could specify one scenario e.g. all products are landfilled, or you could reference WRAP data for likely end of life scenarios.

- Additional Elements and Lifecycle Boundaries can be declared but should be itemized separately. A reference service life other than 60 year can also be declared in addition to the 60 year reference service life.

Guidance for GLA support for embodied carbon statement

- Online calculator tool
- Benchmarks for future.

Embodied carbon summary:

- There is an industry standard approach to calculate the embodied carbon. EN15978 which RICS have written guidance on: RICS whole life carbon assessment for the built environment. (table agreed that this method is good but there are a lack of input values to use with this methodology).
- Currently we do not have sufficient data to set embodied carbon targets. The overall aim of the policy should be to get people to report on carbon quantities so that targets/benchmarks can be set in the future.
- Embodied carbon relates to SI 2 not SI 7. It was suggested additional words to go in here. Policy to apply to referable schemes. This will drive benchmarks. The EN guide is currently too onerous for small schemes.
- Our recommendation is to consider Whole Life Cycle Carbon in parallel to Operational Carbon within policy SI 2 as both are complex issues on their own and key to achieving Net Zero carbon buildings.

To get involved contact us or visit our website

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