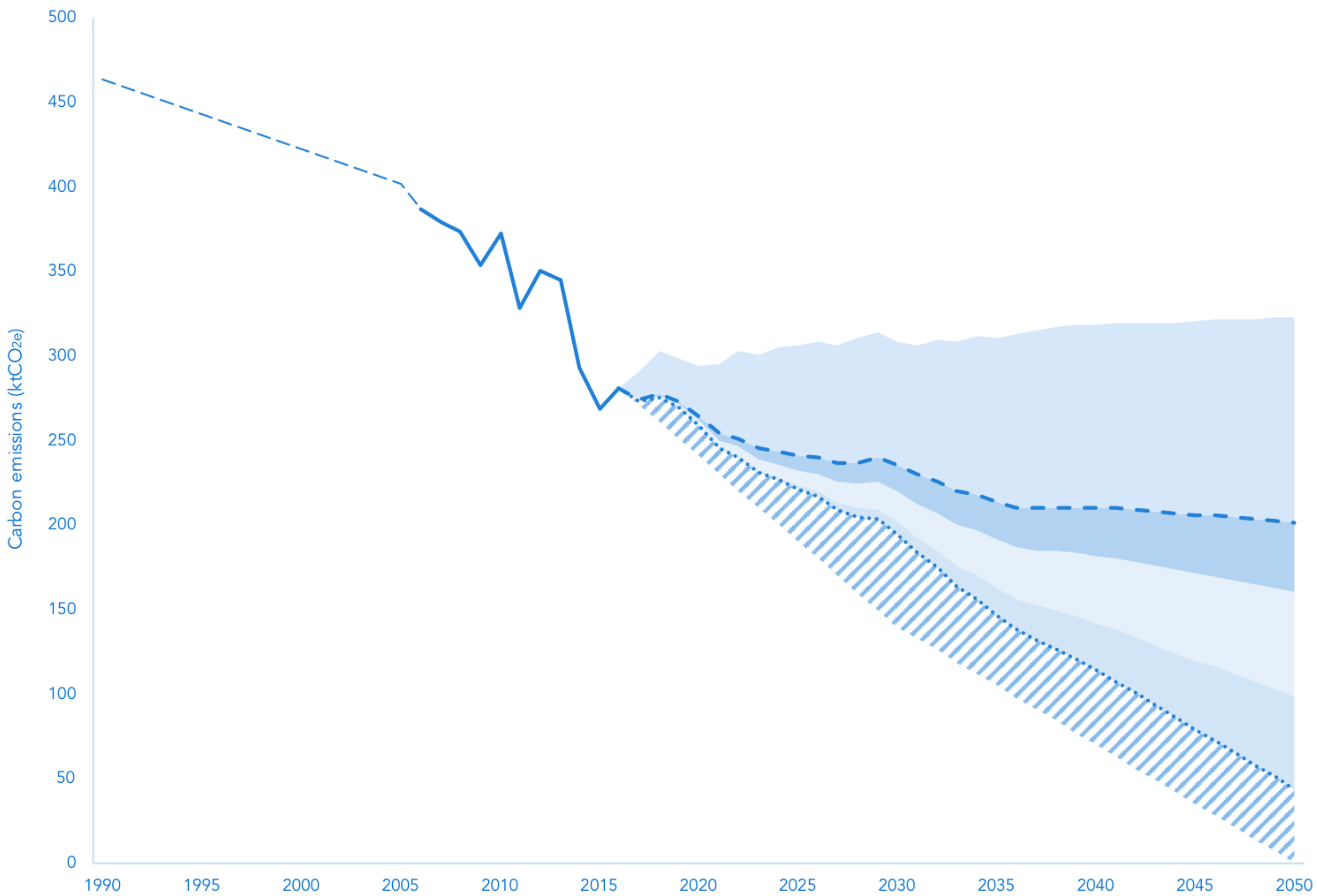
LONDON BOROUGH OF ISLINGTON



ENERGY EVIDENCE BASE

November 2017

A study carried out by Etude, on behalf of the London Borough of Islington

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1.0

15-MINUTE SUMMARY

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The London Borough of Islington is in the process of reviewing its Local Plan as it plans for the future of infrastructure in the borough. The new Local Plan will cover the period 2019-2034.

This report summarises the context in terms of climate change mitigation (policy, electricity decarbonisation), and Islington's current policies. Recommendations for new policy/guidance to address policy gaps are provided, along with their associated technical evidence base.

1.1 Climate change mitigation: context

There is overwhelming scientific consensus that significant climate change is happening and It is extremely likely that human activity is the predominant cause of climate change through emissions of greenhouse gases (GHG). Public action is needed to substantially reduce GHGs as this would not happen at sufficient scale without intervention.

1.1.1 National commitments and policies

International negotiations on climate change are governed through the United Nations Framework Convention on Climate Change (UNFCCC). The most recent negotiations concluded with the **Paris Agreement** (2015). It committed countries to a collective global temperature rise target of '*well below 2°C*' and obliges them to '*pursue efforts*' to limit temperature rise to 1.5°C.

The **Climate Change Act 2008** commits the government to reducing the UK's carbon emissions by at least 80% by 2050 compared with a 1990 baseline. This target was advised by the Committee on Climate Change (CCC) as an appropriate share of global action to limit global surface warming to around 2°C above pre-industrial levels by 2100. The Act also requires the government to set legally binding carbon budgets that cap greenhouse gas emissions over a five-year period.

This report '**Meeting carbon budgets – 2017 progress report to Parliament: Closing the policy gap**', prepared by the Committee on Climate Change, was presented to Parliament pursuant to Section 36(1) of the Climate Change Act 2008. It reviews progress towards meeting the carbon budgets and the 2050 emission reduction target.

Although UK emissions fell 6% in 2016[1] and are down 19% since 2012, progress has been dominated by the power sector (reduction in the use of coal for power generation, which is now at low levels, and increased contribution from renewable energy). Direct carbon dioxide emissions from buildings actually rose in 2015 and 2016[2].

The 2017 progress report's overall conclusion is that the UK urgently needs new policies to cut greenhouse gas emissions.

The report also notes that there is no robust evidence to suggest that the introduction of new energy efficiency/low carbon heat standards for new homes would appreciably reduce or delay new housing supply to meet Government targets for new housing.

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[1] Total UK emissions of GHG in 2016 were estimated to represent 466 million tonnes of CO_{2e} ($MtCO_{2e}$)

[2] Direct building GHG emissions represented 89 $MtCO_{2e}$ in 2016. Indirect building GHG emissions (i.e. electricity used in buildings) represented 52 $MtCO_{2e}$ in 2016. Total GHG emissions for buildings were therefore 141 $MtCO_{2e}$.

1.1.2 Carbon content of electricity and heat

Each year, the National Grid produces a set of UK future energy scenarios for electricity. The most recent version covers the period from 2017 to 2050 and considers both energy supply and demand. Four different scenarios are used to develop predictions using a wide range of technical, financial and societal variables. A key forecast provided by this scenario is the evolution of the electricity grid carbon emission factor, which is expected to continue to decrease between now and 2034, and beyond through to 2050 as shown in figure 1.01.

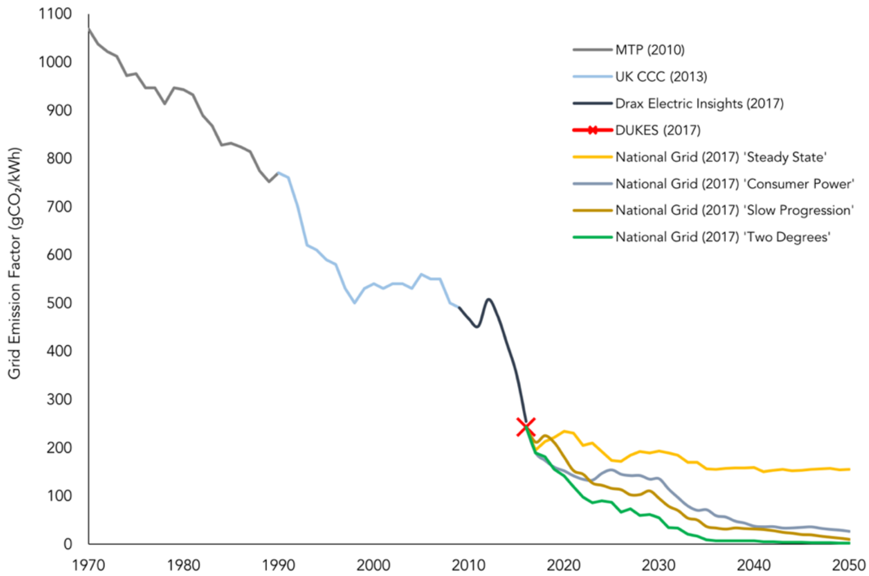

Figure 1-01 – Historical and projected carbon factors for grid electricity (data corrected for continuity between sources)

Space and water heating in buildings is currently responsible for 40% of UK emissions. However, progress in reducing emissions from heating has stalled since 2013, so a significantly stronger policy framework with consistent long term goals is required going forward. The Committee on Climate Change is clear that by 2050, heat will have to be delivered in non-hydrocarbon form. It recommends that gas boiler installations should end by 2035 to avoid the need for scrappage schemes. It highlights three main alternatives: electricity (e.g. heat pumps), low carbon district heating for dense areas and hydrogen via a modified gas network.

1.1.3 The responsibilities of local planning authorities

The Planning and Compulsory Purchase Act (2004), the Planning and Energy Act (2008) and the National Planning Policy Framework (2012) create key obligations and powers for local authorities with regards to the mitigation of, and adaptation to, climate change. The potential evolution of the Planning and Energy Act 2008, and in particular the ability of local authorities to require energy efficiency standards that exceed the energy requirements of building regulations has been discussed over the last 3 years. Our conclusion is that local authorities are still able to set higher energy efficiency standards than the national ones.

The Town and Country Planning Association (TCPA) prepared a report in 2016 titled "*Planning for climate change*?" to assess whether the spatial planning system was dealing effectively with climate change mitigation and adaptation. It concludes that that '*spatial planning has the potential to make a major contribution to both reducing carbon dioxide emissions and preparing for the growing impacts* *of climate change but that it is failing to fulfil this potential'*. It also recommends a stronger link between Local Plans and the recommendations of the Committee on Climate Change.

1.1.4 London context

The Mayor has set a target for London to become a zero carbon city by 2050[3], with a zero carbon transport network and zero carbon buildings.

The **London Plan** (2016) includes a number of policies in relation to climate change. The most relevant to this study are *Policy 5.1 Climate change mitigation* and *Policy 5.2 Minimising carbon dioxide emissions*, which requires all new residential buildings to be zero carbon[4] from 2016 and all new non-residential buildings to be zero carbon from 2019.

C40 cities, a group representing ninety of the world's leading megacities (including London) has published a research report in 2016 ('*Deadline 2020*') into how to turn the Paris Agreement's aspiration into action. It concludes that C40 cities must undertake an unprecedented increase in the pace and scale of climate action to get on the right tracks by 2020 to mitigate and adapt to climate change. Current efforts are not enough and stronger action needs to be taken.

1.1.5 The London Borough of Islington key climate change mitigation objectives

The London Borough of Islington's current energy policy seeks to '*minimise Islington's contribution to climate change and ensure that the borough develops in a way which respects environmental limits and improves quality of life'*. Discussions with key London Borough of Islington planning officers have identified the following key planning policy objectives to ensure that by 2020, Islington is on the right trajectory to meet its 2050 carbon emission reduction targets.

Key objectives

1. **Reducing energy demand**
2. **Decarbonise heat**
3. **Decarbonise electricity**
4. **Energy resilience**

Key considerations

- Ensure the delivery of low/zero energy buildings
- Enable a gradual increase in standards over time to achieve zero carbon buildings by 2050
- Facilitate reporting against Islington's 2034 and 2050 carbon targets
- Mitigate fuel poverty and ensure affordable heat
- Collaboration and skills for a low carbon economy

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[3] London Environment Strategy – Draft for consultation, Mayor of London (2017)

[4] According to the GLA's definition, 'zero carbon' homes are homes forming part of major development applications where the residential element of the application achieves at least a 35% reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100%, are to be off-set through a cash in lieu contribution to the relevant borough that is ring fenced to secure delivery of carbon dioxide savings elsewhere

1.2 Assessment of current policy and guidance

1.2.1 Current climate change mitigation policy and guidance

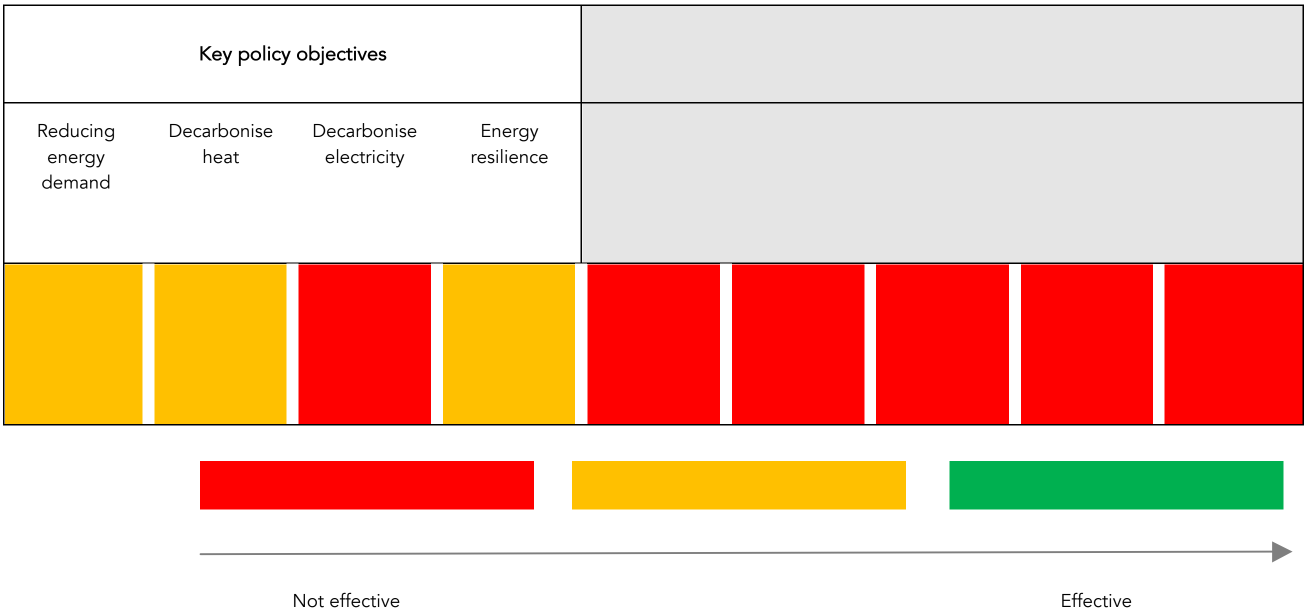
Islington's **Core Strategy (2011)** sets out detailed planning policies for the borough which the Council uses to assess planning applications. The most relevant policy in terms of climate change mitigation is Core Strategy Policy CS10 – Sustainable Design. CS10 covers many aspects of sustainability (CO_2 emissions reduction, energy efficiency, sustainability building standards, best practice water efficiency, climate change adaption, ecology, environmental impact, sustainable transport).

The **Environmental Design Planning Guidance (2012)** is a supplementary planning document (SPD) and does not create new policy, but provides detailed guidance on how Islington's planning policies relating to sustainable design are applied to different types of development. The document includes recommendations to applicants in order to minimise energy demand and carbon emissions.

The **Development Management Policies (2013)** form part of Islington's Local Plan. They add detail to, and complement, the spatial and strategic policies in the Core Strategy. Policies cover sustainable design and construction, energy efficiency and carbon reduction, sustainable design standards, heating and cooling, walking and cycling.

1.2.2 Assessment of current policy

The current policy requirements and guidance were assessed using two approaches. The first one was based on a methodical assessment of the effectiveness of each requirement against the London Borough of Islington's four key policy objectives and five associated considerations. The assessment of the overall effectiveness of current policy and guidance led to the following conclusion:



The second approach to assessing current policy requirements and guidance was to consider their impact on the London Borough of Islington's carbon pathway to 2050. Figure 1.02 shows the estimated carbon emissions in the London Borough of Islington broken down by use. Emissions relating to buildings or building systems/processes consistently represent over 80% of all carbon emissions in the borough. This includes emissions associated with electricity used in buildings.

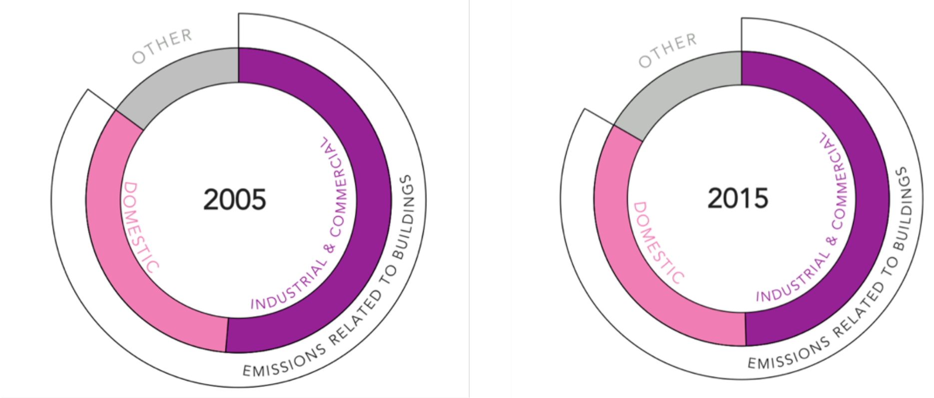


Figure 1.02 – Breakdown of CO_2 emissions from the London Borough of Islington by use for 2005 and 2015

This large contribution to emissions in the borough makes policy that influences building and construction crucially important to meeting commitments to mitigate climate change.

Buildings' CO_2 emissions: pathway and scale of the challenge

The commitments made at a national level and at a local level are against a baseline year of 1990, and have a horizon of 2050. Looking at the likely change over this timescale allows the changes implemented for the policy period in Islington to be seen in relation to the long-term aim.

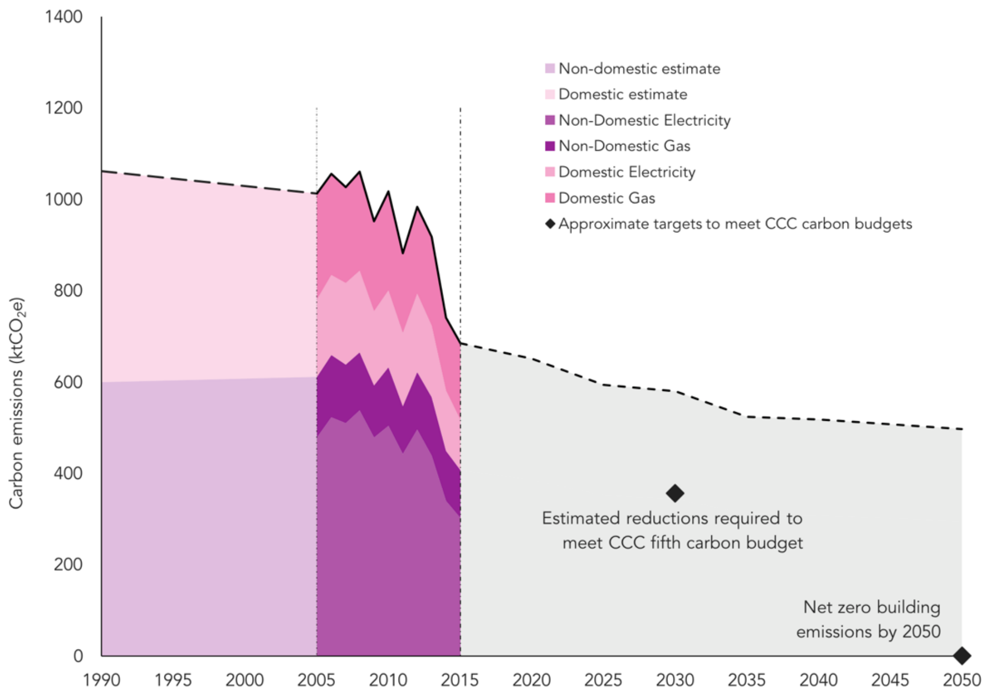


Figure 1.03 – Estimated total carbon emissions due to buildings 1990-2050 in the London Borough of Islington showing the historic split between residential and non-residential buildings

A review of past and current emissions leads to positive conclusions: carbon emissions associated in buildings in the London Borough of Islington have reduced by 35% compared with 1990 and by 32%

compared with 2005[5]. The reduction is even higher on a per capita basis given population growth in Islington.

However, carbon reductions fall well short of the targets in 2030 and 2050. The majority of reductions are due to the decarbonisation of the electricity grid. To show this the carbon content of the electricity grid reduction has been plotted on a second scale with a grey dotted line. The decarbonisation of the grid is not enough.

A higher resolution analysis is required however to allow policy decisions and their impact to be tested. This makes further analysis only possible for the residential portion of the building stock. The analysis indicated that it is reasonable to draw conclusions about the effectiveness of policy based purely on residential buildings. Figure 1.04 shows a projection of residential carbon emissions in Islington.

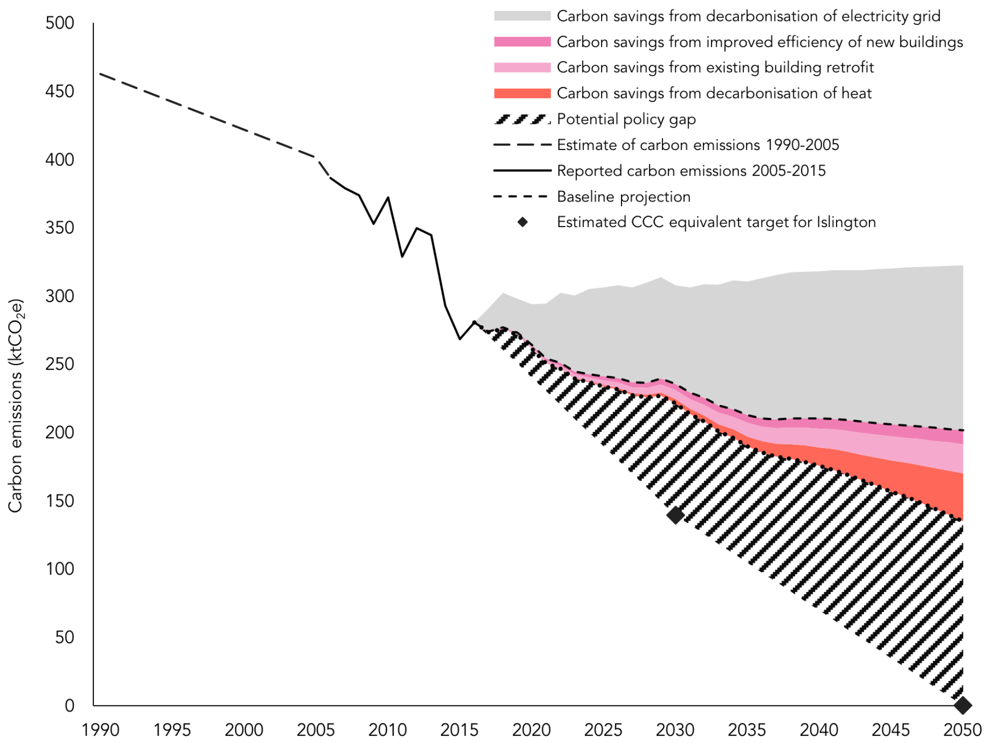


Figure 1.04 – Estimated carbon emissions from dwellings 1990-2050 in the London Borough of Islington showing the projected impact of existing policy from 2015.

The contribution of each of the changes introduced in the calculations has been shown in a stacked area graph, with the total likely emissions represented by the dotted block line. The area hatched in red is the gap between the trajectory of the current policy, market conditions, and that required to be on the right track to achieve zero carbon by 2050. This presentation 'style' is similar to that used by the Committee on Climate Change at a national level and clearly shows the range of potential change in emissions from the current position. The final reductions over 1990 levels are 58% reduction by 2034 and 71% reduction by 2050. These carbon emission reductions fall well short of those required in Islington over the period.

[5] The national average over that same period is 27%.

1.3 Potential improvements and initial recommendations

A number of recommendations have been developed through a collaboration between the London Borough of Islington and Etude. They are structured by themes in order to form, along with current policy and guidance, a more comprehensive and effective climate change mitigation strategy. It should however be noted that they do not represent approved policy and guidance: they are meant to inform the Local Plan review and inform the development of the London Borough of Islington's future policy and guidance for the period 2019-2034, along with other documents such as the London Borough of Islington's energy strategy, which is currently being revised.

1.3.1 Fuel poverty and affordability of energy

According to the sub-regional fuel poverty statistics, 11.1% of households in Islington (i.e. 10,440 households out of a total of 93,991) are fuel poor[6]. Fuel poverty is a very important issue and it is caused by a combination of low income, poor energy efficiency and/or high energy prices. However, it is not currently directly addressed by energy planning policies in the UK. Islington's future energy policy could seek to improve this situation.

Objective	Ref	Recommendation
Reduce the risk of fuel poverty due to poor energy efficiency	TN01-1	Require applicants for domestic refurbishment projects to demonstrate that dwellings post refurbishments will achieve an EPC of C or better.
Avoid excessive heating bills	TN01-2	Require applicants to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of the proposed heating system. Require major applications to estimate life cycle costs of the proposed heating system.
Avoid excessive energy bills	TN01-3	Develop a simple set of specific information which applicants will be required to provide in order for them to estimate future energy bills.
Use carbon offset fund to address fuel poor homes	TN01-4	Encourage applicants for regeneration projects to develop, in conjunction with the Council, a fuel poverty strategy for fuel poor homes within or around the application site.

1.3.2 Fabric energy efficiency

The need to ensure that a building's energy demand is reduced before seeking to use low carbon energy is widely accepted as one of the key principles of good environmental design and has been at the top of the GLA's and Islington's energy hierarchy for more than 10 years. Despite this, there is still considerable progress which can be made to deliver buildings with a truly energy efficient building fabric. This is due to design and compliance methodology issues, as well as construction quality.

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[6] *Please note that the numbers given above are only indicative: the London Borough of Islington officially rejects the Low Income High Cost (LIHC) definition of fuel poverty which is used in England due to a methodological bias against smaller homes (of which there are many in Islington) and higher cost of living in London. The London Borough of Islington favours the 10% indicator which is used by other London boroughs.*

Opportunities for a more ambitious approach in Islington include a greater focus on the building form rather than specifications only. These opportunities are significant as building fabric can 'lock in' poor energy performance for decades.

Objective	Ref	Recommendation
Adopting a specific metric for fabric energy efficiency for residential developments	TN02-1	Adopt 'interim' Fabric Energy Efficiency Standard (FEES), as defined by the Zero Carbon Hub, for the next 3 years with the aim of increasing the requirement to 'full' FEES afterwards.
Encourage the uptake of recognised and successful fabric first approaches	TN02-2	Encourage PHPP/TM54 assessments of energy demand.
	TN02-3	Explain and encourage best practice in terms of fabric energy efficiency through the adoption of Passivhaus and AECB Silver standards.
Ensure that Islington's guidance promotes best practice	TN02-4	Update Table 2.1 in Islington's Environmental Design Planning Guidance and include a 'best practice' column.
Reduce the performance gap	TN02-5	Require applicants to declare assumed construction build up and insulation thickness alongside assumed U-value for the major envelope components.
	TN02-6	Provide guidance to applicants on U-value calculations at application stage.
	TN02-7	Require applicants to estimate and declare the estimated impact of thermal bridges more accurately.
	TN02-8	Require applicants to set out their approach to thermal bridges and how they will improve the thermal performance of junctions.
Require clear fabric improvements for major refurbishments	TN02-9	Require applicants to set out clearly how their fabric improvements go beyond minimum requirements of Part L and what it will achieve in terms of carbon.

1.3.3 Heat generation and distribution

Heat generation and distribution systems are generally specified to enable buildings to achieve a reduction in carbon emissions in line with planning requirements. Unfortunately, Part L currently uses outdated carbon factors for electricity, carbon emissions, and the reductions identified at planning stage are not accurate assessments of future carbon emissions/reductions. This could lead to the wrong conclusions being drawn when comparing systems and prevent the borough from meeting future carbon reduction targets in the future. Addressing the questions raised by the evolving carbon content of electricity is therefore necessary.

The emerging debate in the industry however indicates an element of confusion (with gas-fired CHP and district heating being often referred to as one and the same thing) and a lack of understanding if other implications are not considered (e.g. grid capacity, energy bills and fuel poverty, air quality, existing buildings, etc.). It is therefore important that any new policy is developed in accordance with the Islington's '2050 vision' for infrastructure and DE in the borough.

Objective	Ref	Recommendation
Use more accurate carbon emission factors for electricity	TN03-1	Require applicants to calculate the carbon factor of heat using more accurate emissions factors (e.g. from BEIS and/or CCC and/or LBI).
Eliminate high carbon heat systems	TN03-2	Require applicants to specify heating systems with an average annual carbon content of heat of less than 280g CO_2/kWh (example).
Ensure that applications take into account the Council's strategic vision	TN03-3	Explain Islington's infrastructure and DE vision to 2050 to enable applicants to understand the context of their site (e.g. likely future heat network)
Protect heat network customers	TN03-4	Require applicants to ensure that the future heat network operator will be registered with the Heat Trust Scheme (or any other equivalent/future customer protection scheme). Require all heat networks to be constructed and commissioned in line with CIBSE's Code of Practice CP1.
Ensure heat networks are well metered and monitored	TN03-5	Require applicants to install heat meters for each dwelling so heat can be billed fairly and system efficiencies monitored. Ensure compliance with The Heat Network (Metering and Billing) Regulations 2014.

1.3.4 Photovoltaics

Solar photovoltaic technology provides a reliable source of clean renewable electricity. The London Borough of Islington, as an inner city location, has a significant potential for more PV generation as demand for electricity is high and solar electricity can be generated at/near the point of use. This would not create issues for the grid as in other areas, would avoid transmission losses and would enable communities to be powered, in part, from their own energy infrastructure. Solar electricity is increasingly cost competitive with grid electricity and offers stable prices.

Objective	Ref	Recommendation
Promote a more ambitious use of available roof space for solar photovoltaics	TN04-1	Encourage applicants to utilise roof spaces more effectively for PVs by setting a target (e.g. 100-140W/m^2 of roof area) which they will need to report against, and to consider other opportunities for PVs.
	TN04-2	Reduce the applicant's carbon offset contribution if the on-site carbon target is exceeded.
Promote best practice photovoltaic installations	TN04-3	Encourage applicants to adopt best practices in utilisation of solar photovoltaic technology.
Encouraging alternative sources of funding for PV systems	TN04-4	Encourage communication between applicants and local community energy groups (e.g. energy cooperatives).
	TN04-5	Enable applications to apply for carbon offset funds for exemplar PV systems.

1.3.5 Better performing buildings

Ensuring buildings perform better than they currently do does not rely only on factors outside of the planning system control (e.g. users and occupants being more energy conscious). Key aspects of delivering better performing buildings in new and refurbished buildings include pursuing best practice design with appropriate calculation tools, developing the design and appropriate specifications and ensuring high quality construction practices are followed, including proper commissioning and testing of the building envelope and services.

The 'performance gap' is a term used to describe the, usually significant, disparity between the predicted/modelled energy performance of buildings at design stage and their actual operational performance. The recommendations below seek to address the issues associated with inaccurate energy calculations, the degradation of performance between the planning stage and detailed design/construction and poor quality construction.

Objective	Ref	Recommendation
Estimate future energy use at planning stage in a way that can be verified after construction	TN05-1	Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology in addition to accredited Part L modelling. Declare predicted energy use in kWh/m^2/yr and kWh/yr. This would become one of the GPP indicator targets.
Reduce performance gap (detailed design)	TN05-2	Require applicants to provide initial U-value calculations and assumed build-up/insulation thicknesses of key building envelope components.
	TN05-3	Require applicants to provide initial estimates/calculations of the performance from key repeating and non-repeating thermal bridges.
	TN05-4	Require applicants to provide examples of key mechanical and electrical products/design strategies that would meet the detailed energy efficiency standards (e.g. MVHR).
Reduce performance gap (construction)	TN05-5	Require applicants to complete an on-line form / table confirming the actual performance values achieved compared with the original energy targets (e.g. U-value, window performance, etc.) and to submit the associated documentary evidence (e.g. construction manager's declaration, delivery notes of key products, site photographs for insulation installation, MVHR commissioning certificates).
	TN05-6	Require applicants to carry out an air tightness test and thermographic survey of all new and refurbished buildings over 500m^2. The test reports, along with details of any remediation measures, would have to be provided to the Council prior to occupancy.
Monitoring and dissemination of operational performance data	TN05-7	Require energy and water sub-metering and reporting beyond the minimum Part L requirements.
	TN05-8	Require all applicants for non-residential buildings above 500 m^2 to undertake a DEC assessment and display it at reception.

1.3.6 Assessment of combined policy (existing and recommendations)

The assessment of the overall effectiveness of current policy/guidance combined with the recommendations summarised above led to the following conclusion.

Key policy objectives								
Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience					

The assessment indicates that the current policy and guidance, combined with the initial recommendations would form a more comprehensive and effective climate change mitigation strategy. The only key policy objective which would be 'amber' is the objective to decarbonise electricity, but that is because this objective relies heavily on national government policy. The London Borough of Islington should, however, do what it is within its control and influence to achieve this objective (solar electricity, peak shaving, dynamic demand management, energy storage). The second approach to assessing current policy requirements and guidance was to consider their impact on the London Borough of Islington's carbon pathway to 2050. The carbon pathway of residential buildings was used to test the impact of these recommendations.

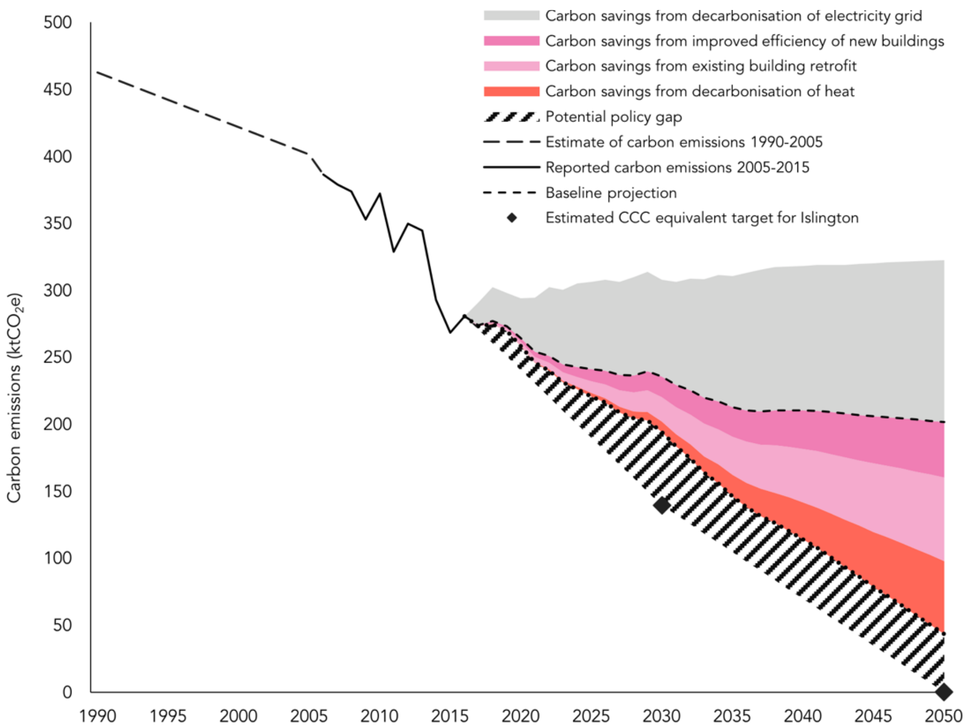


Figure 1.05 – Estimated carbon emissions from dwellings 1990-2050 in the London Borough of Islington showing the projected impact of potential policy

The improved carbon emission reductions are still short of the targets, however they demonstrate that with ambitious but realistic policy and guidance, significant reductions can be achieved. The final reductions over 1990 levels shown here are 66% reduction by 2034 and 91% reduction by 2050. The analysis was found to be consistent with the carbon pathway developed by the GLA.

1.4 Technical evidence base

A significant amount of energy modelling has been undertaken to develop the technical evidence base. In order to represent different types of buildings (residential/non-residential), different scales of applications (minor/major) and different typologies (house/apartment block), three building types have been considered:

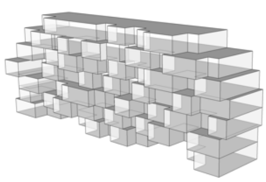
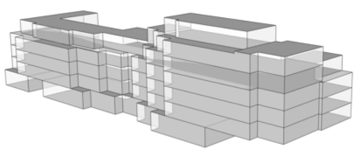
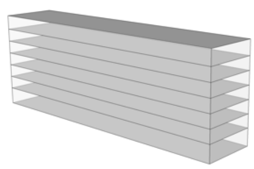
- a **terrace house** – which represents a 'minor' residential application;
- an **apartment block** – which represents a 'major' residential application;
- a **school** – which represents a 'major' non-residential application.

1.4.1 Usefulness of the Fabric Energy Efficiency metric for residential developments

In order to help ensure that new homes built in the borough are not only zero carbon but also energy efficient, it is proposed to introduce a requirement for all new homes to achieve the following Fabric Energy Efficiency Standard (FEES).

Type of residential development	Interim FEES (2019-2022)	Full FEES (from 2022)
Mid-terrace houses and blocks of flats	< 43 kWh/m^2/yr	< 39 kWh/m^2/yr
Semi-detached, end of terrace and detached houses	< 52 kWh/m^2/yr	< 46 kWh/m^2/yr

Energy modelling has been undertaken on a typical terrace house and a typical medium-rise apartment block. For each building type, three different form factors and three different sets of specifications were modelled. The results of the energy modelling for the medium density apartment block are summarised below.

	Form factor		
	High	Medium (base case)	Low
Apartment block			

Part L results (% improvement over Part L 2013)

Apartment block	Improvement over Part L 2013 (%)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	15%	35%	50%
Medium form factor	15%	35%	50%
Low form factor	17%	37%	50%

Table 1.01 – Apartment block – Part L results of various combinations

It can be seen from the above table that percentage improvements over Part L 2013 reflect positively to an increase in specifications, with the percentage improvement over Part L become significantly better as U-values and other parameters are improved.

However, it can also be seen that the percentage improvement over Part L metric is not suitable for reflecting the efforts made by an architect to improve the energy efficiency of the design: there is virtually no difference between the results achieved for a given set of specifications and several form factors.

FEES results

Apartment block	Fabric Energy Efficiency Standard (FEES)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	41 kWh/m^2/yr		
Medium form factor	38 kWh/m^2/yr	31 kWh/m^2/yr	25 kWh/m^2/yr
Low form factor	33 kWh/m^2/yr	27 kWh/m^2/yr	22 kWh/m^2/yr

Table 1.02 – Apartment block – FEES performance of various combinations

The table above shows that the Fabric Energy Efficiency Standard is much better at valuing both the increase in energy efficient specifications and the efforts made to make the form of the building more efficient.

Cells coloured in green in Table 1.02 show the combinations which would comply with 'full FEES' and those in amber those which comply with 'interim FEES'. It therefore demonstrates that 9 out of the 9 combinations would comply with a policy requiring compliance with 'interim FEES'. The 'worst' case combination (i.e. high form factor and 'standard practice' specifications) would only become non-policy compliant after 'full FEES' are introduced.

In addition, this metric would be useful to enable clients to quantify the efforts made not only in terms of specifications, but also with the building design itself, without constraining architectural freedom.

This section demonstrates how useful the introduction of the Fabric Energy Efficiency Standard would be. Whereas Part L helps to assess and value better specifications, it is not the right tool and metric to assess an applicant's effort to design and build more efficient building forms. As forms have a direct influence on energy efficiency through the increased heat loss areas and thermal bridges, it is considered appropriate for planning policy to promote holistic efforts towards energy efficiency.

1.4.2 Benefit of requiring assessments of predicted energy use (e.g. TM54, PHPP) rather than Part L only assessments

Energy models currently used to check compliance with Islington's energy policy are the same as those used to check compliance with Building Regulations and use the percentage improvement over Building Regulations as their key metric. These energy models are not intended as predictions of energy use, but are sometimes mistakenly used as such.

Seeking to more accurately predict the future energy performance of a building by using a metric which can also be verified in operation would significantly increase the impact of policy on the carbon emissions of future buildings in Islington and help to create a very virtuous feedback loop. It would provide better information to applicants and design teams and therefore drive the design of better residential and non-residential buildings. This metric (FEES) would also make It possible to quantify the effectiveness of planning policy, at a building scale or at a borough level.

The prediction can be undertaken pre-planning, checked throughout design/construction and then verified during operation. This would then be reported through the Green Performance Plan already required by the London Borough of Islington.

Predicting the future energy use of buildings in Islington would require evolving the current energy modelling approach towards better energy assessment. There are existing methodologies and tools available (e.g. CIBSE TM54, PHPP) for carrying out better energy modelling that is essential to ensure that design and construction choices are well informed. A specific heat demand metric (kWh/m^2) could also potentially be introduced to address the specific and challenging issue of heat demand.

The results of the energy modelling for the School are summarised below.

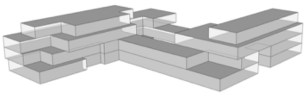
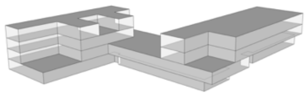
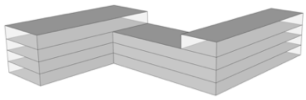
Energy use in good-performing schools

In order to be able to compare the energy modelling results from Part L, PHPP and TM54 to actual energy data, a variety of sources have been used (e.g. CIBSE TM46, Post Occupancy Evaluation (POE) data, Carbonbuzz).

The data shows annual heating consumption for existing schools varying between less than 15 kWh/m^2/yr (Passivhaus schools) to approximately 150 kWh/m^2/yr, with most schools having an annual heating consumption of over 80 kWh/m^2/yr.

The data also shows total energy for existing schools varying between less than 70 kWh/m^2/yr (Passivhaus schools) to approximately 190 kWh/m^2/yr, with most schools having an annual energy consumption of over 140 kWh/m^2/yr.

The school 'base case' was modified to enable the assessment and comparison of energy consumption from using Part L, PHPP or TM54.

	Form factor		
	High	Medium (base case)	Low
School			

Space heating demand

The figure below shows the estimated heating demand according to Part L and PHPP.

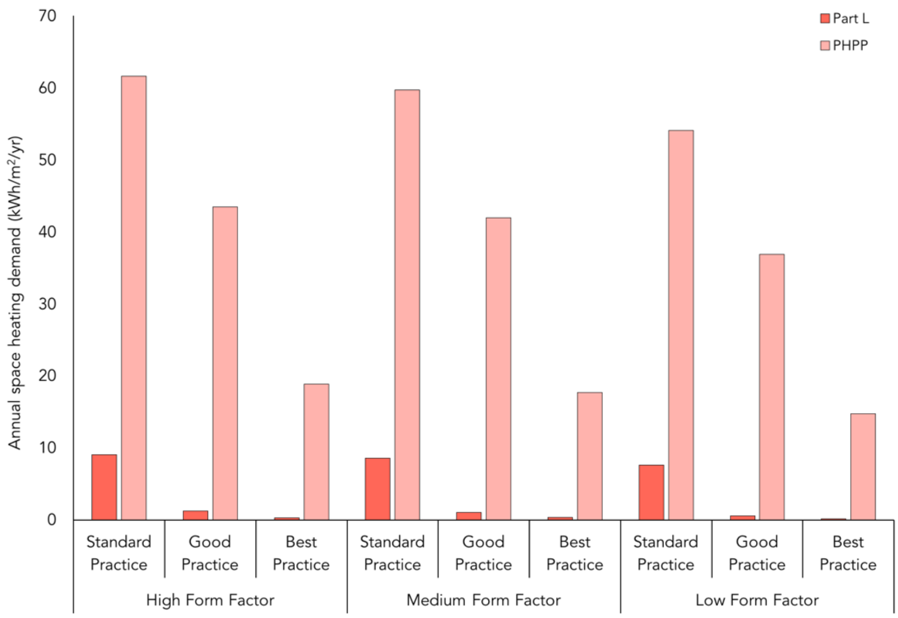


Figure 1.06 – School – Assessment of space heating demand using Part L or PHPP

It is clear that the Part L assessment underestimates space heating demand. This is problematic as design and construction changes (e.g. relaxation of U-value or airtightness target) will have a minor effect on Part L CO_2 emissions, but a much more significant one on actual CO_2 emissions.

Total energy consumption

Assuming a medium form and standard practice specification, a TM54 assessment was undertaken in order to be compared to the Part L and PHPP energy assessments. Despite differences, the scale of energy consumption is very similar for both PHPP and TM54, and they both relate satisfactorily to actual energy consumption benchmarks, demonstrating that both methodologies/tools could be used to predict likely future energy consumption.

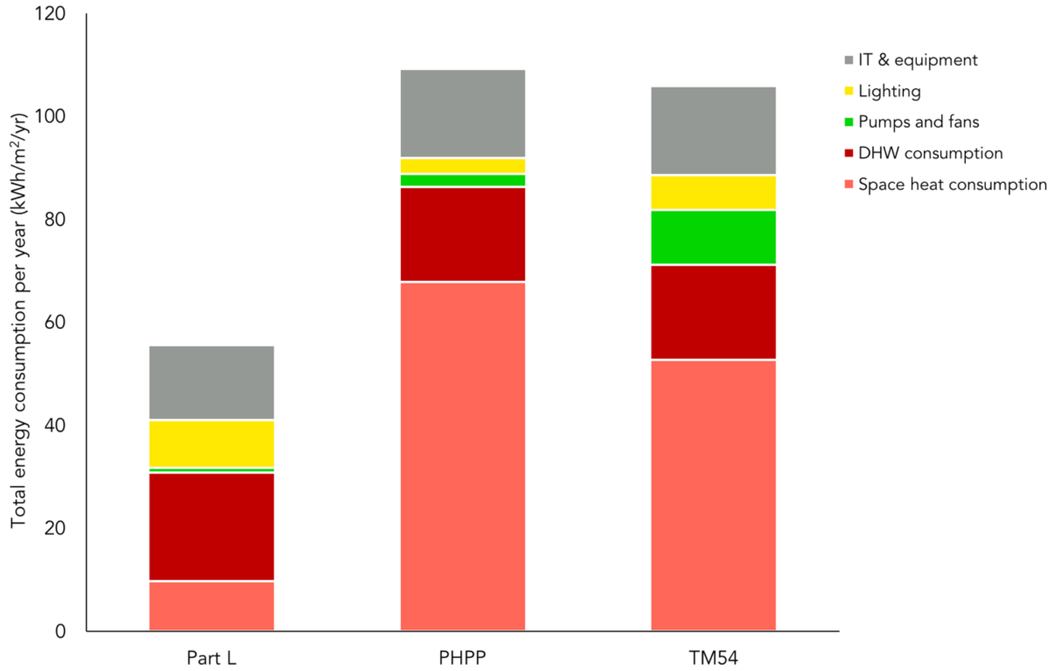


Figure 1.07 – School – Assessment of total energy use using Part L, PHPP or TM54

This section demonstrates that requiring assessments of predicted energy use (using PHPP or TM54) rather than Part L only assessments would provide better information to applicants and design teams and therefore drive the design of better residential and non-residential buildings.

1.4.3 The need for accurate carbon factor to be used

Promoting decarbonisation of the electricity grid generally falls outside the scope of London Borough of Islington's responsibility and is down to national policy, with the exception of encouraging solar PV on buildings. However, the effects of decarbonisation do have a significant impact on several key policy areas:

1. Carbon emissions associated with electricity use for lighting, pumps, fans and other auxiliary services within buildings will fall as the grid decarbonises.
2. Carbon emissions arising from heating systems that either use or produce[7] (indirectly) electricity will change substantially.
3. The effectiveness of solar PV to reduce carbon emissions and improve performance against Part L will diminish[8].

Two important carbon factors used for calculating emissions from buildings are compared in Table 1.03.

[7] For example, gas fired CHP systems.
[8] Paradoxically, more PV is required to decarbonise the grid, yet the more that is deployed the lower the incentive (in carbon terms) to continue to deploy more.

Energy type	SAP2012 (Part L)	DUKES 2017 (BEIS)
Electricity	519 g/kWh	254 g/kWh

Table 1.03 – Carbon content of electricity depending on source used

The SAP 2012 figure is currently used to calculate the carbon emissions from every new building in the United Kingdom, for any refurbishments that require Part L assessments, and for the carbon emissions indicated on a property's Energy Performance Certificate. This figure is based on a three year average that was predicted in SAP 2012 for the period 2013-2015[9].

The most up to date government figure for the grid emission factor is only 254gCO_2/kWh, less than half the value that is currently being used to assess buildings. Consequently, the results of any calculations based on the carbon factors for electricity contained within SAP 2012 are misleading. This affects all three of the key areas previously outlined.

It is therefore clear that the use of more up-to-date carbon factors is important.

1.4.4 Carbon content of heat

A recommendation from the report is to set a requirement for applicants to specify heating systems with a carbon content of heat below a given level. This would both ensure that high carbon heating systems are no longer installed in new buildings and create a performance indicator at project level against the strategic objective to decarbonise heat.

Initially it is recommended that the maximum permissible carbon content of heat is set at 280 gCO_2/kWh. This would permit the use of both efficient low NOx individual and communal gas boilers, while prohibiting the use of poorly efficient gas boiler systems and district heating with natural gas fired CHP systems[10] with no established plans for low carbon heat in the short to medium term. Over time the level could be reduced further to encourage lower carbon heating technologies to be adopted.

It is important to note that relatively small reductions in the required carbon content of heat will represent tipping points that effectively prohibit the use of certain technologies. For example, reducing the level from 280 gCO_2/kWh to 200 gCO_2/kWh would cause gas boilers to become non-compliant. Applicants would need to specify alternative systems such as low carbon heat networks or heat pumps (or direct electrical heating) to remain compliant with the policy. Therefore, this carbon cap is not proposed for the initial phase.

The maximum permissible carbon content of heat permitted by this policy from now through to 2034 should therefore be carefully developed in conjunction with other policies to avoid unintended consequences. To ensure that the policy of setting a cap on the maximum permissible carbon content of heat is practical, it is necessary to demonstrate a viable technological pathway for low carbon

[9] SAP 2012 (2013) *The Government's Standard Assessment Procedure for Energy Rating of Dwellings. Table 12: Fuel prices, emission factors and primary energy factors.*
[10] When calculating their emissions based on the grid electricity carbon factor from DUKES 2017

heating. Understanding how the carbon content of heat from different heating technologies is likely to develop in the future also provides context to inform policy development.

Figure 1.08 uses grid electricity emission factors from the National Grid's 'Slow Progression' scenario to project the carbon content of heat for the key technologies previously assessed.

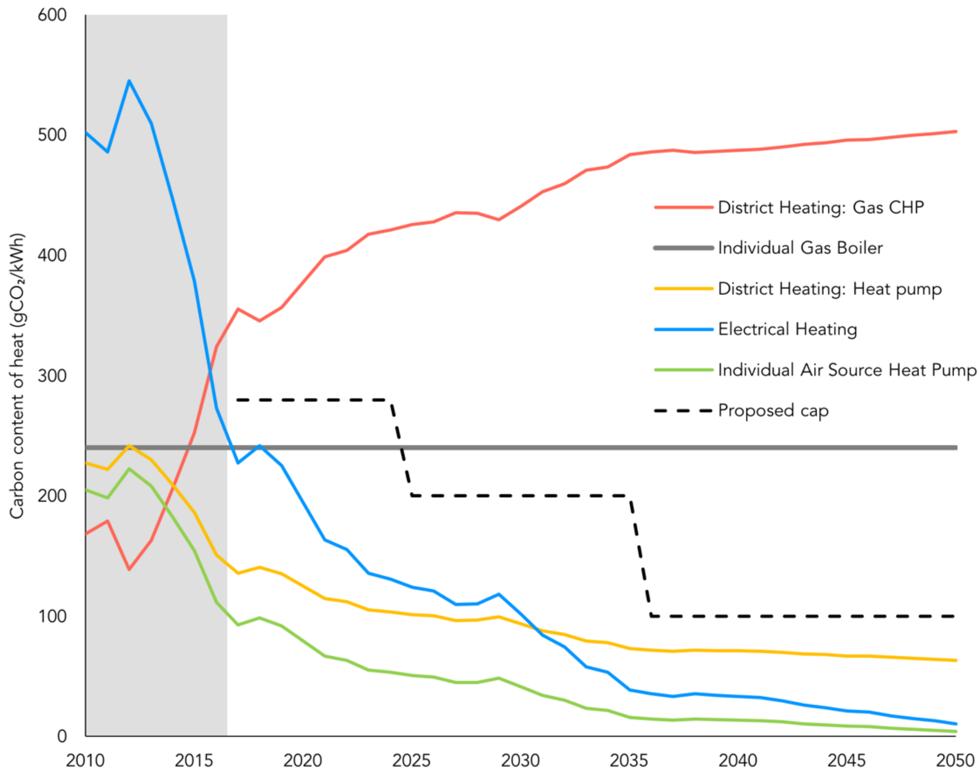


Figure 1.08 – Projected carbon content of heat for key technologies based on National Grid 'Slow Progression' scenario from FES 2017

Figure 1.08 also includes a proposed pathway for the emissions cap, which would achieve two key outcomes:

1. Starting with a maximum permissible carbon content of heat of 280 gCO_2/kWh would cease the deployment of high carbon heating systems in new buildings.
2. Reducing the carbon content of heat to 200 gCO_2/kWh by 2025-2030 would then prohibit the use of gas boilers in new builds. While the long-term trends may justify introduction of this limit sooner, selecting a date in the future will provide applicants and industry with time to prepare for the change.

Beyond 2025, it would be possible to introduce further reductions to the cap if necessary. An indicative reduction to 110gCO_2/kWh is shown to occur in 2035. Such a cap may not affect electrical heating systems due to the projected reductions in the carbon content of electricity, but may be necessary to drive ongoing carbon reductions in other heating technologies such as low carbon district heating systems.

2.0

CLIMATE CHANGE AND THE NEED FOR ACTION

2.0 CLIMATE CHANGE AND THE NEED FOR ACTION

This section summarises the evidence demonstrating the need for the proposed revisions to Islington's energy policy for reducing CO_2 emissions from buildings. After a short explanation of the scientific and international consensus, it provides a summary of the international and national policy context as well as the current and proposed policies and strategies for Greater London.

There is overwhelming scientific consensus that significant climate change is happening. This is evidenced in the latest assessment of the Intergovernmental Panel on Climate Change (IPCC AR5). Climate change is leading to rising temperatures and sea levels, causing extreme weather, damaging ecosystems, reducing the productivity of crops and changing the natural environment. Many impacts are already being detected globally.

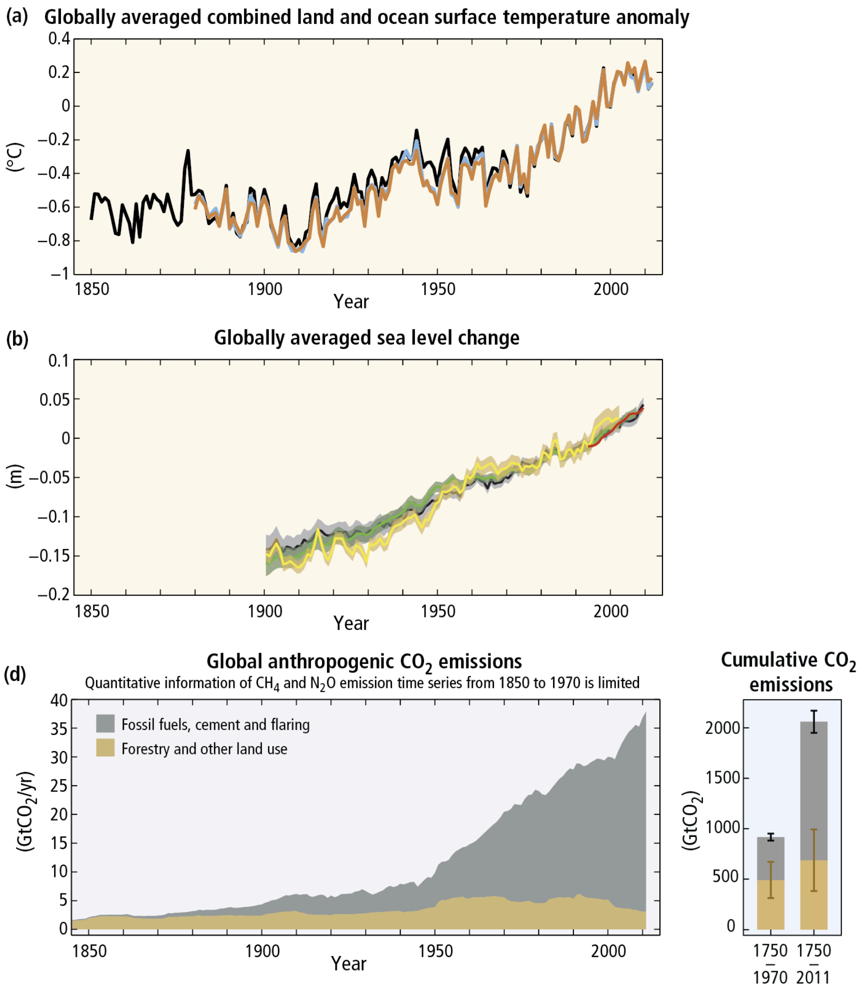


Figure 2.01 – Surface temperatures, sea level and anthropogenic CO_2 emissions (Source: IPCC AR5, 2014)

It is extremely likely that human activity is the predominant cause of climate change through emissions of greenhouse gases (GHG).

Public action is needed to substantially reduce GHGs, which would not happen at sufficient scale without intervention. Those who produce GHG emissions do not directly face the consequences of their actions, and do not necessarily take into account these consequences when taking decisions.

Climate change is also a global phenomenon in both its causes and consequences, and its impacts are persistent. It is considered as one of the most serious long-term risks to global and national economic stability and security.

2.1 International context

The UK's commitments are set in the context of global efforts to reduce GHG emissions.

2.1.1 The Paris Agreement (2015)

International negotiations on climate change are governed through the United Nations Framework Convention on Climate Change (UNFCCC). The most recent negotiations concluded with the Paris Agreement in December 2015. This Agreement reaffirms global ambition to limit temperature rises to below 2°C and binds every country to the collective ambition which should guide national plans to reduce emissions. The agreement also contains a further collective aspirational goal to reduce emissions in line with keeping the temperature increase to 1.5°C.

In total, 187 countries, including all of the G20 except the US[11], have now announced mitigation targets for the post-2020 period. Collectively they represent a significant reduction in emissions relative to the current emissions pathway. However, targets announced by countries in advance of the Paris Agreement collectively fell short of what is needed to meet the below 2°C objective. The Paris Agreement therefore created a mechanism of five-yearly cycles to look at and increase the level of global ambition. This should result in countries increasing the ambition of their targets.

2.1.2 The UK role in meeting the 2°C objective

The Paris Agreement committed countries to a collective global temperature target of '*well below 2°C*' and obliges them to '*pursue efforts*' to limit temperature rise to 1.5°C. Analysis suggests that the appropriate contribution from the UK to the global 2°C objective would be equivalent to a 58% to 62% reduction in emissions from 1990 levels by 2030.

2.1.3 EU directive (2010/31/EU)

Article 9 of the EU directive (2010/31/EU) requires member states to ensure that all new buildings are nearly zero energy buildings by 2020, and that public authority new buildings are nearly zero energy after 31st December 2018. Member states are required to have intermediate targets for improving the energy performance of new buildings to meet the 2020 timeframe.

The status of this EU directive will be affected by the UK leaving the EU following the referendum in June 2016.

[11] The US Federal Government has formally notified the UN of its intention to withdraw from the Paris Agreement in August 2017. Many US States, cities, businesses have however recommitted to the agreement.

2.2 National policy context

2.2.1 Climate Change Act 2008

The Climate Change Act 2008 commits the government to reducing the UK's carbon emissions by at least 80% by 2050 compared with a 1990 baseline. This target was advised by the Committee on Climate Change (CCC) as an appropriate share of global action to limit global surface warming to around 2°C above pre-industrial levels by 2100. The Act also requires the government to set legally binding carbon budgets that cap greenhouse gas emissions over a five-year period.

2.2.2 Key policy documents

A series of energy policy documents relating to buildings and heat have been produced since the Climate Change Act 2008. These documents outline some of the policies required to reduce carbon emissions. These include: The UK Low Carbon Transition Plan (2009), The Carbon Plan (2011), The Future of Heating: A strategic framework for low carbon heat in the UK (2011), and The Future of Heating: Meeting the challenge (2013). A consistent theme in these documents is the need to decarbonise the heating of buildings for the 2050 target to be achieved.

2.2.3 The Fifth Carbon Budget

As required by the Climate Change Act 2008 the Government has set the fifth carbon budget: a five-year cumulative limit on the level of the net UK carbon account over 2028-32 in order to meet the UK's 2050 target. In its advice for the fifth carbon budget level, the CCC reaffirmed the appropriateness of the UK's 80% target for a global 2° Celsius pathway.

The fifth carbon budget was published on 30th June 2016. The budget level is 1,765 million tonnes of carbon dioxide equivalent ($MtCO_{2e}$). It is equivalent to a 56.9% reduction on 1990 levels by 2030.

2.2.4 Meeting carbon budgets – 2017 progress report to Parliament: Closing the policy gap

This report, prepared by the Committee on Climate Change, was presented to Parliament pursuant to Section 36(1) of the Climate Change Act 2008. It reviews progress towards meeting the carbon budgets and the 2050 emission reduction target.

Although UK emissions fell 6% in 2016[12] and are down 19% since 2012, progress has been dominated by the power sector (reduction in the use of coal for power generation, which is now at low levels, and increased contribution from renewable energy).

Direct carbon dioxide emissions from buildings actually rose in 2015 and 2016[13]. The report notes that:

- the rates of installing insulation have stalled (down over 90% from 2012);
- new buildings with high-carbon heating systems are still being built;
- the deployment of heat pumps and low-carbon heat networks is below what is required for meeting future carbon budgets.

[12] Total UK emissions of GHG in 2016 were estimated to represent 466 million tonnes of CO_{2e} ($MtCO_{2e}$)
[13] Direct building GHG emissions represented 89 $MtCO_{2e}$ in 2016. Indirect building GHG emissions (i.e. electricity used in buildings) represented 52 $MtCO_{2e}$ in 2016. Total GHG emissions for buildings were therefore 141 $MtCO_{2e}$.

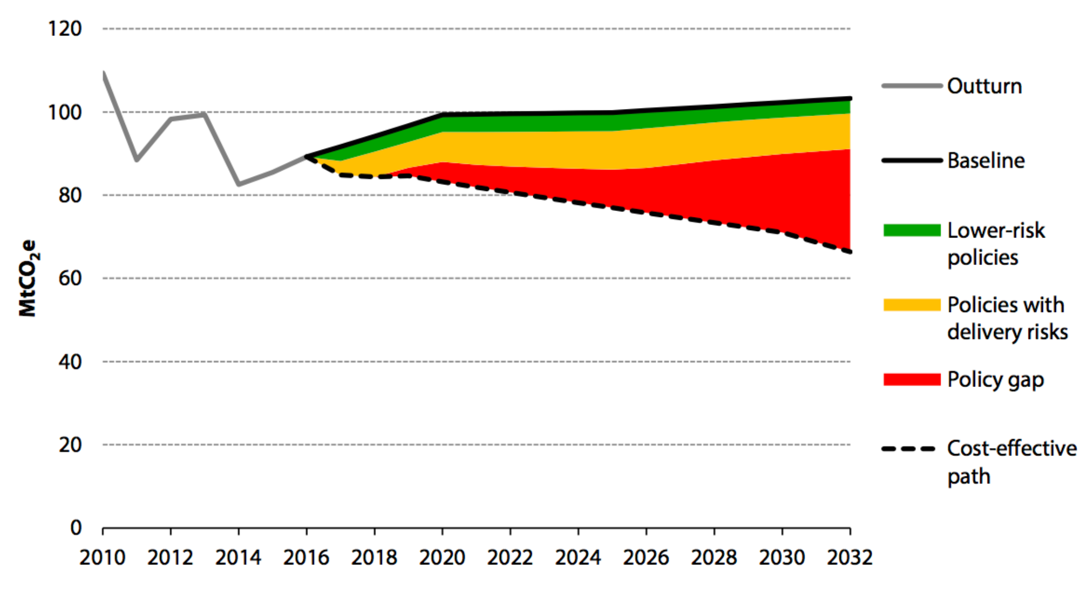
The 2017 progress report's overall conclusion is that the UK urgently needs new policies to cut greenhouse gas emissions. It highlights that Parliament has made commitments and that the government has a legal duty to propose policies to meet them. Despite this, it notes that no significant new policy plans have been published in the 11 months since the fifth carbon budget was set.

The figure and table below, extracted from the 2017 progress report prepared by the Committee on Climate Change illustrate the current national policy gap.

Abatement options	2016 policy		2017 policy assessment and updates	
Building-scale low-carbon heat options in existing buildings to 2021	Amber	Renewable Heat Incentive funded to 2021, but does not address awareness and upfront cost barriers.	Amber	No change.
Building-scale low-carbon heat options in existing buildings from 2021	Red	No policy.	Red	Further research underway on infrastructure and options.
Heat networks to 2021	Amber	£320m capital funding.	Amber	Outcome of first round of funding announced.
Hydrogen	Amber		Amber	Need for strategy.
Standards for new-build to drive low-carbon heat and energy efficiency	Red	No policy.	Red	No policy.
Residential energy efficiency, able-to-pay	Red		Red	Green Deal Finance Company sold. PRS regulations need urgent amendment. Lack of incentives for owner-occupiers.
Residential energy efficiency, low income	Amber		Amber	ECO transition April 2017-Sep 2018 – reduced size and focused on fuel poverty. ECO specification unclear beyond Sep 2018.
Non-residential energy efficiency	Amber		Amber	Sell off of GIB, CRC Scheme closing in 2019 with rebalancing of CCL, and poor compliance under ESOS. PRS regulations in place along with Salix finance in for public sector. Gap in policy for SMEs.

Notes: Red: Policy gap - new policy required. Amber: Policy with delivery risk - stronger implementation required. Green: Lower-risk policy - expected to deliver.
The assessment in this table does not map directly on to the RAG assessment in Figure 3.5. This reflects that it is an aggregate assessment for an area with a number of existing policies (e.g. non-residential energy efficiency), and in some areas no abatement is currently factored into the BEIS projections used as the basis for the Policy Gap Chart (e.g. heat networks to 2021, hydrogen).

Figure 2.02 – Assessment of policies to drive carbon abatement in buildings (Source: CCC, 2017)



Source: BEIS (2017) *Updated energy and emission projections 2016*; CCC analysis.
Notes: Residential baseline emissions align to BEIS projections rather than the CCC baseline projection developed for the fifth carbon budget analysis (which factor in savings from boiler efficiency). This is to illustrate the gap with current Government projections. The cost-effective path for buildings has been updated to reflect a new residential baseline emissions projection, which is 2 Mt higher for 2030 than previously.

Figure 2.03 – Policy gap chart 2010-2032 (Source: CCC, 2017) – Building direct emissions only (excl. electricity)

The Committee on Climate Change suggests an example of package of measures to deliver the changes required for buildings. These include:

- **Energy efficiency improvements to existing buildings**, including insulation of all practicable lofts by 2022 and cavity walls by 2030, and 2 million solid walls by 2030;
- **Stronger new build standards** for energy efficiency and low-carbon heat;
- **Low carbon heat**, including 2.5 million heat pumps in homes by 2030, around 40 TWh of low-carbon heat networks by 2030 and around 20 TWh of biomethane to the gas grid by 2030.

The report also notes that there is no robust evidence to suggest that the introduction of new energy efficiency/low carbon heat standards for new homes would appreciably reduce or delay new housing supply to meet Government targets for new housing.

2.2.5 The Clean Growth Strategy: Leading the way to a low carbon future (2017)

The Clean Growth Strategy was published in October 2017 and presented to Parliament pursuant to Sections 12 and 14 of the Climate Change Act 2008. It sets out a broad strategy for the UK to grow its national income while cutting greenhouse gas emissions.

The report acknowledges the challenge head by stating that:

"Hitting our carbon budgets and expanding the low carbon economy will not be easy. We have achieved significant results in the power and waste sectors and now need to replicate this success

across the economy, particularly in the transport, business and industrial sectors. We also need to reduce the emissions created by heating our homes and businesses, which account for almost a third of UK emissions. If done in the right way, cutting emissions in these areas can benefit us all through reduced energy bills, which will help improve the UK's productivity, and improved air quality, while the innovation and investment required to drive these emissions down can create more jobs and more export opportunities. In order to meet the fourth and fifth carbon budgets (covering the periods 2023-2027 and 2028-2032) we will need to drive a significant acceleration in the pace of decarbonisation."

The Government is proposing to take a number of actions. Examples include:

- Supporting around £3.6 billion of investment to upgrade around a million homes through the Energy Company Obligation (ECO);
- Upgrading all fuel poor homes to Energy Performance Certificate (EPC) Band C by 2030 and as many homes as possible by 2035 where practical, cost-effective and affordable;
- Following the outcome of the independent review of Building Regulations and fire safety, and subject to its conclusions, improving the energy efficiency of new and existing buildings;
- Exploring how voluntary building standards can support improvements in the energy efficiency performance of buildings;
- Building and extending heat networks across the country, underpinned with public funding;
- Supporting the recycling of heat produced in industrial processes, to reduce business energy bills and benefit local communities.

2.2.6 Committee on Climate Change: Next steps for UK heat policy (2016)

This report was prepared by the Committee on Climate Change with assistance from a specialist technical working group. The report examines pathways to decarbonise heat used within buildings by 2050[14]. This will be necessary as emissions from industry, agriculture and aviation are projected to be 140 $MtCtCO_{2e}$ in 2050 (of a total budget of 165 $MtCtCO_{2e}$) leaving only 25 $MtCtCO_{2e}$ for the other sectors.

Space and water heating in buildings is currently responsible for 40% of UK emissions. However, progress in reducing emissions from heating has stalled since 2013, so a significantly stronger policy framework with consistent long term goals is required going forward. The government is expected to outline a strategy to achieve this in the upcoming Emissions Reduction Plan, however this has been subject to a series of delays and the current timeframe for publication is unclear. In this context, the Committee on Climate Change's analysis provides a useful appraisal of the options.

The report is clear that by 2050, heat will have to be delivered in non-hydrocarbon form. It recommends that gas boiler installations should end by 2035 to avoid the need for scrappage schemes. It highlights three main alternatives:

- Electricity (e.g. heat pumps);
- Low carbon district heating for dense areas;
- Hydrogen via a modified gas network.

[14] This requirement was first outlined as a priority in the 2011 Low Carbon Transition Plan

In the shorter term, the Committee on Climate Change recommends that efforts focus on 'no-regret' solutions at key trigger points in a building's life cycle such as construction, refurbishment or sale. No-regret measures that should be immediately pursued include building fabric efficiency[15], installing heat pumps in buildings that are not on the gas network, deploying low carbon heat networks[16] and injection of biomethane into the gas supply. These will ensure adequate progress while longer term strategic decisions are made to address more challenging questions.

Finally, the report recommends principles that should guide policy development including the **focus on real world performance**, the development of a **joined up approach between building fabric efficiency and low carbon heat**, and the need for industry to be aware of the solutions and capable of delivering them.

2.3 National context: electricity decarbonisation

Each year, the National Grid produces a set of UK future energy scenarios. The most recent version covers the period from 2017 to 2050 and considers both energy supply and demand. Four different scenarios are used to develop predictions using a wide range of technical, financial and societal variables.

Establishing the likely future grid carbon factor over the period 2019-2034 and beyond is required to inform the development of Islington's Local Plan and the associated decarbonisation strategy for buildings. It will not only affect the building's CO_2 emissions due to electricity use for lighting, equipment, etc. It will also affect the carbon content of heat produced from heat pumps, electrical heating and technologies that offset emissions against the grid, such as gas fired CHP[17].

Of the four scenarios, the 'slow progression' scenario has been identified by Etude as the most likely to represent the UK's energy future. This scenario, outlined in figure 2.04, offers a plausible balance of progress toward the goals of the Climate Change Act 2008 while applying economic constraints to progress. Low economic growth is assumed, with affordability of energy remaining a key policy driver that competes with the need to reduce carbon emissions throughout the assessment period. This scenario ultimately achieves significant emissions reductions, but progress is tempered by the lack of financial support.

[15]This is particularly important as it can reduce loads on the electrical grid from heat pumps, and reduce the amount of low carbon heat required by heat networks.
[16] Heat networks using heat provided by fossil fuel based CHP plant are not considered as low carbon.
[17] Please refer to section 5.7 for further details

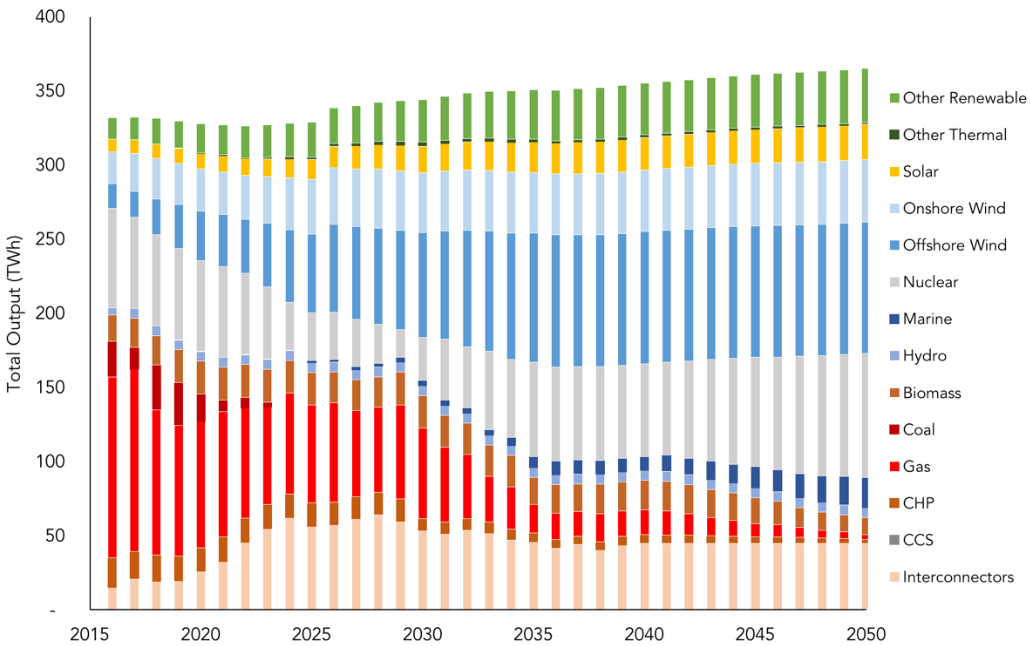


Figure 2.04 – Generation output by technology in National Grid FES2017 'slow progression' scenario (© National Grid)

A key forecast provided by this scenario is the evolution of the electricity grid carbon emission factor, which is expected to continue to decrease between now and 2034, and beyond through to 2050 as shown in figure 2.05.

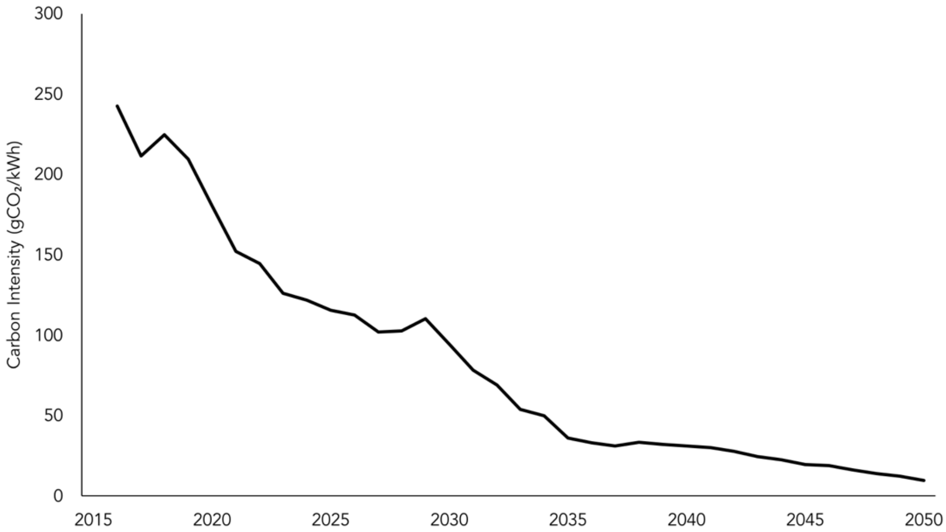


Figure 2.05 – Grid carbon content in National Grid FES2017 'Slow Progression' scenario (© National Grid)

For a more comprehensive version of Figure 2.05, which includes over 40 years of historical data from a variety of sources and additional scenarios from the National Grid, please refer to Appendix A.

2.4 National policy and the responsibilities of local planning authorities

2.4.1 Planning and Compulsory Purchase Act (2004)

The Planning and Compulsory Purchase Act places a duty on local planning authorities to:

1. Include in their development plan documents "*policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change*" - Section 19 (1A) of the Planning and Compulsory Purchase Act 2004 (Inserted by 2008 Planning Act).
2. Deliver sustainable development through the planning system.

"39 – Sustainable development
This section applies to any person who or body which exercises any function— (a) under Part 1 in relation to a regional spatial strategy; (b) under Part 2 in relation to local development documents; (c) under Part 6 in relation to the Wales Spatial Plan or a local development plan. (2) The person or body must exercise the function with the objective of contributing to the achievement of sustainable development".

2.4.2 Planning and Energy Act (2008)

The Planning and Energy Act (2008) states the following

"1. Energy policies

(1) A local planning authority in England may in their development plan documents, and a local planning authority in Wales may in their local development plan, include policies imposing reasonable requirements for:

(a) a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;

(b) a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development;

(c) development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations."

The potential evolution of the Planning and Energy Act 2008 is discussed in Appendix B. It led to the conclusion that local authorities are still be able to set higher energy efficiency standards than the national ones.

2.4.3 National Planning Policy Framework – NPPF (2012)

The NPPF sets out the key national planning priorities for England. It cites the Climate Change Act 2008 as a relevant consideration in decision-making and Paragraph 17 states that planning should '*support the transition to a low carbon future in a changing climate*'. The objective of reducing carbon dioxide emissions by 80% by 2050 is therefore relevant to the discharge of the duty on planning authorities to shape policy that reduces carbon dioxide emissions.

LPAs should therefore have a clear grasp of their carbon profile, and their policy should support '*radical reductions*' in carbon dioxide emissions.

2.4.4 TCPA report – Planning for climate change? (2016)

The Town and Country Planning Association (TCPA) prepared a report in 2016 titled "*Planning for climate change*?" to assess whether the spatial planning system was dealing effectively with greenhouse gas emissions and climate change adaptation.

Its main conclusion is that '*spatial planning has the potential to make a major contribution to both reducing carbon dioxide emissions and preparing for the growing impacts of climate change but that it is failing to fulfil this potential*'. It is suggesting that LPAs are therefore failing to discharge their duty in terms of climate change mitigation and adaptation.

Key findings include the following:

- Despite increasing scientific understanding of the risks and vulnerabilities faced in the UK due to climate change, and the potential benefits of the solutions, there is still a significant gap between this understanding and actual outcomes for communities delivered through the planning process.
- The majority of LPAs do not have a target for carbon reduction in their plans.
- Local plans deal with carbon dioxide emissions reduction vaguely, often without an explicit methodology for measuring reductions.
- There is a lack of a clear link between evidence and policy outcomes, indicative of a lack of connection between the evidence used for plan preparation and the policy outcomes on climate change mitigation. Local plan policy was found to be effective where there had been a coherent join-up between the evidence used to inform policy options and the final policy outcomes.
- District heating is an area of climate change mitigation that LPAs engaged in more actively.

A stronger link between Local Plans and the recommendations of the Committee on Climate Change would be beneficial and the TCPA recommends that LPAs provide an articulation of what the NPPF currently requires in terms of '*radical reductions*' in greenhouse gas emissions, namely a clear carbon dioxide emissions reduction trajectory, in line with the emissions reductions required by the Climate Change Act 2008.

It also recommends that local authorities ensure that local plans consider climate change over the longer term, using as a minimum 25- and 50-year time horizons scenarios. This would avoid lock-in to problems from developments built now.

Finally, monitoring the outcomes of plan policy is recommended to inform the local authority's future work on climate change. This would be important for future evidence bases and help understand how policy is implemented and whether it is working or not.

2.5 London context

2.5.1 Current CO_2 emissions and carbon reduction targets

The Mayor has set a target to reduce London's carbon dioxide emissions by 60% of their 1990 level by 2025 and for London to become a zero carbon city by 2050[18]. 80% of carbon emissions are associated with London's buildings.

In 2014, London's greenhouse gas emissions were estimated at around 38 $MtCO_{2e}$ (million tonnes of carbon dioxide equivalent[19]), around 7% of the UK's total emissions. The 1990 level was 45.1 $MtCO_2$.

CO_2 emissions per capita are approximately 4.4 tCO_2/capita/yr.

2.5.2 Carbon reduction policy

London Plan (2016)

The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. It includes a number of policies in relation to climate change. The most relevant to this study are policies 5.1 and 5.2.

Policy 5.1 Climate change mitigation

Strategic: *the Mayor seeks to achieve an overall reduction in London's carbon dioxide emissions of 60 per cent (below 1990 levels) by 2025. It is expected that the GLA Group, London boroughs and other organisations will contribute to meeting this strategic reduction target, and the GLA will monitor progress towards its achievement annually.*

LDF preparation: *within LDFs boroughs should develop detailed policies and proposals that promote and are consistent with the achievement of the Mayor's strategic carbon dioxide emissions reduction target for London.*

Policy 5.2 Minimising carbon dioxide emissions

Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:
1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

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[18] London Environment Strategy – Draft for consultation, Mayor of London (2017)
[19] London Energy and Greenhouse Gas Inventory, LEGGI (2014)

Residential buildings:

Year	Improvement on 2010[20] Building Regulations
2010-2013	25% CO_2 emissions reduction
2013-2016	40% CO_2 emissions reduction
2016-2031	Zero Carbon

Non-residential buildings:

Year	Improvement on 2010[20] Building Regulations
2010-2013	25% CO_2 emissions reduction
2013-2016	40% CO_2 emissions reduction
2016-2019	As per building regulations
2019-2031	Zero Carbon

Evolution of the London Plan

The new London Plan is currently being prepared and the draft is expected to be published by the end of 2017.

London Environment Strategy – Draft for consultation (2017)

Published in August 2017, the London Environment Strategy sets out the Mayor of London's approach to address the range of environmental challenges that threaten the future of the city. It articulates what the issues are, the policy objectives to address them and sets out concrete proposals. Given its importance and relevance to the work undertaken by the London Borough of Islington on the energy evidence base, this document has been summarised in more detail than the other documents in this section.

Climate change and energy

London's greenhouse gas emissions have decreased by 16% since 1990, largely due to reduced gas consumption and decarbonisation of the national electricity grid. The Mayor will re-establish London's position as a leader in tackling climate change by setting a target for London to become zero carbon by 2050, with a zero carbon transport network and zero carbon buildings. To achieve this target, the rate of emissions reduction must be increased threefold over progress to date since 1990. Detailed proposals which are, directly or indirectly, relevant to the Islington energy evidence base, are provided below.

Mayor's proposal	Ref	Direct relevance
Contribute to helping Londoners improve the energy efficiency of their homes, where appropriate, by providing technical assistance, support and funding	6.1.1a	✓
Pilot state of the art methods to implement the stronger energy retrofitting needed	6.1.1b	✓
Improve the way energy is managed in London including supporting the roll out of smart meters and advocating time of day tariffs	6.1.1d	

[20] The targets in the London Plan are expressed against Part L 2010:
- a 25% reduction on Part L 2010 is deemed equivalent to a 19% reduction on Part L 2013
- a 40% reduction on Part L 2010 is deemed equivalent to a 35% reduction on Part L 2013

Work with partners to help alleviate fuel poverty in London through implementing the recommendations of the Fuel Poverty Action Plan	6.1.2a	✓
Tender for the delivery of an energy supply company, aiming to offer fairer energy bills to Londoners and encourage Londoners to switch and move away from pre-payment meters	6.1.2b	
Support reducing emissions and energy within the commercial sector including through improved building management, energy efficiency and reporting	6.1.3b	✓
Through the London Plan consider policies to support the delivery of zero carbon development	6.1.4a	✓
Support the design of effective methods to ensure the energy and carbon performance of new developments meet their agreed designed standards	6.1.4b	✓
Encourage the reduction of whole lifecycle building emissions (embodied carbon)	6.1.4c	
Help implement large scale decentralised and low carbon energy projects, including stimulating demand from the GLA group	6.2.1a	✓
Increase the amount of solar generation in London including through community energy projects and on GLA group buildings	6.2.1b	✓
Encourage the identification and planning of decentralised energy in priority areas	6.2.2a	✓
Investigate the potential for further smart, flexible energy system demonstrators and pilots where Londoners can help manage demand	6.2.2c	

Table 2.01 – Summary of key Mayor's proposals on climate change and energy

The London Environment Strategy stresses that, over the next two decades, dependence on natural gas must be reduced by increasing the use of low carbon heating (harnessing energy from water, ground and air using heat pumps) as well as capturing more of the heat wasted from our buildings and infrastructure and using heat networks in the densest areas of the city to distribute it to London homes and workplaces.

Demand on the electricity grid will likely increase due to the growing population and electrification of heat and transport. Smart technology will need to become an increasingly important part of managing London's energy system, helping to balance more intermittent supply of energy from renewables with more variable electricity demand from electric cars, or electric heating. Added strain on the electricity grid can partially be managed through the use of storage, such as hot water cylinders to store heat, or batteries to store electricity generated off-peak.

Air quality

The London Environment Strategy identifies air quality as the most pressing environmental threat to the future of health in London, with two pollutants remaining a specific concern: particulate matters (PM_{10}, $PM_{2.5}$ and black carbon) and nitrogen dioxide (NO_2).

The Mayor's strategic aim for 2050 is for London to have the best air quality of any major city, going beyond the requirements to protect human health and minimise inequalities. Detailed proposals which are, directly or indirectly, relevant to the Islington energy evidence base, are provided below. The proposals which have a direct relevance are highlighted.

Mayor's proposal	Ref	Direct relevance
Provide better information about air quality, especially during high and very high pollution episodes, and use emergency measures where appropriate	4.1.1a	
Do more to protect London's schoolchildren by reducing their exposure to poor air quality at school and on their journey to and from school	4.1.1b	✓
Through the London Plan, consider policies that mean new developments are suitable for use and for their particular location, taking into account local air quality	4.1.1c	
Produce and maintain the London Atmospheric Emissions Inventory (LAEI) to better understand pollution sources in London	4.1.2a	
Work with government, TfL, the London boroughs, the construction industry and other users of Non-Road Mobile Machinery (NRMM), such as event organisers, to prevent or reduce NRMM emissions	4.2.3a	
Work with industry and other partners to seek reductions in emissions from construction and demolition sites	4.2.3b	
Improve London's air quality by reducing emissions from homes and workplaces, including through energy efficiency programmes	4.2.3c	✓
Work with government to seek reductions in emissions from large scale generators producing power for commercial buildings in London	4.2.3d	✓

Table 2.02 – Summary of key Mayor's proposals on air quality

The strategy specifically refers to the fact that policy makers have focused in the past on reducing carbon emissions which has resulted in unintended consequences like encouraging the use of diesel, the promotion of biomass boilers and gas engine combined heat and power systems being installed in areas of poor air quality. Instead, the Mayor of London is now seeking to design integrated policies which deliver multiple benefits. Maximising co-benefits between air quality and climate change policies is one of his key objectives.

The Mayor will therefore consider introducing a hierarchy for energy systems in the London Plan that contributes towards improving air quality. In particular, while combined heat and power systems (CHP) can have benefits in terms of carbon emissions, gas engine CHP plant usually gives rise to higher emissions of NOx and/or PM_{10} emissions than ultra-low NOx gas boilers, even when abatement equipment is used. Therefore in preparing the London Plan, the Mayor will consider whether, in areas which exceed legal air quality limits, the policy should prevent emissions from energy production plant, including from gas-fired CHP, that would exceed those of an ultra-low NOx gas boiler. Energy production plant used in other areas should meet all relevant emission standards (which may require abatement equipment) as considered by the new London Plan, as well as not causing unacceptable local impacts on air quality. To better understand the pollution impact of existing CHP systems in London the Mayor will develop a new CHP register which will be reflected in future versions of the London Atmospheric Emissions Inventory.

The Mayor is also committed to policies that support phasing out fossil fuels. The Mayor's Energy for Londoners programme will support the transition from old inefficient gas boilers to ultra low NOx gas boilers and low carbon (and low-pollution) heating alternatives such as heat pumps. The Mayor's energy efficiency programmes, such as RE:NEW and RE:FIT, will also help to remove inefficient heating systems which contribute to poor air quality.

Other strategic aims of the London Environment Strategy

The following strategic aims of the London Environment Strategy and their associated objectives and proposals are not anticipated to have a direct impact on the work being undertaken by Islington Council on the energy evidence base.

Green infrastructure. As London grows, its parks, rivers, canals, trees and other green infrastructure will become ever more vital. The Mayor of London's aim is to ensure the health of Londoners is improved, protect the city from climate change and boost London's economic growth. His strategic aim for 2050 is for half of London's area to be green and for the tree cover to increase by 10%.

Waste. London's homes, public buildings and businesses generate around 7 million tonnes each year, with a significant proportion going to landfill and incineration, which are costly and an inefficient use of resources. The capacity of landfills accepting London's waste is expected to run out by 2026 and London's waste bill is now in in excess of £2bn a year and rising. The Mayor of London's aim is that by 2026 no biodegradable or recyclable waste will be sent to landfill and that by 2030 65% of London's municipal waste will be recycled.

Adaptation to climate change. Climate change will have an impact on London: it will make flooding more frequent and severe, threaten water resources, and increase the risk of overheating. The Mayor's strategic aim is for London to adapt to climate change and be resilient to severe weather events.

Noise. By tackling excessive noise, London can become a healthier and more pleasant place to live. The Mayor's strategic aim is to reduce the number of people adversely affected by noise.

Transition to a low carbon economy. The Mayor of London wants to build on London's strength and grow the low carbon and environmental goods and services sector.

London Zero Carbon Pathway Tool (2017)

The Greater London Authority has produced the London Zero Carbon Pathway Tool in conjunction with the draft London Environment Strategy. It brings together existing and new evidence under one tool. Data can be visualised on a detailed interactive map for energy and emissions trajectories until 2050.

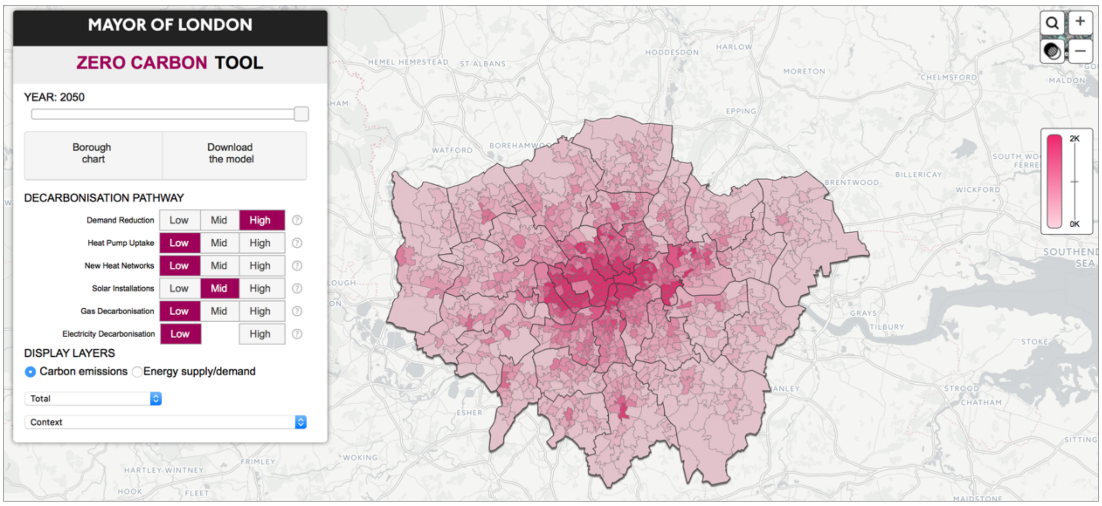

Figure 2.06 – Mayor of London's Zero Carbon Tool (Source: GLA)

The data and model underlying the map can also be used to generate a dashboard for each Local Authority. The figure below represents Islington's carbon pathway dashboard.

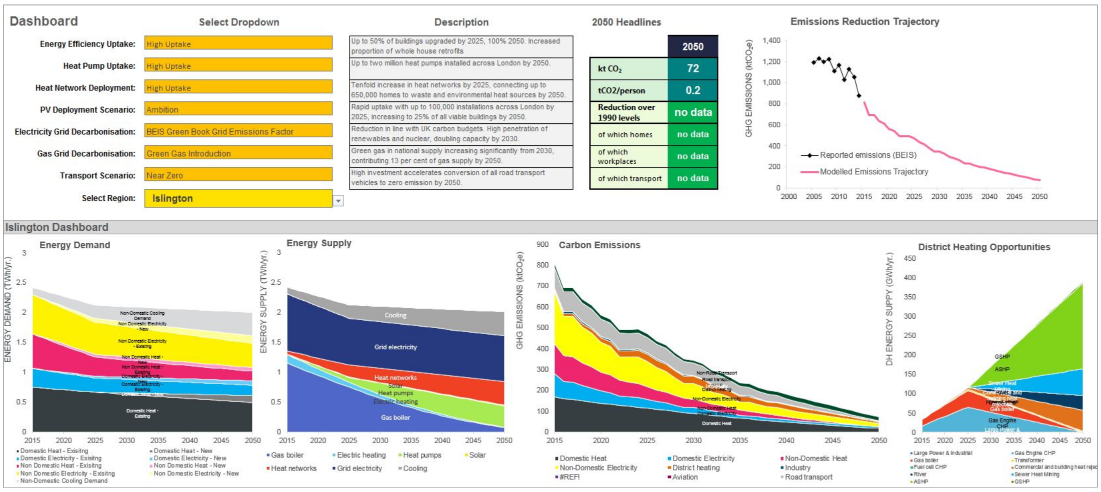

Figure 2.07 – Islington carbon pathway dashboard (Source: GLA)

Note: There is a high degree of correlation between the carbon pathway tool developed by the GLA and the work summarised in this report on the carbon pathway for Islington. This suggests that the Zero Carbon Pathway Tool developed by the GLA can be a very useful source of data and information to inform policies.

Energy guidance on preparing energy assessments (2016)

The purpose of an energy assessment submitted in support of a planning application is to demonstrate that climate change mitigation measures comply with energy related planning policies.

Residential developments

The energy guidance clarifies the requirement for new residential developments to comply with the 'zero carbon' target set in London Plan Policy 5.2B. This target was to align with the then expected introduction of 'zero carbon homes' through Part L of the Building Regulations. However, the Government announced in July 2015 that it did *'not intend to proceed with the Zero Carbon allowable solutions carbon offsetting scheme, or the proposed 2016 increase in on-site energy efficiency standards, but will keep energy efficiency standards under review'*.

The GLA have advised in this energy guidance that the London Plan zero carbon homes policy remains in place. It indicates that:

"Zero carbon was tested through the needs and viability assessment for the original alteration and the assessment indicated that the standards would not compromise housing viability."

According to the GLA's definition, 'zero carbon' homes are homes forming part of major development applications where the residential element of the application achieves at least a 35% reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100%, are to be off-set through a cash in lieu contribution to the relevant borough that is ring fenced to secure delivery of carbon dioxide savings elsewhere (in line with policy 5.2).

The 'zero carbon' target has been applied to Stage 1 schemes received by the Mayor since October 2016.

As far as carbon offsetting is concerned, the Mayor's Housing Standard's Viability Assessment assumed a carbon off-set price of £60 per tonne of carbon dioxide for a period of 30 years. The guidance states that:

"*Where the borough applies a carbon dioxide off-set price of £60 per tonne, it is not considered necessary for boroughs to carry out a further viability assessment of the policy approach.*"

Non-residential developments

The energy guidance confirms that the London Plan policy setting out the Building Regulations target for non-residential development (35% reduction against Part L 2013) remains in place. However, it highlights that a needs assessment and feasibility and viability study tested a 50% CO_2 reduction target for non-domestic development (beyond Part L 2013) and showed that for a number of non-residential development types a 50% carbon reduction target (beyond Part L 2013) would be technically feasible. The study also found that for most locations a 50% target would be financially viable.

The zero carbon requirement for new non-residential applications will apply from 2019.

C40 cities: Deadline 2020

C40 cities, a group representing ninety of the world's leading megacities (including London) has published a research report in 2016 ('*Deadline 2020*') into how to turn the Paris Agreement's aspiration into action. It concludes that C40 cities must undertake an unprecedented increase in the pace and scale of climate action, doing 125% more than they have in the last decade by 2020 to get on the right track to mitigate and adapt to climate change. Current efforts are not enough and stronger actions needs to be taken.

The name of the report 'Deadline 2020' highlights the overriding and deeply significant finding of the underlying work undertaken: cities should be on the right track by 2020 if they are to deliver their part of the ambition of the Paris Agreement. The report states that a zero-emissions 2050 is incompatible with the continued unabated combustion of fossil fuels. It also emphasises the carbon saving programmes likely to deliver significant emissions reductions by 2030. The top programmes by impact are:

- Commercial building retrofit (financial support and incentives);
- Residential building retrofit (financial support and incentives);
- Building data reporting and disclosure (financial support and incentives);
- Building energy codes/standards for new and existing buildings;
- Public building retrofits.

2.6 The London Borough of Islington key climate change mitigation objectives

The London Borough of Islington's current energy policy seeks to '*minimise Islington's contribution to climate change and ensure that the borough develops in a way which respects environmental limits and improves quality of life*'. Discussions with key London Borough of Islington planning officers during the development of this evidence base have identified the following key planning policy objectives to ensure that by 2020 Islington is on the right trajectory to meet its 2050 carbon emission reduction targets.

2.6.1 Key objectives

Reducing energy demand

There is a consensus that reducing energy demand (both for new buildings and refurbishments) significantly beyond the current policy requirements is necessary. Fabric energy efficiency in particular must improve in order to reduce heat demand, whilst the impact on energy bills particularly for the most vulnerable is a critical consideration.

Decarbonise heat

Fossil fuel based heating will gradually be replaced in Islington by low/zero carbon heat networks, potential re-purposing of the gas grid and electricity-based solutions (e.g. heat pumps).

Decarbonise electricity

Although most of the grid decarbonisation will happen at the national level, local generation of zero carbon electricity has an important role to play in Islington.

Energy resilience

Developing solutions should form part of a vision to 2050 for resilient energy and infrastructure in Islington.

2.6.2 Key considerations

Beyond the key climate change mitigation policy objectives above, the following considerations are critical.

Ensure the delivery of low/zero energy buildings

There is currently a significant gap between the design performance controlled by planning and the actual 'as built' performance. The performance gap is an issue affecting all stages: design, construction, commissioning, handover and operation. Eliminating this gap is necessary to deliver Islington's carbon targets.

Enable a gradual increase in standards over time to achieve zero carbon buildings by 2050

Islington's approach to climate change mitigation should facilitate the gradual tightening of standards during the period 2019-2034 (e.g. 2019-2024, 2024-2029, 2029-2034)[21]. It should also set the London Borough of Islington on the right trajectory, enabling CO_2 emissions to be further reduced between 2034 and 2050.

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[21] The standards could be associated with 5-year carbon budgets, similar to those adopted at national level.

Facilitate reporting against Islington's 2034 and 2050 carbon targets

Defining a carbon trajectory and objective is necessary for the London Borough of Islington to develop their roadmap. Reporting progress and the efficiency of the policies is equally critical.

Mitigate fuel poverty and ensure affordable heat

The transition to a lower carbon Islington must not happen at the expense of residents and people working in Islington, particularly the most vulnerable.

Collaboration and skills for a low carbon economy

Collaboration is key to achieving these ambitions, and the London Borough of Islington stands ready to work with the GLA, other local authorities, professionals and civil society to deliver the ambition and, more generally, to continue to develop the growing low carbon economy, skills and jobs.

3.0

ASSESSMENT OF CURRENT POLICY AND GUIDANCE

3.0 ASSESSMENT OF CURRENT POLICY AND GUIDANCE

The London Borough of Islington is in the process of reviewing its Local Plan as it plans for the future of infrastructure in the borough. The new Local Plan will cover the period 2019-2034. An important part of this process is to consider whether planning policy and guidance need to change to meet the borough's obligation to mitigate climate change. The purpose of this section is to summarise the current climate change mitigation policies and their effectiveness, outlining Islington's carbon pathway to 2034 and 2050.

3.1 Current climate change mitigation policy and guidance

3.1.1 Core strategy (2011)

Islington's Core Strategy sets out detailed planning policies for the borough which the Council uses to assess planning applications. It is the primary and strategic Development Plan Document. The most relevant policy in terms of climate change mitigation is Core Strategy Policy CS10 – Sustainable Design.

CS10 covers many aspects of sustainability (CO_2 emissions reduction, energy efficiency, sustainability building standards, best practice water efficiency, climate change adaption, ecology, environmental impact, sustainable transport). The key requirements associated with climate change mitigation are summarised in the table below.

Reference	Key requirement	Policy (P) or Guidance (G)
CS 10-A	On-site reduction in CO_2 emissions (regulated and unregulated) of at least 40% in comparison with Part L 2006	P
CS 10-A	All remaining CO_2 emissions (to Zero Carbon) to be offset to fund CO_2 reductions in the existing building stock	P
CS 10-A	Promote and develop decentralised energy (DE) networks	P
CS 10-A	Highest feasible level of nationally recognised sustainable building standard (e.g. BREEAM, CSH)	P
CS 10-E	Demonstration that development is designed to be adapted to climate change (e.g. overheating, flood risk)	P
CS (3.2.7)	London Plan target of 20% CO_2 reduction through on-site renewable generation (4A.7) where possible	G
CS (3.2.8)	Clear implementation and monitoring of CO_2 reductions	G

Table 3.01 – Summary of key Core Strategy requirements in terms of climate change mitigation

3.1.2 Environmental Design Planning Guidance (2012)

The Environmental Design Planning Guidance is a supplementary planning document (SPD) and does not create new policy, but provides detailed guidance on how Islington's planning policies relating to sustainable design are applied to different types of development.

The document includes recommendations to applicants in order to minimise energy demand and carbon emissions, deliver high sustainable buildings standards (e.g. BREEAM), minimise water consumption, protect and enhance biodiversity and facilitate access to nature, adapt to climate change (SUDS and overheating), incorporate sustainable materials, reduce the environmental impact of construction and operate sustainably.

This document also includes specific requirements associated with fabric energy efficiency.

Reference	Key requirement	Policy (P) or Guidance (G)
SPD-T2.1	Minimum energy efficiency standards	G

Table 3.02 – Summary of specific environmental design SPD requirements in terms of climate change mitigation

3.1.3 Local Plan Development Management Policies (2013)

The Development Management Policies form part of Islington's Local Plan. They add detail to, and complement, the spatial and strategic policies in the Core Strategy.

Policies cover sustainable design and construction, energy efficiency and carbon reduction, sustainable design standards, heating and cooling, walking and cycling. The key requirements associated with climate change mitigation are summarised in the table below.

Reference	Key requirement	Policy (P) or Guidance (G)
DM7.1-A	Requirement to integrate best practice sustainable design standards during design, construction and operation	P
DM7.1-B	Renewable energy technologies supported	P
DM7.1-C	Preparation of an Energy Statement	P
DM7.1-E	Preparation of a Green Performance Plan (GPP) detailing measurable outputs for the occupied building (e.g. energy consumption, CO_2)	P
DM7.1-F	Access to the development and submission of information to the Council when requested	P
DM7.2-A	Best practice energy efficiency standards are required	P
DM7.2-B	Minor new build residential development to achieve a 25% improvement over Part L 2010	P

DM7.2-C	All remaining CO_2 emissions to be offset through a Section 106 legal agreement	P
DM7.2-D	Householders to be encouraged to apply cost-effective energy efficient measures to their property	P
DM7.3-A	All major developments to be designed to be able to connect to a Decentralised Energy Network (DEN)	P
DM7.3-A	Minor new build development to be designed to connect to a DEN wherever reasonably possible	P
DM7.3-B	Major developments within 500m and minor developments within 100m of an existing DEN to connect to that network	P
DM7.3-C	Major developments within 500m of a planned DEN to connect to that network in the future	P
DM7.3-D	Where connection is not possible, major developments should develop and/or connect to a Shared Heating Network (SHN)	P
DM7.3-E	Where connection to an existing or future DEN is not deemed possible, alternative strategy to be proposed	P
DM7.4-A	Major new build residential developments to achieve Code Level 5 from 2016	P
DM7.4-A	Minor new build residential developments to achieve Code Level 4	P
DM7.4-D	Major non-residential developments to achieve BREEAM Excellent and make reasonable endeavours to achieve Outstanding	P
DM7.5-A	Heating and cooling priority: 1) Passive design 2) Natural ventilation 3) Local mechanical ventilation/cooling 4) Full mechanical ventilation/cooling	G

Table 3.03 – Summary of key Development Management Policies requirements in terms of climate change mitigation

3.2 Assessment of current policy and guidance

The current policy and guidance requirements were assessed using two approaches. The first one was based on a methodical assessment of the effectiveness of each requirement against the London Borough of Islington's four key policy objectives and five associated considerations.

Key policy objectives				Important policy considerations				
Reduce energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy

Table 3.04 – Summary of key climate change mitigation policy objectives and considerations for the London Borough of Islington

Each policy requirement's effectiveness at delivering the key policy objectives and enabling compliance with the important policy consideration was assessed using the following ranking system.

Effectiveness at delivering key policy objective

X	-	●	● ●	● ● ●
Potential negative effect	Neutral	Low	Medium	High

Effectiveness at enabling compliance with policy consideration

X	-	○	○ ○	○ ○ ○
Potential negative effect	Neutral	Low	Medium	High

Overall assessment of effectiveness

The ranking for each requirement was associated with a score and all scores were added to provide an overall assessment of the effectiveness of current policy and guidance as a whole at delivering Islington's policy objective and at enabling compliance with the Council's important policy considerations.

Not effective → Effective

Please refer to Appendix C for the detailed assessment matrix (reproduced below as an image).

Project number: 20170145
Project name: Islington energy evidence base
Document: Assessment of current policy/guidance against key objectives and important considerations
Revision: C
Date: 21/07/2017

KEY
• / • • Scale of effectiveness to meet key policy objective
o / o o Scale of effectiveness to address key policy consideration
X Potential negative effect

Etude

				Key policy objectives				Important policy considerations					Other
Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy	Additional comments
CS 10-A	On-site reduction in CO_2 emissions (regulated and unregulated) of at least 40% in comparison with Part L 2006	P		•	•	•	-	-	-	-	-	-	No specific target/requirement against each policy objective. Part L limitations.
CS 10-A	Promote and develop decentralised energy (DE) networks	P		-	•	-	• •	-	o o	-	o	-	Long-term infrastructure required for decarbonised heat but not sufficient in itself. It needs to be supported by a 'low carbon heat generation vision'.
CS 10-A	All remaining CO_2 emissions to be offset to fund CO_2 reductions in the existing building stock	P		•	-	-	•	-	-	-	o	o	Useful source of revenues to improve energy efficiency and mitigate fuel poverty in existing buildings.
CS 10-A	Highest feasible level of nationally recognised sustainable building standard (e.g. BREEAM, CSH)	P		•	•	•	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
CS 10-E	Demonstration that development is designed to be adapted to climate change (e.g. overheating, flood risk)	P		-	-	-	•	-	-	-	-	o	Adaptation to climate change an important consideration.
CS (3.2.7)	London Plan target of 20% CO_2 reduction through on-site renewable generation (4A.7) where possible	G			•	•	•	-	-	-		-	This element of guidance tends not to be applied in favour of overall carbon reduction policies.
CS (3.2.8)	Clear implementation and monitoring of CO_2 reductions	G		-	-	-	-	-	-	o	-	-	Useful intent to check the implementation and monitoring of CO_2 emissions
DM7.1-A	Requirement to integrate best practice sustainable design standards during design, construction and operation	P		•	-	-	-	o	-	-	-	-	Useful intent but no specific 'design standards' referred to.
DM7.1-B	Renewable energy technologies supported	P		-	•	•	-	-	-	-	-	o	General support but no specific target.
DM7.1-C	Preparation of an Energy Statement	P		•	•	•	-	o	-	-	-	-	Encourages the applicant to report specifically against three of the policy objectives.
DM7.1-E	Preparation of a Green Performance Plan (GPP) detailing measurable outputs for the occupied building (e.g. energy consumption, CO_2)	P		•	-	-	•	o o	-	-	o	o o	The GPP as it stands would not directly address the policy objectives but it is a very important tool to address other important policy considerations.
DM7.1-F	Access to the development and submission of information to the council when requested	P		-	-	-	-	o	-	o	-	o o	Useful intent to check the implementation and monitoring of CO_2 emissions
DM7.2-A	Best practice energy efficiency standards are required	P		•	-	-	•	-	-	-	o	-	Useful intent but the 'best practice energy efficiency standards' are not set out.
DM7.2-B	Minor new build residential developmet to achieve a 25% improvement over Part L 2010	P		•	•	•	-	o	-	-	-	-	No specific target/requirement against each policy objective. Part L limitations.
DM7.2-C	All remaining CO_2 emissions to be offset through a Section 106 legal agreement	P		•	-	-	-	-	-	-	o	-	Useful source of revenues to improve energy efficiency and mitigate fuel poverty in existing buildings.
DM7.2-D	Householders to be encouraged to apply cost-effective energy efficient measures to their property	P		•	-	-	-	-	-	-	-	-	Useful intent but no specific requirement.
DM7.3-A	All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN)	P		-	• •	-	• •	-	o o	-	-	-	Enables long-term infrastucture required for decarbonised heat to be developed over time.
DM7.3-A	Minor new build development to be designed to connect to a DEN wherever reasonably possible	P		-	•	-	•	-	-	-	-	-	This policy could have a negative impact on carbon emissions in cases of low density developments.
DM7.3-B	Major developments within 500m and minor developments within 100m of an existing DEN to connect to that network	P		-	•	-	• •	-	o	-	-	-	Enables (indirectly) existing infrastucture to be improved and decarbonised. The long term performance of the existing network is crucial.
DM7.3-C	Major developments within 500m of a planned DEN to connect to that network in the future	P		-	• •	-	• •	-	o	-	-	-	Enables long-term infrastucture required for decarbonised heat to be developed over time.
DM7.3-D	Where connection is not possible, major developments should develop and/or connect to a Shared Heating Network (SHN)	P		-	X	-	-	-	-	-	-	-	This policy could have a negative impact on carbon emissions if the SHN development is not accompanied by a vision for low carbon generation.
DM7.3-E	Where connection to an existing or future DEN is not deemed possible, alternative strategy to be proposed	P		-	•	-	-	-	-	-	-	-	Encourages the applicant to consider an alternative low carbon strategy.
DM7.4-A	Major new build residential developments to achieve Code Level 5 from 2016	P											The Code for Sustainable Homes has been technically withdrawn and cannot be required anymore on new applications.
DM7.4-A	Minor new build residential developments to achieve Code Level 4	P											See above.
DM7.4-D	Major non-residential developments to achieve BREEAM Excellent and make reasonable endeavours to achieve Outstanding	P		•	•	•	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
DM7.5-A	Heating and cooling priority: 1) Passive design 2) Natural ventilation 3) Local mechanical ventilation/cooling 4) Full mechanical ventilation/cooling	G		X	-	-	-	-	-	-	-	-	In many cases, mechanical ventilation with heat recovery is more energy efficient (and better for air quality) than natural ventilation.
SPD-T2.1	Minimum energy efficiency standards	G		•	-	-	-	-	-	-	-	-	Table 2.1 does not reflect current best practice. A 'best practice' column could be aded.
	OVERALL ASSESSMENT			12	14	7	13	6	6	2	5	7	Current policy should be reviewed. Key areas where requirements need to be set out include energy efficiency and fuel poverty/affordabiliy of energy. In addition, policy should address important policy considerations in order for the Council to be on the right trajectory for 2050.

Table 3.05 – Detailed assessment of effectiveness of current policy and guidance *– please refer to Appendix C for A3 version*

The assessment of the overall effectiveness of current policy and guidance led to the following conclusion:

Key policy objectives								
Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience					

Table 3.06 – Summary of effectiveness of current policy and guidance

The second approach to assessing current policy requirements and guidance was to consider their impact on the London Borough of Islington's carbon pathway to 2050.

3.3 The London Borough of Islington carbon pathway from 1990 to 2050

The aim of climate change mitigation policy is to enable the achievement carbon emission targets. To this end, the projected carbon emissions in the London Borough of Islington have been estimated to assess the impact and effectiveness of current policy, and the potential need for additional policy. This has been compared to estimates of carbon emission savings required in the borough that have been approximated from national and London-wide targets for reduction in building emissions.

It is important to note that this is a high level assessment and that the methodology for estimating and forecasting local authority carbon emissions for this purpose is neither established nor widely used. In this context, the conclusions of this analysis should therefore be considered as indicative.

3.3.1 The London Borough of Islington's overall carbon emission target

The national government has not set out how the required national carbon emission reductions are to be shared between local authorities. A per capita measure can be used to compare areas, but it should also be recognised that the opportunity for reduction is very different in various parts of the country. As a dynamic and economically attractive area, the London Borough of Islington has a lower barrier to improvement compared to other UK local authorities. It is therefore assumed that the national targets will apply in full to the London Borough of Islington.

In practice, it may be that more modest absolute improvements are required because of the economic and population growth in the area, or that more onerous targets are set to compensate for other local authorities with less potential for change. In either case the analysis is useful to put policy into context.

The targets are estimated based on the Committee on Climate Change 'Meeting Carbon Budgets - 2016 Progress report to Parliament'. For 2030 the percentage reduction over 2015 emissions quoted in Table 1.3 of the CCC report are used. For buildings, this includes a 13% reduction from building energy consumption, and a 35% reduction in the carbon content of grid electricity.

Buildings in the London Borough of Islington are the largest opportunity for carbon savings. They are therefore likely to have to achieve a significantly greater reduction in carbon emissions in order for the UK as a whole to meet its reduction target of 80%. For this reason, and based on the Mayor of London's objective for all buildings to be zero carbon by 2050, a notional target of net zero carbon emissions has been assumed for buildings in Islington in 2050.

3.3.2 Breakdown of carbon emissions

Historical data from DECC (now BEIS) provides a breakdown of carbon emissions by local authority. This uses meter readings for gas and electricity and is the actual consumption over time including all uses. Reliable and detailed data is available from 2005 to the latest reported year 2015[22].

Figure 3.01 below shows the estimated carbon emissions in the London Borough of Islington broken down by use. Emissions relating to buildings or building systems/processes consistently represent over 80% of all carbon emissions in the borough. Please note that this includes emissions associated with electricity used in buildings.

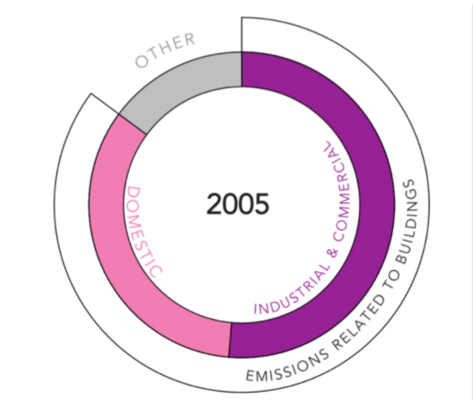

Figure 3.01 – Breakdown of CO_2 emissions from the London Borough of Islington by use for 2005 and 2015.

This large contribution to emissions in the borough makes policy influencing building and construction crucially important to meeting commitments to mitigate climate change.

3.3.3 Buildings' CO_2 emissions: pathway and scale of the challenge

The commitments made at a national level and at a local level are against a baseline year of 1990, and have a horizon of 2050. Looking at the likely change over this timescale allows the changes implemented for the policy period in Islington to be seen in relation to the long-term aim.

In addition, Islington's Local Plan is likely to be adopted in 2019 and will consider the following 15 years (period covering 2015-2034). In order to consider this timeframe, a horizon of 2030 has also been set. The 2030 and 2050 targets have therefore been added on the carbon pathway.
Figure 3.02 brings together several sources to show the approximate change in CO_2 emissions from buildings in Islington over this period, and to allow comparisons with the targets for 2030 and 2050. For historic emissions between 2005 and 2015 reliable information and breakdown for Islington are taken directly from DECC data. Emissions before this are estimated based on portioning a quoted figure for all London emissions in 1990 of 45,100,000 tCO_2e by the 3-year average share of emissions

[22] DECC UK Local authority and regional CO_2 emissions data 2005-2015 (June 2016)

in Islington and of each building types in 2005. Projected emissions are calculated by approximating the electricity and gas consumption per building based on current emissions, and then estimating the change based on:

- **Projected growth in the borough and the proportion of existing buildings replaced**. This is calculated for residential buildings and then extrapolated to the non-domestic building stock based on the historic relationship;
- The **improvement in performance of new and refurbished buildings**. Initially assuming that there is no change in Part L of the building regulations and that planning policy is kept as it is now;
- The **change in carbon factor of the electricity grid**. From National Grid Future Energy Scenarios, "Slow progression" scenario.

A full list of assumptions used in this calculation is available in the Appendix D.

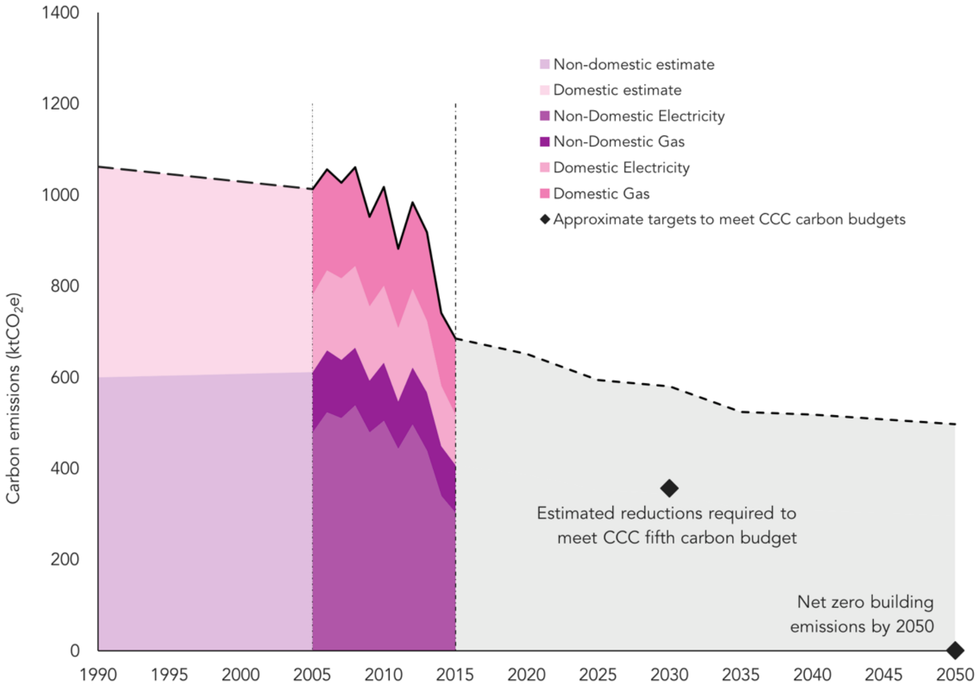

Figure 3.02 – Estimated total carbon emissions due to buildings 1990-2050 in the London Borough of Islington showing the historic split between residential and non-residential buildings

A review of past and current emissions leads to positive conclusions: carbon emissions associated in buildings in the London Borough of Islington have reduced by 35% compared with 1990 and by 32% compared with 2005[23]. The reduction is even higher on a per capita basis given population growth in Islington.

However, carbon reductions fall well short of the targets in 2030 and 2050. The majority of reductions are due to the decarbonisation of the electricity grid. To show this the carbon content of the electricity grid reduction has been plotted on a second scale with a grey dotted line. The decarbonisation of the grid is not enough.

[23] The national average over that same period is 27%.

In a 'business as usual' scenario, the reduction due to grid carbon content will be offset though by a significant growth in population and workforce in the borough. Detailed projections for this growth at a residential level are shown in the next section. This effect can be seen from past emissions as well; although reductions since 1990 are an estimate, they indicate that net emissions have been decreasing at a slower rate than reductions in grid carbon.

The baseline carbon pathway clearly shows that the current policy direction is not sufficient to reduce carbon emissions significantly whilst maintaining growth in the borough.

A higher resolution analysis is required however to allow policy decisions and impact to be tested.

Across the range of building uses in the borough a detailed breakdown is only available for residential buildings and planning category B-use commercial space. A reliable breakdown of carbon emissions has only been provided by DECC between residential and industrial/commercial, and the fraction of industrial/commercial buildings made up of B-use buildings is unknown. This makes further analysis only possible for the residential portion of the building stock.

The relationship between domestic and non-domestic building emissions is shown by past data to be relatively constant. Based on this it is reasonable to draw conclusions about the effectiveness of policy based purely on residential buildings, and assume that non-residential buildings will undergo a similar effect. Further, recent changes in national policy have had a disproportionate effect on residential buildings. The potential for residential buildings is therefore likely to be a conservative estimate of the potential for improvements on the whole.

3.3.4 Assessment of the effectiveness of current policy on residential buildings

Number of dwellings

Islington is a growing borough with a population which has increased by around 12,000 people in the last five years. Housing provision is an important issue and detailed historic data and projections on future households for each borough are available from the GLA.

The number of households is a useful metric for estimating carbon emissions as they can be taken to represent one occupied dwelling. By making assumptions on the makeup of these households and the properties they live in, the effect of various policies to change the housing stock can be tested. This is a good complementary approach to testing with energy modelling on a per building basis, as it is based wholly on actual emissions and future projections can therefore be calibrated to account for how buildings are actually used, and all emissions.

Figure 3.03 shows the total number of households based on the GLA data, and the assumed evolution of the building stock over this time. The total number of buildings is broken down between:

- **New buildings** provided in addition to the existing stock;
- **New buildings replacing the existing stock**;
- **Retrofits or refurbishment** of the existing stock;
- **Existing buildings that will have no efficiency improvements**. In this chapter, 'existing dwellings' refer to buildings used as dwellings in 2017.

The projection below is based on several assumptions. The sensitivity to these assumptions has been tested and where no evidence was available a value that aims to be more optimistic in terms of the carbon emission reductions possible based on current policy has been chosen. This is to make sure that the analysis can clearly inform the development of new policy requirements.

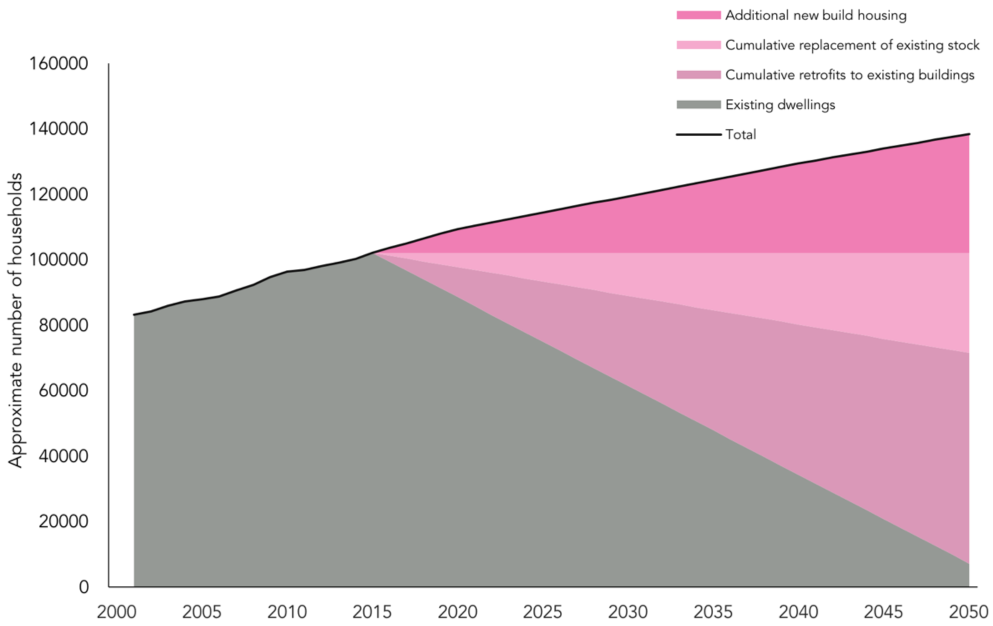

Figure 3.03 – Total number of residential households in Islington showing past data up to 2015 and projections by GLA to 2040 [24]***. Values from 2040 to 2050 are extrapolated following a similar profile.***

Key assumptions are described below.

All additional households are assumed to occupy a new dwelling. This represents the most optimistic representation of energy use per household as new dwellings are more energy efficient. This is not necessarily the case as dwellings unoccupied in 2017 could come back to use, however over time a proportion of these will be refurbished or replaced. The proportion of other buildings in the total stock is assumed to change linearly to an overall proportion of building stock in 2050.

A proportion of existing dwellings will be replaced by new dwellings. In 2050 it is assumed that 30% of current existing buildings will have been replaced. This is higher than nationally quoted figures but is possible given the urban context.

The vast majority of existing dwellings will have some form of refurbishment. This appears a reasonable assumption given the length of the time frame analysed. Some will consider energy efficiency improvements as part of this. It is estimated that only listed buildings and some very slow adopters (homeowners only) will remain unimproved in 2050. It is assumed that 90% of the remaining existing building stock will undergo a refurbishment, and of that half of these will carry out some meaningful energy efficiency measures. This is in line with current CCC projections that assume a 17% improvement in existing building efficiency before 2030. Meeting this target and continuing at the same rate of improvement gives over 90% of all buildings being refurbished before 2050.

[24] GLA London Borough Atlas – retrieved 27/06/2017 from London Data Store.

Energy consumption of dwellings

The carbon content of grid electricity and various heating systems will vary over time. To separate out this effect from improvements to the buildings themselves the energy performance of each household has been calculated based on average dwelling types. This is a simplification but can be calibrated against past energy consumption for gas and electricity, and average dwelling performance from previous studies.

Two dwelling types have been used to represent an average flat and an average house. This is to allow comparison with national averages for consumption as the breakdown of house types in Islington is very different to the national average. 85% of dwellings in Islington are flats compared to only 17% on average nationally.

The three-year rolling averages for energy consumption in buildings in Islington between 2005 and 2015 ranged:

- between 7,375kWh and 10,913kWh per household for gas
- between 3,500kWh and 3,675kWh per household for electricity.

There is far higher variation in gas consumption and generally this can be linked to average annual temperatures, building fabric efficiency and type of heating. From this we have inferred that historic gas use is a strong indicator for the heating energy required for dwellings.

Taking the heating energy per household and using average consumption figures from different types of dwelling[25] an average household size of 60m^2 for flats and 100m^2 for houses in the borough has been estimated. This allows benchmarks for specific annual heating demand (such as the Passivhaus standard) to be used. For comparison this results in a current specific annual heating consumption of approximately 100 kWh/m^2 for flats and 150 kWh/m^2 for houses and an average equivalent gas consumption per household of 7,350 kWh/household – at the lower end of the range from historic data.

There are currently no mandatory requirements for absolute reductions in energy use, however there is a slow downward trend following consistent improvement to Part L of the Building Regulations. As a baseline an average new build specific heating demand of 50 kWh/m^2/yr has been used.

For refurbishments there are a wide range of energy efficiency improvements possible, with some dwellings achieving Passivhaus levels of performance, and others just replacing windows or increasing loft insulation. To represent this an average improvement over the current performance and the proportion of buildings that will have achieved this by 2050 has been used. Based on work by the AECB[26] there are generally significant barriers to achieving a specific annual heating demand of lower than 40kWh/m^2/yr in existing dwellings without considerable short term disruption. There are currently no significant policy or market incentives for refurbishments to consider energy efficiency, for this reason an initial value of 80kWh/m^2/yr has been used as an optimistic assumption.

[25] UK housing factfile (2013), Typical consumption figures – Ofgem (2011), Energy use in homes - BRE (2001)

[26] Association for Environment Conscious Building

Carbon content of energy

The carbon content of electricity is discussed in a separate section and is broadly outside of the control of the Local Authority. In this analysis the National Grid "Slow progression" scenario is included with the baseline assessment. For clarity the impact is shown above the baseline profile to illustrate the potential impact of future reductions in the grid carbon content not happening.

The carbon content of heat can be more directly influenced by planning policy. The current carbon content of heat is based on it being generated from gas. A value of 250 gCO_2/kWh (equivalent to an efficient individual gas boiler) is used accounting for generation/distribution efficiency.

In the future the carbon content of heat is expected to reduce due to:

- the reduction of the carbon content of electricity affecting installations using direct electric heating;
- an increase in heat pump installations, both individual and communal/larger systems;
- an increase in the provision of low carbon heat sources connected to district heating networks;
- potential changes to the mix of gas in the gas grid.

The exact contribution of these factors is unknown, but the carbon content can be estimated for a number of different scenarios. As a baseline a conservative heat carbon emissions factor of 200 gCO_2/kWh in 2050 has been used with slow adoption assumed, an increasing departure from gas heating occurs from 2030 based on the market.

Projected carbon emissions based on current policy

Figure 3.04 brings all these assumptions together to show a projection of residential carbon emissions in Islington. The contribution of each of the changes introduced in the calculations has been shown in a stacked area graph, with the total likely emissions represented by the dotted block line. The area hatched in red is the gap between the trajectory of the current policy and market conditions, and that required to be on the right track to achieve zero carbon by 2050.

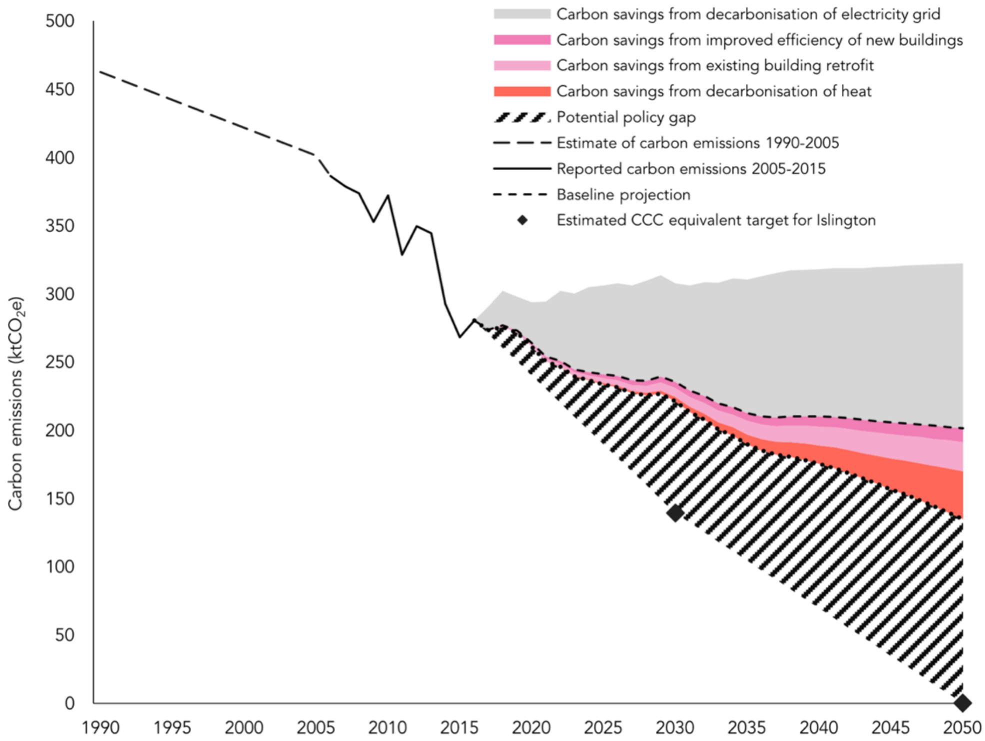

Figure 3.04 – Estimated carbon emissions from dwellings 1990-2050 in the London Borough of Islington showing the projected impact of existing policy from 2015.

This presentation 'style' is similar to that used by the Committee on Climate Change at a national level and clearly shows the range of potential change in emissions from the current position. The final reductions over 1990 levels are 58% reduction by 2034 and 71% reduction by 2050. These carbon emission reductions fall well short of those required in Islington over the period.

3.3.5 Conclusion

This section, and in particular the detailed assessment of current policy and guidance against the London Borough of Islington key objectives and their estimated impact on Islington's projected carbon pathway highlight the need for complementary new policy and guidance. Particular efforts are required to:

- Further reduce energy demand from 2019 and even further afterwards;
- Decarbonise heat, while mitigating fuel poverty and ensuring heat is affordable;
- Contribute to the decarbonisation of electricity;
- Ensure that low/zero carbon buildings deliver their carbon emissions targets;
- Enable reporting against carbon targets.

4.0

POTENTIAL IMPROVEMENTS AND INITIAL RECOMMENDATIONS

4.0 POTENTIAL IMPROVEMENTS AND INITIAL RECOMMENDATIONS

Section 3.0 demonstrates that the current policy and guidance is not sufficient to meet all of Islington's key objectives and achieve sufficient CO_2 emission reductions for buildings in the borough. This section outlines a number of initial recommendations, structured by themes, in order to form, along with current policy and guidance, a more comprehensive and effective climate change mitigation strategy. These initial recommendations have been developed through a collaboration between the London Borough of Islington and Etude. It should however be noted that they do not represent approved policy and guidance. At this stage, they are meant to inform the Local Plan review and inform the development of the London Borough of Islington's future policy and guidance for the period 2019-2034, along with other documents such as the London Borough of Islington's energy strategy, which is currently being revised.

4.1 Fuel poverty and affordability of energy

According to the sub-regional fuel poverty statistics, 11.1% of households in Islington (i.e. 10,440 households out of a total of 93,991) are fuel poor[27]. Fuel poverty is a very important issue and it is caused by a combination of low income, poor energy efficiency and/or high energy prices. However, it is not currently directly addressed by energy planning policies in the UK. Islington's future energy policy could seek to improve this situation.

Fuel poverty in England is measured using the Low Income High Costs (LIHC) indicator. Under this indicator, a household is considered to be fuel poor if they have required fuel costs that are above average and, if they were to spend that amount, if they would be left with a residual income below the official poverty line.

The main drivers of fuel poverty are the household income, its energy requirements and the energy prices. A number of mechanisms seek to alleviate fuel poverty through requirements on utility companies or financial assistance (e.g. warm home discount). The considerations below explore what could be done with the buildings themselves and therefore through the planning system.

Energy efficiency requirements for refurbishments

One of the national fuel poverty reduction objectives is to ensure that as many fuel poor homes as possible achieve a minimum Fuel Poverty Energy Efficiency Rating[28] (FPEER) of band C by 2030. The FPEER is to be used only for the housing survey data but applicants for any application (minor or major) involving existing residential buildings could be required to estimate the energy efficiency rating of the post-refurbishment dwellings and demonstrate that it is C or better. This would ensure that risks of fuel poverty due to poor energy efficiency are being addressed.

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[27] *Please note that the numbers given above are only indicative: the London Borough of Islington officially rejects the Low Income High Cost (LIHC) definition of fuel poverty which is used in England due to a methodological bias against smaller homes (of which there are many in Islington) and higher cost of living in London. The London Borough of Islington favours the 10% indicator which is used by other London boroughs.*

[28] *As defined in Fuel Poverty Energy Efficiency Rating Methodology, DECC (2014) and based on SAP. The rating is translated in a way that is analogous to a SAP rating being used to generate an overall energy efficiency band (again from G to A) for Energy Performance Certificates.*

Recommendation TN01-1 Require applicants for domestic refurbishment projects to demonstrate that dwellings post refurbishments will achieve an EPC of C or better.

Energy prices for all dwellings (refurbishments and new build)

Poor energy efficiency is less of a risk in new buildings and other planning requirements should encourage better energy efficiency for those buildings. A risk in terms of fuel poverty which is not currently managed lies with energy prices with examples including residents supplied with a privately-owned low efficiency and expensive communal heating system (with no alternative or possibility to switch supplier) or an expensive to maintain individual heating system (e.g. complex heat pump).

Historically, carbon has been considered as the exclusive proxy for energy efficiency but some systems could be low carbon and lead to high energy bills (e.g. direct electric heating). It is therefore important that the consequences of energy supply decisions at the planning stage are assessed not only in terms of carbon efficiency but also likely energy supply prices. Applicants could be required to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of their proposed heating system. Applicants for major applications could be required to consider life cycle costs of the heating system using CIBSE quoted plant lifetimes.

Recommendation TN01-2 Require applicants to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of the proposed heating system. Require major applications to estimate life cycle costs of the proposed heating system.

Assessing likely annual energy expenditure at planning stage

The likely annual energy bill for a new or refurbished home is not assessed at planning stage. Although it is a complex subject, there could be merit in requiring applicants to predict it and for it to influence design decisions. This would be particularly useful for Council-led schemes and affordable housing units.

In the first instance, it would be difficult to set a quantitative requirement (e.g. maximum annual energy bill) and applicants are likely to be reluctant to commit to a precise figure, which is understandable. However, there are ways to make it relatively easy for applicants to communicate this information and, more importantly, for it to inform design decisions positively by putting the spotlight on the potential consequences for the most vulnerable residents.

Recommendation TN01-3 Develop a simple set of specific information which applicants will be required to provide in order for them to estimate future energy bills.

Funding energy efficiency improvements through carbon offsetting

More than 85% of fuel poor households live in dwellings built before 1974. As funding for improvements to this existing building stock has been significantly reduced over the last few years, applicants' contributions into the Islington's carbon offset fund could be used to focus on fuel poor households in Islington. Applicants for regeneration projects could be required, for example, to identify the worst buildings in terms of energy efficiency within or immediately close to their application boundary.

Recommendation TN01-4 Encourage applicants for regeneration projects to develop, in conjunction with the Council, a fuel poverty strategy for fuel poor homes within or around the application site.

4.2 Fabric energy efficiency

The need to ensure that a building's energy demand is reduced before seeking to use low carbon energy is widely accepted as one of the key principles of good environmental design, and has been at the top of the GLA's and Islington's energy hierarchy for more than 10 years. Despite this, there is still considerable progress which can be made to deliver buildings with a truly energy efficient building fabric. This is due to design and compliance methodology issues, as well as construction quality.

Before 2002, Part L of the building regulations set minimum standards for the building fabric. This approach was replaced by a 'whole building' approach to carbon emissions which enabled low carbon energy to compensate for a poor building fabric. Conscious of this risk of poor energy efficiency, the energy hierarchy requirement to comply with Part L 2013 with energy efficiency only, the work on the Fabric Energy Efficiency Standard (FEES) done by the Zero Carbon Hub and the introduction of the FEES metric in SAP calculations helped to create a consensus in the building industry that an energy efficient building fabric is essential.

Opportunities for a more ambitious approach in Islington include a greater focus on the building form rather than specification only, the improvement of the level of performance and a greater attention to how this level of performance can be delivered. These opportunities are significant as building fabric can 'lock in' poor energy performance for decades.

Adopting a specific metric for fabric energy efficiency: FEES

The fabric energy efficiency of a building is not only the result of the thickness of insulation but also of the area of external envelope and its complexity, particularly in terms of thermal bridges, and window proportions. The Fabric Energy Efficiency Standard (FEES) developed by the Zero Carbon Hub seeks to assess all these components under one metric which is readily available for residential developments in SAP (the methodology for checking compliance of new dwellings against Part L of the Building Regulations). Introducing this metric and requiring compliance with the levels recommended by the Zero Carbon Hub would demonstrate a commitment to Zero Carbon homes that are as energy efficient as possible, challenge design teams and steer them towards more effective fabric solutions while still providing architectural freedom.

Recommendation TN02-1 Adopt 'interim' FEES (as defined by the Zero Carbon Hub) for the next 3 years with the aim of increasing the requirement to 'full' FEES afterwards.

Encourage the uptake of recognised and successful fabric first approaches

Passivhaus is the gold standard for energy efficiency. A comparable but less ambitious approach is recommended by the AECB 'silver' standard. Both rely on a focus on building fabric and, in addition to SAP, on a more accurate energy demand assessment using PHPP. Encouraging the uptake of these standards (e.g. by reducing the carbon offset rate when they are achieved) and the use of PHPP could encourage best practice in Islington.

Recommendation TN02-2 Encourage PHPP/TM54 assessments of energy demand.

Recommendation TN02-3 Explain and encourage best practice in terms of fabric energy efficiency through the adoption of Passivhaus and AECB Silver standards.

Updating the requirements of Islington's Environmental Design Planning Guidance

Table 2.1 in Islington's Environmental Design Planning Guidance sets out energy efficiency standards in terms of building fabric (e.g. U-values, airtightness). An unintended consequence of this 'minimum standards' guidance is that it could give the impression to applicants without the expertise required that these standards represent best practice, locking in 'average performance' (e.g. external wall U-value of 0.20 W/m^{2}K). We would recommend updating this table with two columns: minimum/good practice and best practice.

Recommendation TN02-4 *Update Table 2.1 in Islington's Environmental Design Planning Guidance and include a 'best practice' column.*

Requiring additional information with the energy statement to ensure that targets can be delivered

The performance gap and solutions to reduce it are the subject of another set of recommendations (see 4.5). However, it is particularly relevant to fabric energy efficiency as optimistic assumptions can lead to compliance with planning policy at the early design stage but increased emissions for the building once completed. In order to avoid fabric energy efficiency assumptions that are not well considered and as a result increase the performance gap, we would recommend a number of measures:

Recommendation TN02-5 *Require applicants to declare assumed construction build up and insulation thickness alongside assumed U-value for the major envelope components.*

Recommendation TN02-6 *Provide guidance to applicants on U-value calculations at application stage.*

Recommendation TN02-7 *Require applicants to estimate and declare the estimated impact of thermal bridges more accurately.*

Recommendation TN02-8 *Require applicants to set out their approach to thermal bridges and how they will improve the thermal performance of junctions.*

Setting more precise improvement targets for major refurbishments

Building fabric improvements required by 'consequential improvements' are often limited and fail to realise the opportunities made possible by major refurbishments. Requiring applicants to go beyond the minimum obligations of Part L1B and Part L2B of the building regulations could have a very positive impact.

Recommendation TN02-9 *Require applicants to set out clearly how their fabric improvements go beyond minimum requirements of Part L and what it will achieve in terms of carbon.*

4.3 Heat generation and distribution

Buildings still require significant amounts of heat with heating demand reducing at a lower rate that other energy demands (e.g. lighting, equipment) both in existing and new buildings. Due to its nature and variability, it is also one of the most challenging forms of energy to provide. The design, specification and installation of heat generation and heat distribution systems significantly affect the amount of carbon that will be produced during their lifetime and the future residents/tenants' energy bills. Due to the complexity of changing heat distribution systems during a building's lifetime, there is also a high risk of locking in poor performance if these systems are not correctly selected, designed, specified and installed. Finally, heat distribution systems can also affect buildings negatively in other ways, for example causing overheating if not properly designed and insulated.

Heat generation and distribution systems are generally specified in order for the building as a whole to achieve a reduction in carbon emissions in line with planning requirements. Unfortunately, as Part L currently uses outdated carbon factors for electricity, carbon emissions and reductions identified at the planning stage are not accurate assessments of future carbon emissions/reductions. This could lead to the wrong conclusions being drawn when comparing systems and prevent the borough from meeting future carbon reduction targets in the future. Addressing the questions raised by the evolving carbon content of electricity is therefore necessary.

The emerging debate in the industry however indicates an element of confusion (with gas-fired CHP and district heating being often referred to as one and the same thing) and a lack of understanding if other implications are not considered (e.g. grid capacity, energy bills and fuel poverty, energy resilience and reliability, air quality, existing buildings, etc.). It is therefore important that any new policy is developed in accordance with the Islington's '2050 vision' for infrastructure and DE in the borough, the London Environment Strategy and the London Plan.

Use more accurate carbon emission factors for electricity and fuels

Applicants could be required to calculate the carbon content of heat using more accurate carbon emission factors, in addition to their Part L calculations. One option would be to use the '*UK Government GHG conversion factors for company reporting*', which are produced annually. These emission factors would however be outdated rapidly as they are based on past averages. Alternatively, more accurate forecast of lifetime heating system emissions could be produced using future emissions data from BEIS (fuels) and the UK Committee on Climate Change (grid electricity). Using these emission factors would enable informed decisions to be made when selecting heating systems. This approach would also account for future changes such as grid decarbonisation and potential integration of hydrogen within the gas grid. Finally the London Borough of Islington could decide to publish guidance on the carbon factors to use and update it every 2-3 years.

Recommendation TN03-1 Require applicants to calculate the carbon factor of heat using more accurate emissions factors.

Establish a maximum carbon content for heat

A specific maximum carbon content for heat supply to a dwelling or building could be set. The aim would be to encourage applicants to consider the carbon content of heat of their systems, eliminate poorly efficient systems and, gradually, promote the use of lower carbon heating system as the mechanism could easily be tightened in the future.

Recommendation TN03-2 Require applicants to specify heating systems with an average annual carbon content of heat of less than 280g CO_2/kWh (example).

Require the creation of and connection to heat networks where appropriate

Low carbon heat solutions in London are likely to include heat networks, heat pumps and re-purposing of the gas grid (e.g. hydrogen). Heat networks may offer cost effective carbon savings for buildings (new and existing) with large heat loads near existing sources of waste or secondary heat. The heat loads from new and low energy buildings in low density areas may not justify distribution/connection costs and may lead to relatively high distribution losses, eroding the financial and environmental advantages of network connection. In these cases, building level communal heating may be a more cost effective and potentially a lower carbon option than a district heating connection.

Recommendation TN03-3 *Explain Islington's infrastructure and DE vision to 2050 to enable applicants to understand the context of their site (e.g. likely future heat network)*

Protect heat network customers using the Heat Trust Scheme

Heat networks often exist as natural monopolies, with users unable to purchase heat from alternative suppliers so it is important to ensure consumer's rights are protected. The Heat Trust Scheme is operated by a not-for-profit company that was established in 2015 and is sponsored by the Association for Decentralised Energy (ADE). The scheme is voluntary and provides limited protection for consumers.

Recommendation TN03-4 *Require applicants to ensure that the future heat network operator will be registered with the Heat Trust Scheme (or any other equivalent/future customer protection scheme).*

Require all heat networks to be constructed and commissioned in line with CIBSE's Code of Practice CP1.

Metering and monitoring for heat networks

Heat metering enables accurate allocation of costs and calculation of distribution network efficiency. Applicants could be required to monitor and report distribution efficiency, and to take responsibility for losses rather than passing any additional energy costs on to consumers.

Recommendation TN03-5 *Require applicants to install heat meters for each dwelling so heat can be billed fairly and system efficiencies monitored. Ensure compliance with The Heat Network (Metering and Billing) Regulations 2014.*

4.4 Photovoltaics

Solar photovoltaic technology provides a reliable source of clean renewable electricity. It offers an effective way to reduce carbon emissions as it directly displaces electricity that would otherwise be generated from carbon based fuels. The London Borough of Islington, as an inner city location, has a significant potential for more PV generation as demand for electricity is high and solar electricity can be generated at/near the point of use. This would not create issues for the grid as in other areas, would avoid transmission losses and would enable communities to be powered, in part, from their own energy infrastructure. Solar electricity is increasingly cost competitive with grid electricity and offers stable prices. It can therefore form an important part of any strategy to address affordability.

Solar photovoltaic technology is often proposed and installed in order to achieve carbon reduction requirements required by the GLA and/or the London Borough of Islington planning policy, Part L of the building regulations or BREEAM. A key issue with this approach is that applicants often install the minimum number of panels required to achieve the necessary carbon emission reduction. This is also based on the historical attitude towards PVs when they were more expensive and less efficient. This results in only a partial utilisation of roofs which have a greater potential. In many cases, the marginal cost of adding additional panels to occupy a much greater proportion of the roof may be relatively low and would achieve greater on-site carbon savings.

From a national perspective, the UK currently has around 11.5 GW of installed solar capacity but the penetration of PVs varies significantly regionally. Some regions such as the South West have so much solar electricity generation that the grid cannot accept much more. Deployment in London has been very slow. Therefore a significant potential for more PV deployment still exists and should be pursued.

Looking to the future, as the electricity grid gradually decarbonises, the carbon reductions offered by solar technology will diminish. As a result, more and more solar panels will be required to achieve the same carbon emission reduction. To some extent this will be offset by cost reductions, but policy should be developed with this in mind. Within the next decade the carbon reductions offered by solar could be reduced so much that an alternative policy is required to encourage ongoing adoption.

Promote a more ambitious use of available roof space for solar photovoltaics

This policy would encourage applicants to fully utilise roof spaces that are well suited to solar technology. This could be achieved through setting a target for solar capacity in Watts per m² of roof space. The link between PVs and carbon offset contribution should also be considered in order to reward applicants who decide to go further on-site with PVs.

Recommendation TN04-1 *Encourage applicants to utilise roof spaces more effectively for PVs by setting a target (e.g. 100-140W/m² of roof area) which they will need to report against, and to consider other opportunities for PVs.*

Recommendation TN04-2 *Encourage applicants to achieve further on-site carbon reductions beyond minimum planning policy requirements by reducing the price of carbon associated with the applicant's carbon offset contribution.*

Promote best practice photovoltaic installations

Part L calculations do not encourage best practice solar photovoltaic installations. It does not adequately reward optimum system orientation[29], or account for the reduced losses (and therefore additional PV energy generation potential) that may be associated with the specification of microinverters or DC optimisers. The London Borough of Islington could provide guidance in order to encourage applicants to adopt best practices in solar photovoltaic system design and installation.

Recommendation TN04-3 Encourage applicants to adopt best practices in utilisation of solar photovoltaic technology.

Encouraging alternative sources of funding for PV systems

Applicants could be encouraged to partner with solar financing companies/community energy groups.

Applicants could also be allowed to apply for funding from the carbon offset fund provided that their PV proposals would exceed the planning requirements and provide a benefit to the community (e.g. Council tenants, public building).

Recommendation TN04-4 Encourage communication between applicants and local community energy groups (e.g. energy cooperatives)

Recommendation TN04-5 Enable applications to apply for carbon offset funds for exemplar PV systems.

4.5 Better performing buildings

The planning system can promote buildings which perform better than they currently do. Key aspects of delivering better performing buildings in new and refurbished buildings include pursuing best practice design with appropriate calculation tools, developing the design and appropriate specifications and ensuring high quality construction practices are followed, including proper commissioning and testing of the building envelope and services.

The 'performance gap' is a term used to describe the, usually significant, disparity between the predicted/modelled energy performance of buildings at design stage and their actual operational performance. The performance gap is a critical issue for climate change as achieving the delivery of truly low/zero carbon buildings is the real objective. Given the life time expectancy of a new or refurbished building, it is also very important not to 'lock in' high carbon emissions.

[29] PV systems are generally designed to maximise the output per m^2 of panel (and therefore the cost efficiency of the system) rather than to maximise the electricity generation of the system as a whole. For example, the same roof could accommodate more panels if they were oriented East-West at 10 degrees than with panels oriented South at 30 degrees. Although the output per panel would be lower, the PV system would generate more renewable electricity.

There are several major factors that contribute to the performance gap:

- **Inaccurate energy calculations:** thermal modelling at design stage is normally undertaken with Part L accredited software tools that use the National Calculation Methodology. These tools are meant to be used for demonstrating compliance with building regulations. Rather than predicting energy use, they are based on standardised and simplified inputs and assumptions designed to rationalise and enable comparability between buildings. They are not 'actual' energy estimation tools. This alone can result in the initial design stage estimate underestimating actual energy use by a factor of 20% to 600%;
- The **degradation of performance** between the level of efficiency of building fabric and services targeted at planning/specified at design stage and those that are built and installed. This can be due to incorrect calculations or assumptions at design stage or alternative materials and design details being used at construction;
- **Poor quality construction** practices and inadequate on-site quality checks;
- **Insufficient post-construction testing and commissioning** of the building fabric and services.

Addressing some or all the above factors within Islington's planning framework could help to deliver better quality buildings, improve occupant satisfaction and lower energy consumption and carbon emissions in the borough.

Requiring applicants to predict future energy use

Estimating predicted energy performance using tools such as PHPP for residential and low energy non-domestic buildings or CIBSE TM54 for non-domestic buildings would enable designers to consider factors that impact buildings' actual operational performance at an earlier stage. This would also enable a more accurate determination of the anticipated energy consumption and carbon emissions that can be used to verify the performance of the constructed building in operation (which is not possible with Part L % reductions).

Recommendation TN05-1 *Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology in addition to accredited Part L modelling. Declare predicted energy use in kWh/m²/yr and kWh/yr. This would become one of the GPP indicator targets.*

Require applicants to consider the key implications of their performance targets

In order to prevent the degradation of energy performance during detailed design, project teams could be encouraged to consider in more detail the design implications of the specified energy efficiency performance standards detailed in their energy strategy and sustainability statement. It is therefore recommended that the planning submissions also include the provision of early/indicative design calculations.

Recommendation TN05-2 *Require applicants to provide initial U-value calculations and assumed build-up / insulation thicknesses of key building envelope components.*

Recommendation TN05-3 *Require applicants to provide initial estimates/calculations of the performance from key repeating and non-repeating thermal bridges.*

Recommendation TN05-4 *Require applicants to provide examples of key mechanical and electrical products/design strategies that would meet the detailed energy efficiency standards (e.g. MVHR).*

Improving construction quality in Islington

Ensuring that the building has been constructed to a high standard and that all appropriate tests and checks have been carried out will reduce the risk of the final building falling short of meeting the energy performance standards committed to at planning stage. Improving construction quality is one of the key ways to reduce the performance gap.

Recommendation TN05-5 *Require applicants to complete an on-line form/table confirming the actual performance values achieved compared with the original energy targets (e.g. U-value, window performance, etc.) and to submit the associated documentary evidence (e.g. construction manager's declaration, delivery notes of key products, site photographs for insulation installation, MVHR commissioning certificates).*

Recommendation TN05-6 *Require applicants to carry out an air tightness test and thermographic survey of all new and refurbished buildings over 500m^2. The test reports, along with details of any remediation measures, would have to be provided to the Council prior to occupancy.*

Monitoring and dissemination of operational performance data

To increase transparency of the actual energy performance of buildings, encouraging developers and occupants to monitor and record energy consumption data, and encouraging its dissemination, would help to verify actual vs targeted energy use and provide valuable information to the London Borough of Islington and the industry. This recorded energy consumption data could potentially be collected and stored on an accessible on-line database, like Carbon Buzz. The London Borough of Islington already has a mechanism (via the Green Performance Plan) for requiring developers to make operational energy targets and monitor/record consumption. It is envisaged that this could be expanded to also include the following:

Recommendation TN05-7 *Require energy and water sub-metering and reporting beyond the minimum Part L requirements.*

Recommendation TN05-8 *Require all applicants for non-residential buildings above 500m^2 to undertake a DEC assessment and display it at reception.*

4.6 Assessment against key policy objectives and guidance

The initial recommendations summarised in sections 4.1 to 4.5 were assessed using the same two approaches. The first one was based on a methodical assessment of the effectiveness of each requirement against the London Borough of Islington's four key policy objectives and five associated considerations.

Key policy objectives				Important policy considerations				
Reduce energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy

Table 4.01 – Summary of key climate change mitigation policy objectives and considerations for the London Borough of Islington

Each policy requirement's effectiveness at delivering the key policy objective and at enabling compliance with the important policy consideration was assessed using the following ranking system.

Effectiveness at delivering key policy objective

X	-	●	● ●	● ● ●
Potential negative effect	Neutral	Low	Medium	High

Effectiveness at enabling compliance with policy consideration

X	-	○	○ ○	○ ○ ○
Potential negative effect	Neutral	Low	Medium	High

Overall assessment of effectiveness

The ranking for each requirement was associated with a score and all scores were added to provide an overall assessment of the effectiveness of these initial recommendations as a whole at delivering the key policy objective and at enabling compliance with the important policy consideration.

The assessment of the overall effectiveness of the initial recommendations summarised in section 4.0 led to the following conclusion:

Key policy objectives								
Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience					

Table 4.01 – Summary of effectiveness of initial recommendations

Please refer to Appendix E for the detailed assessment matrix (reproduced overleaf as an image).

Project number: 20170145
Project name: Islington energy evidence base
Document: Assessment of proposed energy policy/guidance against key objectives
Revision: C
Date: 21/07/2017

KEY	
1	Low level of interest
2	Medium level of interest
3	High level of interest

KEY	
● / ● ●	Scale of effectiveness to meet key policy objective
○ / ○ ○	Scale of effectiveness to address key policy consideration
X	Potential negative effect

Etude

				Key policy objectives				Important policy considerations					Other
Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy	Additional comments
TN01-1	Require applicants for domestic refurbishment projects to demonstrate that dwellings post refurbishments will achieve an EPC of C or better	P	2	● ●	-	-	●	-	○	-	○ ○ ○	○	
TN01-2	Require applicants to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of their proposed heating system	P	1	-	-	-	-	-	-	-	○ ○ ○	-	
TN01-3	Develop a simple set of specific information which applicants will be required to provide to estimate future energy bills	G	2	-	-	-	-	-	-	-	○ ○	○	
TN01-4	Require applicants for regeneration projects to develop a fuel poverty strategy involving the identification of fuel poor homes within or around the application site	P	0	-	-	-	●	-	-	-	○ ○	○ ○	
TN02-1	Adopt 'interim' FEES (as defined by the Zero Carbon Hub) for the next 3 years with the aim of increasing the requirement to 'full' FEES afterwards	P	3	● ●	-	-	●	○ ○	○ ○ ○	-	○ ○	○ ○	
TN02-2	Encourage PHPP assessment of energy demand	G	3	● ●	-	-	●	○ ○	○ ○	○ ○ ○	○	○ ○	
TN02-3	Explain and encourage best practice in terms of fabric energy efficiency through the adoption of Passivhaus and AECB Silver standards	G	2	● ● ●	●	●	●	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	
TN02-4	Update Table 2.1 in Islington's Environmental Design Planning Guidance and include a 'best practice' column	G	3	● ●	-	-	●	○	○ ○	-	○ ○	-	
TN02-5 TN05-2	Require applicants to declare assumed construction build up and insulation thickness alongside assumed U-value for the major envelope components	G	1	●	-	-	●	○	-	-	○	-	
TN02-6 TN05-2	Provide guidance to applicants on U-value calculations at application stage	G	2	●	-	-	-	○	-	-	○	-	
TN02-7 TN05-3	Require applicants to estimate and declare the estimated impact of thermal bridges more accurately	G	0	●	-	-	-	○	-	-	○	-	
TN02-8	Require applicants to set out their approach to thermal bridges and how they will improve the thermal performance of junctions	G	2	●	-	-	-	○	-	-	○	-	
TN02-9	Require applicants to set out clearly how their fabric improvements go beyond minimum requirements of Part L and what it will achieve in terms of carbon	P	2	●	-	-	●	○	-	○	○	-	
TN03-1	Require applicants to calculate the carbon factor of heat using more accurate emissions factors	P	3	-	● ● ●	-	● ●	○ ○ ○	○ ○ ○	○ ○	-	○ ○	
TN03-2	Require applicants to specify heating systems with an average annual carbon content of heat of less than 240 gCO_2/kWh (example)	P	?	-	● ●	-	●	○	○ ○ ○	○	-	○	
TN03-3	Explain Islington's infrastructure and DE vision to 2050. Require applicants to demonstrate they have objectively assessed heat network connection vs communal or individual heating systems	G	3	-	● ● ●	-	● ● ●	○ ○ ○	○ ○ ○	○ ○ ○	-	○	
TN03-4	Require applicants to ensure that the future heat network operator will be registered with the Heat Trust Scheme (or any other equivalent/future customer protection scheme)	P/G	1	-	-	-	-	-	-	-	○ ○	-	I think already secure this through commercial agreements for connection. Could be put in guidance as well
TN03-5	Require applicants to install heat meters for each dwelling so heat can be billed fairly and system efficiencies monitored	G	2	-	● ●	-	-	-	-	○	○	○	
TN04-1	Encourage applicants to utilise roof spaces more effectively for PVs by setting a target (100-140W/m² of roof area) which they will need to report against	P	3	-	-	● ●	●	○	○	-	-	○	
TN04-2	Reduce the applicant's carbon offset contribution if the on-site carbon target is exceeded	G	?	●	●	●	-	○	○	-	○	○	e.g. a sliding scale of offset price to try and incentivise on-site reductions? This would require a local carbon price to be adopted (possible but need evidence to formulate price).
TN04-3	Encourage applicants to adopt best practices in utilisation of solar photovoltaic technology	G	3	-	-	● ●	●	○ ○	-	-	-	-	
TN04-4	Encourage communication between applicants and community energy groups	G	1	-	-	●	-	-	-	-	-	○ ○	
TN04-5	Enable applications for carbon offset funds to finance 'exemplar' PV systems	G	0	-	-	●	-	○	-	-	-	○	This is more about the management of the carbon fund rather than planning policy
TN05-1	Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology. The kWh/m2/yr and kWh/yr would become GPP indicator targets.	P	2	● ●	-	-	●	○ ○	○ ○ ○	○ ○ ○	○	○ ○	Links to TN02-2.
TN05-4	Require applicants to provide examples of key mechanical and electrical products / design strategies that would meet the detailed energy efficiency standards.	G	1	● ●	-	-	-	○	○	-	-	-	
TN05-5	Require applicants to confirm the actual performance values achieved compared with the original energy targets and to submit the associated evidence (e.g. site photographs for insulation)	P	2	●	-	-	-	○ ○ ○	-	-	○	○ ○	Links to TN02-2 and TN05-1 and could be secured through Energy Strategy and Green Performance Plan
TN05-6	Require applicants to carry out an air tightness test and thermographic survey of all new and refurbished buildings over 500m²	P	1	●	-	-	-	○ ○	-	-	-	○ ○	
TN05-7	Require energy and water sub-metering and reporting beyond the minimum Part L requirements	G	2	●	-	-	-	○	-	○ ○ ○	○	-	
TN05-8	Require all applicants for non-residential buildings above 500m² to undertake a DEC assessment and display it at reception	P	0	●	-	-	-	○ ○ ○	○	○ ○ ○	-	○	
	OVERALL ASSESSMENT			25	12	8	17	37	27	23	29	28	

Table 4.02 – Detailed assessment of effectiveness of initial recommendations *– please refer to Appendix E for A3 version*

The second approach to assessing current policy requirements and guidance was to consider their impact on the London Borough of Islington's carbon pathway to 2050. The carbon pathway of residential buildings was used to test the impact of these recommendations.

The calculation has been set up to test the impact of changes to simple baseline assumptions. This calculator has been provided to Islington Council to allow other changes to be tested. For the purpose of this report a better case scenario has been tested to show what could be possible in the borough.

For this projection the following changes to the assumptions were made:

- From 2019, gradual improvement of fabric energy efficiency beyond the requirements of the building regulations and current policy and after 2030 requirement for all new buildings to achieve an annual heat demand of below 15 $kWh/m^2/yr$[30],
- All refurbishments are encouraged to consider energy efficiency, so 90% of dwellings are refurbished by 2050 with an average annual heat demand of 50 $kWh/m^2/yr$.
- Low carbon heat sources are realised across the borough (low carbon heat networks and individual heat pumps) allowing the carbon content of heat to reduce to 0.100 $kgCO_2/kWh$.

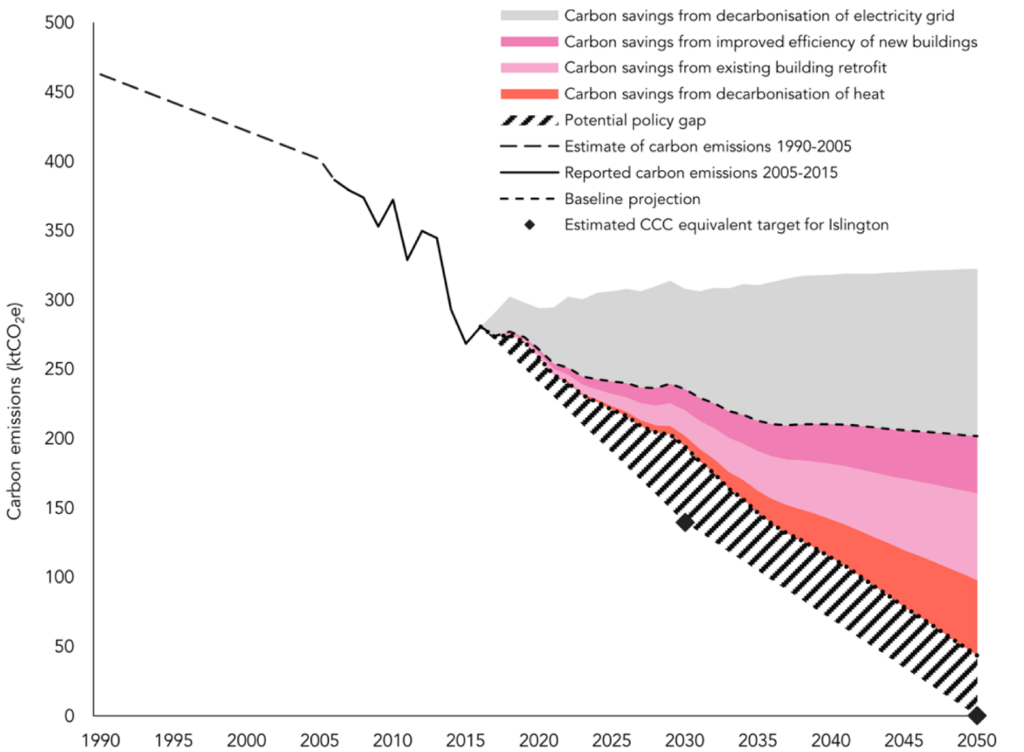


Figure 4.01 – Estimated carbon emissions from dwellings 1990-2050 in the London Borough of Islington showing the projected impact of potential policy

The improved carbon emission reductions are still short of the targets, however they demonstrate that with ambitious but realistic policy and guidance significant reductions can be achieved.

[30] This level of space heating demand is equivalent to the Passivhaus standard.

The final reductions over 1990 levels shown here are 66% reduction by 2034 and 91% reduction by 2050.

The data above was compared with the data underlying London's Zero Carbon Pathway tool developed by the GLA. There is a good correlation between the two sets of data which is very positive.

Conclusion

The detailed assessment of current policy and guidance against the London Borough of Islington key objectives and their impact on Islington's carbon pathway demonstrate that the initial recommendations in section 4.0 would help to form a more comprehensive and effective carbon mitigation strategy for the London Borough of Islington.

Following this analysis, the initial recommendations have been ranked by the London Borough of Islington in order to establish priorities in line with strategic policy objectives, identify those which were not likely to be taken further and to consider how to combine the existing policy and guidance with the selected recommendations.

4.7 Combining current policy and initial recommendations

4.7.1 Proposed new structure

In order to follow the recommendations of the TCPA and in particular the advice to have stronger links between the Local Plan and the recommendations of the Committee on Climate Change (CCC), it is recommended to adopt the CCC's structure for climate change mitigation:

1. Reducing energy demand;
2. Decarbonising heat;
3. Decarbonising electricity.

Current policy and guidance and initial recommendations have therefore been combined and structured around these three themes. They have also been split up into three categories: strategic policies, detailed policies and guidance.

4.7.2 Relationship with London Plan policies (current and emerging)

The London Plan climate change policies remain the overarching policies and it is fundamental that the London Borough of Islington both benefits from the Greater London initiatives and plays its part in the coordinated London's efforts to mitigate climate change. For this reason, it is suggested to refer to the London Plan policies and require compliance with them.

The current key policies are 5.1 and 5.2 but they are likely to evolve in the new London Plan, due to be published by the end of 2017.

4.7.3 Strategic policies (combined)

The table below combines the existing strategic policies (shown in grey) and recommendations for new policies (shown in black). Those requiring a specific evidence base are marked with a '●'.

Reference	Policy	Existing (E) or New (N)	Evidence base required?
Reducing energy demand			
DM7.2-A	Best practice energy efficiency standards are required	E	
DM7.2-D	Householders to be encouraged to apply cost-effective energy efficient measures to their property	E	
Decarbonising heat			
DM7.1-B	Renewable energy technologies supported	E	
Decarbonising electricity			
DM7.1-B	Renewable energy technologies supported	E	

Table 4.03 – Summary of strategic climate change mitigation policies

4.7.4 Detailed policies (combined)

The table below combines the existing detailed policies (shown in grey) and recommendations for new policies (shown in black). Those requiring a specific evidence base are marked with a '●'.

Reference	Policy	Existing (E) or New (N)	Evidence base required?
Reducing energy demand			
TN02-1	Adopt 'interim' FEES (as defined by the Zero Carbon Hub) for the next 3 years with the aim of increasing the requirement to 'full' FEES afterwards	N	●
DM7.1-E	Preparation of a Green Performance Plan (GPP) detailing measurable outputs for the occupied building(e.g. energy consumption, CO_2)	E	
TN05-1	Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology. The kWh/m^2/yr and kWh/yr would become GPP indicator targets.	N	●
TN05-5	Require applicants to confirm the actual performance values achieved compared with the original energy targets and to submit the associated evidence (e.g. site photographs for insulation)	N	
TN05-6	Require applicants to carry out an air tightness test and thermographic survey of all new and refurbished buildings over 500m^2	N	
DM7.1-F	Access to the development and submission of information to the council when requested	E	

TN02-9	Require applicants to set out clearly how their fabric improvements go beyond minimum requirements of Part L and what it will achieve in terms of carbon	N	
Decarbonising heat			
TN03-1	Require applicants to calculate the carbon factor of heat using more accurate emissions factors	N	●
DM7.3-A	All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN)	E	
DM7.3-B	Major developments within 500m ~~and minor developments within 100m of~~* an existing DEN to connect to that network	E	
DM7.3-C	Major developments within 500m of a planned DEN to connect to that network in the future	E	
TN03-2	Require applicants to specify heating systems with an annual carbon content of heat of less than 280 gCO_2/kWh (example)	N	●
TN03-3	Explain Islington's infrastructure and DE vision to 2050. Require applicants to demonstrate they have objectively assessed heat network connection vs communal or individual heating systems	N	
Decarbonising electricity			
TN04-1	Encourage applicants to utilise roof spaces more effectively for PVs by setting a target (100-140W/m^2 of roof area) which they will need to report against, and to consider other opportunities for PVs.	N	
Others			
TN01-2	Require applicants to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of their proposed heating system.	N	
CS 10-A	Highest feasible level of nationally recognised sustainable building standard (e.g. BREEAM, CSH)	E	
CS 10-E	Demonstration that development is designed to be adapted to climate change (e.g. overheating, flood risk)	E	
DM7.1-A	Requirement to integrate best practice sustainable design standards during design, construction and operation	E	
DM7.4-D	Major non-residential developments to achieve BREEAM Excellent and make reasonable endeavours to achieve Outstanding	E	

** It is proposed to remove the obligation for minor developments within 100m of an existing DEN to connect to encourage applicants to consider other low carbon heat options.*

Table 4.04 – Summary of existing and new recommended climate change mitigation policies

4.7.5 Guidance (combined)

The table below combines the existing guidance (shown in grey) and recommendations for new guidance areas (shown in black).

Reference	Guidance	Existing (E) or New (N)	Evidence base required?
Reducing energy demand			
TN02-2	Encourage PHPP / TM54 assessment of energy demand	N	
SPD-T2.1	Minimum energy efficiency standards	E	
TN02-4	Update Table 2.1 in Islington's Environmental Design Planning Guidance and include a 'best practice' column	N	
TN02-5 TN05-2	Require applicants to declare assumed construction build up and insulation thickness alongside assumed U-value for the major envelope components	N	
TN02-6 TN05-2	Provide guidance to applicants on U-value calculations at application stage	N	
TN02-8	Require applicants to set out their approach to thermal bridges and how they will improve the thermal performance of junctions	N	
TN02-3	Explain and encourage best practice in terms of fabric energy efficiency through the adoption of Passivhaus and AECB Silver standards	N	
TN05-4	Require applicants to provide examples of key mechanical and electrical products / design strategies that would meet the detailed energy efficiency standards.	N	
CS (3.2.8)	Clear implementation and monitoring of CO_2 reductions	E	
TN05-7	Require energy and water sub-metering and reporting beyond the minimum Part L requirements	N	
Decarbonising heat			
TN03-5	Require applicants to install heat meters for each dwelling so heat can be billed fairly and system efficiencies monitored	N	
Decarbonising electricity			
TN04-3	Encourage applicants to adopt best practices in utilisation of solar photovoltaic technology	N	

TN04-4	Encourage communication between applicants and community energy groups	N
Others		
TN01-3	Develop a simple set of specific information which applicants will be required to provide to estimate future energy bills	N
TN03-4	Require applicants to ensure that the future heat network operator will be registered with the Heat Trust Scheme (or any other equivalent/future customer protection scheme) Require all heat networks to be constructed and commissioned in line with CIBSE's Code of Practice CP1.	N

Table 4.05 – Summary of guidance areas to support climate change mitigation strategies

4.7.6 Assessment against key policy objectives and guidance

The combined policies and guidance (current and initial recommendations) were assessed using the same methodical assessment of the effectiveness of each requirement against the London Borough of Islington's four key policy objectives and five associated considerations.

Please refer to Appendix F for the detailed assessment matrix (reproduced overleaf as an image).

Project number: 20170145
Project name: Islington energy evidence base
Document: Assessment of combined retained/proposed energy policy/guidance against key objectives
Revision: C
Date: 21/07/2017

KEY	
1	Low level of interest
2	Medium level of interest
3	High level of interest

KEY	
• / • •	Scale of effectiveness to meet key policy objective
o / o o	Scale of effectiveness to address key policy consideration
X	Potential negative effect

Etude

Purple text: London policies I Blue text: new LBI policy and guidance

				Key policy objectives				Important policy considerations					Other
Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy	Additional comments
REDUCING ENERGY DEMAND													
LP5.2	Zero carbon buildings (domestic and non-domestic)	P		•	•	•	-	-	-	-	-	o	
LP5.2	35% improvement over Part L 2013 on-site as minimum (regulated energy only)	P		•	•	•	-	-	-	-	-	-	No specific target/requirement against each policy objective. Part L limitations.
LP5.2	Carbon offsetting to Zero Carbon (regulated only) through a s106 agreement	P		•	-	-	•	-	-	-	o	o	Useful source of revenues to improve energy efficiency and mitigate fuel poverty in existing buildings.
DM7.2-A	Best practice energy efficiency standards are required	P		•	-	-	•	-	-	-	o	-	Useful intent but the 'best practice energy efficiency standards' are not set out.
TN02-1	Adopt 'interim' FEES (as defined by the Zero Carbon Hub) for the next 3 years with the aim of increasing the requirement to 'full' FEES afterwards	P	3	• •	-	-	•	o o	o o o	-	o o	o o	
DM7.1-C	Preparation of an Energy Statement	P		•	•	•	-	o	-	-	-	-	Encourages the applicant to report specifically against three of the policy objectives.
DM7.1-E	Preparation of a Green Performance Plan (GPP) detailing measurable outputs for the occupied building(e.g. energy consumption, CO_2)	P		•	-	-	•	o o	-	-	o	o o	The GPP as it stands would not directly address the policy objectives but it is a very important tool to address other important policy considerations.
TN05-1	Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology. The kWh/m2/yr and kWh/yr would become GPP indicator targets.	P	2	• •	-	-	•	o o	o o o	o o o	o	o o	Links to TN02-2.
TN05-5	Require applicants to confirm the actual performance values achieved compared with the original energy targets and to submit the associated evidence (e.g. site photographs for insulation)	P	2	•	-	-	-	o o o	-	-	o	o o	Links to TN02-2 and TN05-1 and could be secured through Energy Strategy and Green Performance Plan
TN05-6	Require applicants to carry out an air tightness test and thermographic survey of all new and refurbished buildings over 500m²	P	1	•	-	-	-	o o	-	-	-	o o	
DM7.1-F	Access to the development and submission of information to the council when requested	P		-	-	-	-	o	-	o	-	o o	Useful intent to check the implementation and monitoring of CO_2 emissions
DM7.2-D	Householders to be encouraged to apply cost-effective energy efficient measures to their property	P		•	-	-	-	-	-	-	-	-	Useful intent but no specific requirement.
TN02-9	Require applicants to set out clearly how their fabric improvements go beyond minimum requirements of Part L and what it will achieve in terms of carbon	P	2	•	-	-	•	o	-	o	o	-	
TN02-2	Encourage PHPP /TM54 assessment of energy demand	G	3	• •	-	-	•	o o	o o	o o o	o	o o	
SPD-T2.1	Minimum energy efficiency standards	G		•	-	-	-	-	-	-	-	-	Table 2.1 does not reflect current best practice. A 'best practice' column could be aded.
TN02-4	Update Table 2.1 in Islington's Environmental Design Planning Guidance and include a 'best practice' column	G	3	• •	-	-	•	o	o o	-	o o	-	
TN02-5 TN05-2	Require applicants to declare assumed construction build up and insulation thickness alongside assumed U-value for the major envelope components	G	1	•	-	-	•	o	-	-	o	-	
TN02-6 TN05-2	Provide guidance to applicants on U-value calculations at application stage	G	2	•	-	-	-	o	-	-	o	-	
TN02-8	Require applicants to set out their approach to thermal bridges and how they will improve the thermal performance of junctions	G	2	•	-	-	-	o	-	-	o	-	
TN02-3	Explain and encourage best practice in terms of fabric energy efficiency through the adoption of Passivhaus and AECB Silver standards	G	2	• • •	•	•	•	o o o	o o o	o o o	o o o	o o o	
TN05-4	Require applicants to provide examples of key mechanical and electrical products / design strategies that would meet the detailed energy efficiency standards.	G	1	• •	-	-	-	o	o	-	-	-	
CS (3.2.8)	Clear implementation and monitoring of CO_2 reductions	G		-	-	-	-	-	-	o	-	-	Useful intent to check the implementation and monitoring of CO_2 emissions
TN05-7	Require energy and water sub-metering and reporting beyond the minimum Part L requirements	G	2	•	-	-	-	o	-	o o o	o	-	
DECARBONISING HEAT													
TN03-1	Require applicants to calculate the carbon factor of heat using more accurate emissions factors	P	3	-	• • •	-	• •	o o o	o o o	o o	-	o o	
DM7.3-A	All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN)	P		-	• •	-	• •	-	-	-	-	-	Enables long-term infrastucture required for decarbonised heat to be developed over time.
DM7.3-B	Major developments within 500m ~~and minor developments within 100m~~ of an existing DEN to connect to that network	P		-	•	-	• •	-	o	-	-	-	Enables (indirectly) existing infrastucture to be improved and decarbonised. The long term performance of the existing network is crucial.
DM7.3-C	Major developments within 500m of a planned DEN to connect to that network in the future	P		-	• •	-	• •	-	o	-	-	-	Enables long-term infrastucture required for decarbonised heat to be developed over time.
DM7.1-B	Renewable energy technologies supported	P		-	•	•	-	-	-	-	-	o	General support but no specific target.
TN03-2	Require applicants to specify heating systems with an average annual carbon content of heat of less than 240 gCO_2/kWh (example)	P	?	-	• •	-	•	o	o o o	o	-	o	

Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Key policy objectives: Reducing energy demand	Key policy objectives: Decarbonise heat	Key policy objectives: Decarbonise electricity	Key policy objectives: Energy resilience	Important policy considerations: Ensure delivery of low/zero energy buildings	Important policy considerations: Step down emissions over time towards 2050	Important policy considerations: Enable reporting against carbon targets	Important policy considerations: Mitigate fuel poverty and ensure affordable heat	Important policy considerations: Collaboration / skills for low carbon economy	Other: Additional comments
TN03-3	Explain Islington's infrastructure and DE vision to 2050. Require applicants to demonstrate they have objectively assessed heat network connection vs communal or individual heating systems	G	3	-	● ● ●	-	● ● ●	○ ○ ○	○ ○ ○	○ ○ ○	-	○	
TN03-5	Require applicants to install heat meters for each dwelling so heat can be billed fairly and system efficiencies monitored	G	2	-	● ●	-	-	-	-	-	○	○	
DECARBONISING ELECTRICITY													
DM7.1-B	Renewable energy technologies supported	P		-	●	●	-	-	-	-	-	○	General support but no specific target.
TN04-1	Encourage applicants to utilise roof spaces more effectively for PVs by setting a target (100-140W/m² of roof area) which they will need to report against	P	3	-	-	● ●	●	○	○	-	-	○	
TN04-3	Encourage applicants to adopt best practices in utilisation of solar photovoltaic technology	G	3	-	-	● ●	●	○ ○	-	-	-	-	
TN04-4	Encourage communication between applicants and community energy groups	G	1	-	-	●	-	-	-	-	-	○ ○	
OTHERS													
TN01-2	Require applicants to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of their proposed heating system	P	1	-	-	-	-	-	-	-	○ ○ ○	-	
CS 10-A	Highest feasible level of nationally recognised sustainable building standard (e.g. BREEAM, CSH)	P		●	●	●	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
CS 10-E	Demonstration that development is designed to be adapted to climate change (e.g. overheating, flood risk)	P		-	-	-	●	-	-	-	-	○	Adaptation to climate change an important consideration.
DM7.1-A	Requirement to integrate best practice sustainable design standards during design, construction and operation	P		●	-	-	-	○	-	-	-	-	Useful intent but no specific 'design standards' referred to.
DM7.4-D	Major non-residential developments to achieve BREEAM Excellent and make reasonable endeavours to achieve Outstanding	P		●	●	●	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
TN01-3	Develop a simple set of specific information which applicants will be required to provide to estimate future energy bills	G	2	-	-	-	-	-	-	-	○ ○	○	
TN03-4	Require applicants to ensure that the future heat network operator will be registered with the Heat Trust Scheme (or any other equivalent/future customer protection scheme)	G	1	-	-	-	-	-	-	-	○ ○	-	I think already secure this through commercial agreements for connection. Could be put in guidance as well
	OVERALL ASSESSMENT			31	23	13	25	35	26	21	26	31	

*Table 4.06 – **Detailed assessment of effectiveness of combined policy/guidance and recommendations** – please refer to Appendix F for A3 version*

The assessment of the overall effectiveness of combined policy / guidance and initial recommendations led to the following conclusion:

Key policy objectives				
Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	

Table 4.07 – Summary of effectiveness of combined policy and guidance

Please refer to Appendix F for the detailed assessment matrix.

The assessment indicates that the current policy and guidance, combined with the initial recommendations would form a more comprehensive and effective climate change mitigation strategy. The only key policy objective which would be 'amber' is the objective to decarbonise electricity, but that is because this objective relies heavily on national government policy. The London Borough of Islington should, however, do what it is within its control and influence to achieve this objective (solar electricity, peak shaving, dynamic demand management, energy storage).

5.0

TECHNICAL EVIDENCE BASE

5.0 TECHNICAL EVIDENCE BASE

5.1 Objectives

This section is the technical evidence base to justify some of the recommendations made in the report. The recommendations requiring evidence have been identified in Table 4.04. In summary, the aims of this section are the following[31]:

- To confirm the usefulness of the Fabric Energy Efficiency metric for residential developments (*Key policy objective: reducing energy demand*);
- To demonstrate that it would not preclude a wide range of residential developments in Islington but reward more efficient residential buildings, both for minor and major applications (*Key policy objective: reducing energy demand*);
- To justify why requiring assessments of predicted energy use (e.g. TM54, PHPP) rather than Part L only assessments would provide better information to applicants and design teams and therefore drive the design of better residential and non-residential buildings (*Key policy objective: reducing energy demand*);
- To justify why using more accurate electricity carbon factors is important (*Key policy objective: decarbonising electricity)*;
- To justify why requiring applicants to report the estimated heat carbon content of their system is important (*Key policy objective: decarbonising heat)*;
- To reference strategic information describing the London Borough of Islington's vision for heat networks in the borough (*Key policy objective: decarbonising heat)*.

5.2 Building types

A significant amount of energy modelling has been undertaken to develop this technical evidence base. In order to represent different types of buildings (residential/non-residential), different scales of applications (minor/major) and typologies (house/apartment block), three building types have been considered:

- a **terrace house** – which represents a 'minor' residential application;
- an **apartment block** – which represents a 'major' residential application;
- a **school** – which represents a 'major' non residential application.

These building types do not represent every possible new building in Islington but the findings in this report can generally be extrapolated to other types of houses, scales of apartment blocks or type of non-residential buildings.

For example, the school was used as a proxy for major non-residential developments in Islington for two main reasons. Firstly, the issues and the findings (associated with the Part L2A methodology) are likely to be similar as both buildings have high internal gains.

[31] The London Borough of Islington's key objective associated with each aim is provided in brackets

Secondly, schools are one of the non-residential building types with the most reliable set of actual energy data from a variety of sources (Innovate UK, Carbonbuzz, Post Occupancy Evaluation, etc.). As one of the objectives of this evidence base is to compare energy modelling data to actual energy data, schools were considered to be particularly relevant.

5.3 Understanding the base cases

A 'base case' for each of these building types has been considered. Each of them is based on a real building and is meant to represent an 'average' application, i.e. one with a building form which is fairly representative of the majority of applications and with 'good practice' energy efficiency specifications. These base cases were then modified: their shape (form) was changed for the same useable floor area, and the energy efficiency of their specifications altered.

Before understanding the changes it is important to understand the base cases. Key data associated with each of these base cases is therefore provided below,

5.3.1 Terrace house – base case

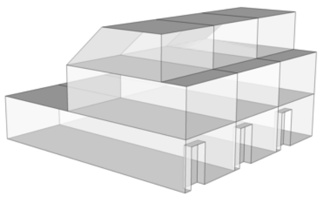
Terrace house	Accommodation type (no. of dwellings)	House (1)
	Gross floor area (Net)	132m^2 (114m^2)
	Building footprint area (w x d)	68m^2
	No. of storeys	3
	Floor to floor height (ceiling height)	2.8m (2.5m)
	Glazed fraction of wall by internal wall area	25%
	Examples of construction	Masonry construction or Insulated timber structural frame; Partial fill or full fill cavity brick façade
	Form factor	Medium
	Energy performance specifications	Good practice

Table 5.01 – Details of the terrace house 'base case'

The base case for the terrace house is 38% better than Part L 2013[32]. This is both compliant with Islington current planning policy for minor applications which requires a minimum 19% improvement over Part L 2013 and with the London Plan which requires a minimum 35% improvement over Part L 2013.

In terms of carbon offsetting to zero, Islington current planning policy for minor applications would require a flat £1,500 contribution. If the London Plan requirement on Zero Carbon were to be considered (e.g. if the terrace house was part of a larger application), a higher (£2,045) contribution into the carbon offset fund would be required.

[32] The house would achieve a 17% improvement over Part L without the 1kWp PV system assumed to be part of the 'good practice' specifications.

5.3.2 Medium rise apartment block – base case

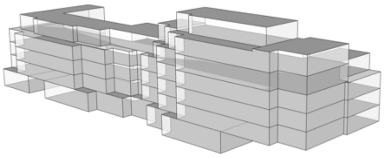
Medium rise apartment block		
	Accommodation type (no. of dwellings)	Flats (68)
	Gross floor area (Net)	6,100m^2 (5,150m^2)
	Building footprint area	770m^2
	No. of storeys	6
	Floor to floor height (ceiling height)	3m (2.5m)
	Glazed fraction of wall[33] by internal area	22%
	Examples of construction	*Concrete frame with masonry or light steel frame infill with cavity wall brick or rainscreen cladding*
	Form factor	Medium
	Energy performance specifications	Good practice

Table 5.02 – Details of the medium rise apartment block 'base case'

The base case for the apartment block is 35% better than Part L 2013[34]. This is compliant with the London Plan. In terms of carbon offsetting to zero, a £105,200 contribution into the carbon offset fund would be required.

5.3.3 School 'base case'

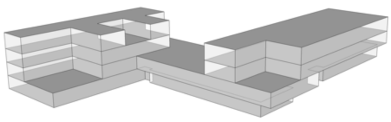
School		
	Accommodation type	School
	Gross floor area (Treated)	6,500m^2 (5,300m^2)
	Building footprint area (w x d)	1,800m^2
	No. of storeys	4
	Floor to floor height (ceiling height)	3.5m (3.0m)
	Glazed fraction of wall by internal area	45%
	Examples of construction	Concrete frame with SFS infill or CLT, cavity wall with bricks or rainscreen cladding
	Form factor	Medium
	Energy performance specifications	Good practice

Table 5.03 – Details of the school 'base case'

The base case for the school is 35% better than Part L 2013[35]. This is compliant with the London Plan which requires a minimum 35% improvement over Part L 2013. From 2019, a £104,600 contribution into the carbon offset fund will be required to offset all regulated CO_2 emissions.

[33] Defined as the proportion of the external elevation that is glass or a glazing system.
[34] The apartment block would achieve a 19% improvement over Part L without the 35kWp PV system assumed to be part of the 'good practice' specifications.
[35] The school would marginally achieve Part L compliance without the 80kWp PV system assumed to be part of the 'good practice' specifications.

5.4 Reducing energy demand – Fabric energy efficiency standard (FEES)

5.4.1 Introduction

The Fabric Energy Efficiency Standard (FEES) was developed in 2009 by the Zero Carbon Hub[36] in consultation with the housing industry. The aim of the FEES was to ensure that future Zero Carbon homes would not rely too heavily on on-site low carbon energy sources and off-site carbon offsetting but would also be energy efficient.

Extensive work and energy modelling was carried out by the Zero Carbon Hub and led to the following recommendations:

- The Fabric Energy Efficiency metric should be **kWh/m²/yr covering space heating and space cooling energy demand** (modelled utilising a notional dwelling assuming natural ventilation and excluding any internal gains from the domestic hot water system);
- **Two types of targets were proposed**: one for blocks of flats and mid terrace houses and one for semi detached, end of terrace and detached houses;
- **Two levels of targets were proposed**: 'interim' FEES for 2013-2016 and 'full' FEES from 2016.

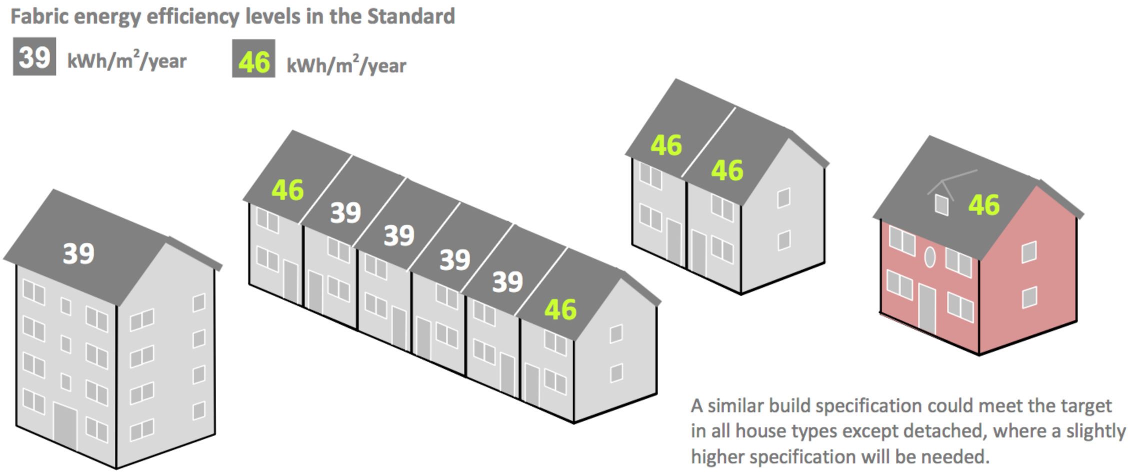


Figure 5.01 – Fabric Energy Efficiency Standard targets (© Zero Carbon Hub)

Type of residential development	Interim FEES (2013-2016)	Full FEES (from 2016)
Mid-terrace houses and blocks of flats	< 43 kWh/m²/yr	< 39 kWh/m²/yr
Semi-detached, end of terrace and detached houses	< 52 kWh/m²/yr	< 46 kWh/m²/yr

Table 5.04 – Fabric Energy Efficiency Standard targets recommended by the Zero Carbon Hub

[36] The Zero Carbon Hub was a non-for-profit organisation established in 2008 by the Government to prepare and co-ordinate the delivery of zero carbon homes in England from 2016.

The FEES calculation was incorporated into SAP 2012 and a relaxed and variable 'Target FEE' introduced in Part L 2013. 'Interim' FEES and 'full' FEES were never introduced due to delay in the implementation of the national Zero Carbon Homes policy.

Some local authorities[37] are, however, requesting compliance with 'full FEES' as a means to ensure that Zero Carbon homes designed and built in their area are energy efficient.

5.4.2 Proposed new policy requirement

In order to help ensure that new homes built in the borough are not only zero carbon but also energy efficient, it is proposed to introduce a requirement for all new homes to achieve the following Fabric Energy Efficiency Standard (FEES).

Type of residential development	Interim FEES (2019-2022)	Full FEES (from 2022)
Mid-terrace houses and blocks of flats	< 43 kWh/m²/yr	< 39 kWh/m²/yr
Semi-detached, end of terrace and detached houses	< 52 kWh/m²/yr	< 46 kWh/m²/yr

Table 5.05 – Fabric Energy Efficiency Standard targets proposed for the London Borough of Islington

5.4.3 Review of available evidence

A number of reports have been published by the Zero Carbon Hub on FEES, most importantly:

- *Defining a Fabric Energy Efficiency Standard for Zero Carbon homes* (2009);
- *Carbon compliance: setting an appropriate limit for Zero Carbon new homes* (2011).

Both reports were the result of work undertaken by Task Groups comprising a range of expertise.

The first report concludes that embedding a high level of energy efficiency within the zero carbon homes policy is important and that it will support the parallel agendas of carbon reduction, long term energy security and reducing fuel poverty. It highlights that focusing efforts on the long-lasting building fabric helps to 'future proof' the homes and avoids 'locking in' high emissions which will require refurbishment at a later date.

It argues that the metric of kWh/m²/yr is appropriate for energy demand as it is independent of fuel type and as it has a number of benefits including: design flexibility, consideration of building form and being a known 'currency' for energy efficiency. The Task Group who produced the report concluded that the construction specifications required to achieve the minimum Fabric Energy Efficiency Standard are achievable with a sufficiently wide selection of products and techniques.

Although the second report focuses on Carbon Compliance (i.e. the absolute carbon emission level recommended for different unit types achieved by on-site or near-site measures) to inform the Zero Carbon homes definition, it recommends FEES as a fabric energy efficiency standard.

[37] E.g. Queen Elizabeth Olympic Park (London Legacy Development Corporation), Northwest Cambridge and Clay Farm developments (Cambridge), North West Bicester Eco-Town (Bicester)

5.4.4 Energy modelling for the Fabric Energy Efficiency Standard (FEES)

The aim of this section is:

- to confirm the usefulness of the Fabric Energy Efficiency metric for residential developments;
- to demonstrate that it would not preclude a wide range of residential developments in Islington but reward more efficient residential buildings, both for minor and major applications.

It summarises the energy modelling work carried out on a typical terrace house and a typical medium-rise apartment block. For each building type, three different form factors and three different sets of specifications were modelled:

- **Form factor**: high, medium, low;
- **Energy performance specifications**: standard, good and best practice.

5.4.5 Terrace house – energy modelling analysis

The terrace house 'base case' was modified to test the impact on Part L performance and FEES of changes to the form factor and energy performance specifications.

Form factor

The form factor is the ratio between the total envelope area losing heat (e.g. ground floor, external walls, roofs) and the floor area. It is a useful metric for quantifying the exposed surface area of building. We have considered three levels of form factor:

- **High:** representing an 'inefficient' form;
- **Medium:** representing a 'standard' form (the 'base case');
- **Low:** representing an efficient form.

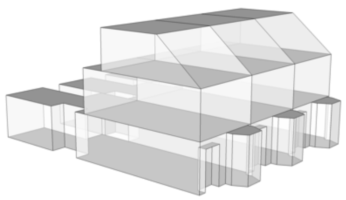
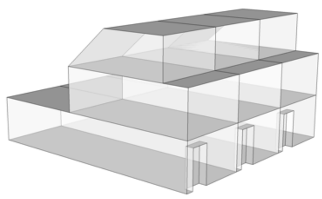
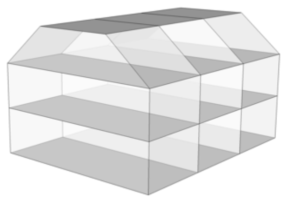
	Form factor		
	High	Medium (base case)	Low
Terrace house			
Form factor	2.0	1.8	1.2

Table 5.06 – Terrace house - form factors considered

Energy performance specifications

The energy performance specifications represent the key specifications which will influence the energy performance of a building (e.g. U-values, airtightness, heat recovery). We have considered three 'levels' of energy efficiency.

- Standard;
- Good practice;
- Best practice.

The 'Standard' category is meant to represent the type of specifications expected on developments submitted at the current time with no particular focus on energy efficiency, whereas the 'Good practice' and 'Best practice' categories represent two levels of improved energy efficient specifications

Terrace house	Performance		
	Standard ★	Good practice ★★	Best practice ★★★
Average floor U-value	0.13 W/m²K	0.10 W/m²K	0.08 W/m²K
Average wall U-value	0.18 W/m²K	0.13 W/m²K	0.10 W/m²K
Average roof U-value	0.15 W/m²K	0.12 W/m²K	0.10 W/m²K
Average window U-value	1.40 W/m²K	1.20 W/m²K	0.80 W/m²K
Average glazing g-value	0.6	0.6	0.5
External door U-value	1.60 W/m²K	1.60 W/m²K	1.20 W/m²K
Thermal bridge y-value	0.10 W/m²K	0.07 W/m²K	0.04 W/m²K
Ventilation	Continuous mechanical extract (MEV)	Good quality MVHR	Best practice MVHR
Heat recovery efficiency	0%	90%	90%
Ventilation system SFP	0.4 W/l/s	0.6 W/l/s	0.4 W/l/s
Air tightness	<5m³/m²h	<3m³/m²h	<1m³/m²h
Heating system	Identical	Identical	Identical
Energy efficient lighting	100%	100%	100%
PVs	1.0 kWp	1.0 kWp	1.0 kWp

Table 5.07 – Terrace house – energy performance specifications

Part L results (% improvement over Part L 2013)

Terrace house	Improvement over Part L 2013 (%)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	16%		
Medium form factor	16%		
Low form factor	21%		

Table 5.08 – Terrace house – Part L results of various combinations

It can be seen from the above table that percentage improvements over Part L 2013 reflect positively an increase in specifications: the percentage improvement over Part L become significantly better as U-values and other parameters are improved, which is positive. However, the percentage improvement over Part L metric does not reflect the efforts made by an architect to improve the energy efficiency of the design: there is no/little difference between the results achieved for a given form set of specifications and several form factors. This is illustrated graphically by the bar chart below, which shows that they do not change significantly.

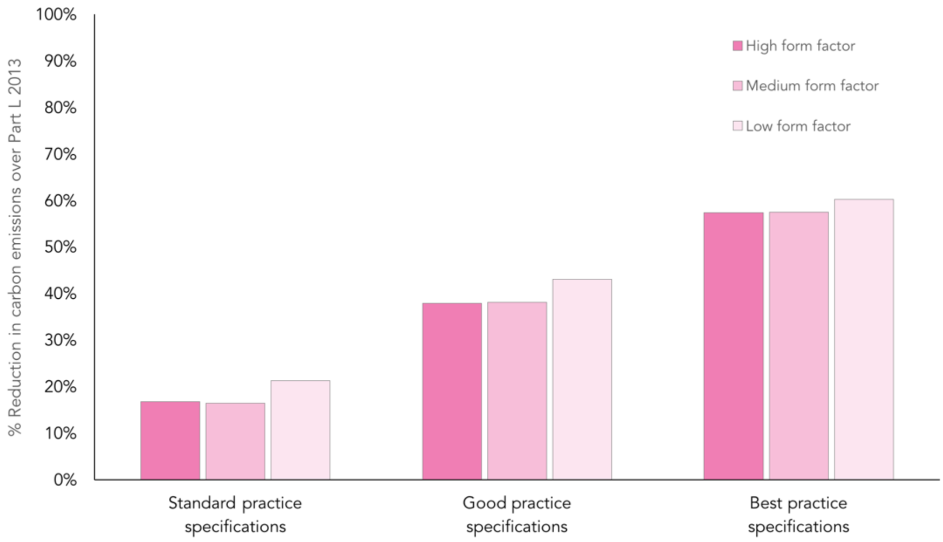


Figure 5.02 – Terrace house – Improvement over Part L of various combinations

The results in Table 5.08 have been colour-coded to show which combinations would be compliant with the current London Plan (minimum on-site 35% improvement over Part L 2013). The 'standard' specifications would not be sufficient and would require an increase in PV area. The 'good practice' and 'best practice' specifications would be sufficient, whatever the form factor.

FEES results

Terrace house	Fabric Energy Efficiency Standard (FEES)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	50 kWh/m²/yr	41 kWh/m²/yr	
Medium form factor	47 kWh/m²/yr		
Low form factor	37 kWh/m²/yr	31 kWh/m²/yr	25 kWh/m²/yr

Table 5.09 – Terrace house – FEES performance of various combinations

In comparison to percentage improvements over Part L, the Fabric Energy Efficiency Standard is much better at valuing both the increase in energy efficient specifications but also the efforts made to make the form of the building more efficient. This is illustrated graphically in the bar chart below.

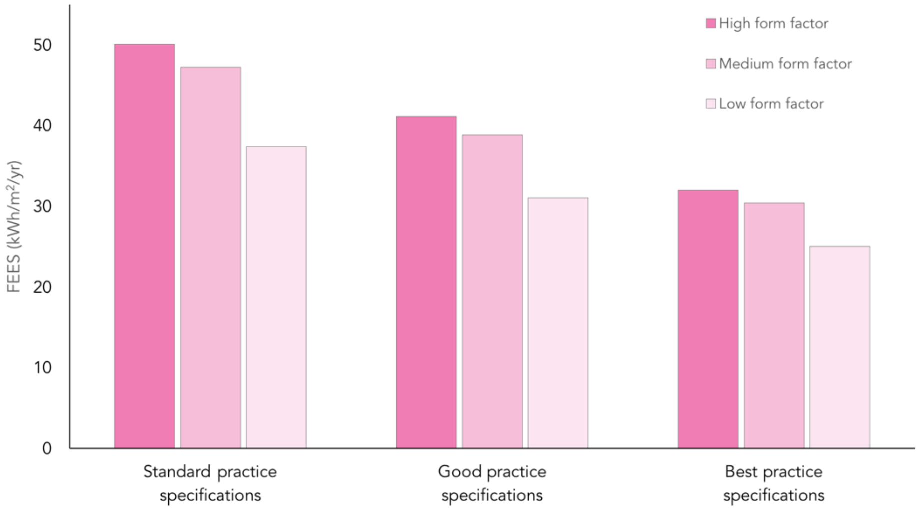


Figure 5.03 – Terrace house – FEES results of various combinations

Cells coloured in green in the table also show the combinations which would comply with 'full FEES' and those in amber which comply with 'interim FEES'. It therefore demonstrates that 7 out of the 9 combinations would comply with the new policy. The two 'worst' cases would not be policy compliant: it shows that FEES would discourage applicants from proposing buildings which combine a high form factor with standard or good practice specifications, in other words poorly efficient buildings. Applicants would have to improve the form factor or the specifications in order to comply. It would therefore encourage efficient combinations:

- either through the form: all sets of specifications with a low form factor would comply, demonstrating that viability would not become a problem;
- and/or through the specifications: all good practice and best practice specifications would comply showing that it would not limit architectural freedom.

5.4.6 Medium rise apartment block – energy modelling analysis

The apartment block 'base case' was also modified to enable to test the impact on Part L performance and FEES of the form factor and different 'grades' of energy performance specifications.

Form factor

We have considered three 'levels' of form factor:

- **High:** representing an 'inefficient' form;
- **Medium:** representing a 'standard' form (the 'base case');
- **Low:** representing an efficient form.

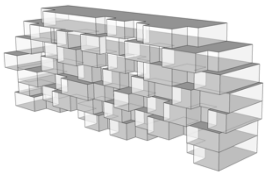
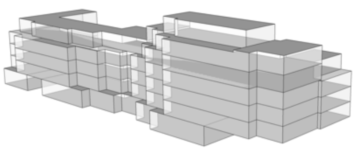
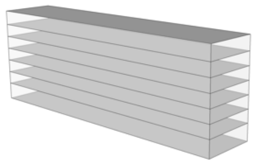
	Form factor		
	High	Medium (base case)	Low
Apartment block			
Form factor	1.5	1.2	0.9

Table 5.10 – Apartment block - form factors considered

Energy performance specifications

The energy performance specifications represent the key specifications which will influence the energy performance of a building (e.g. U-values, airtightness, heat recovery). We have considered three 'levels' of energy efficiency.

- Standard;
- Good practice;
- Best practice.

The 'Standard' category is meant to represent the type of specifications expected on developments with no particular focus on energy efficiency, whereas the 'Good practice' and 'Best practice' categories represent two improved grades of energy efficient specifications

Apartment block	Performance		
	Standard ★	Good practice ★★	Best practice ★★★
Average floor U-value	0.13 W/m^2K	0.10 W/m^2K	0.08 W/m^2K
Average wall U-value	0.18 W/m^2K	0.15 W/m^2K	0.13 W/m^2K
Average roof U-value	0.15 W/m^2K	0.13 W/m^2K	0.10 W/m^2K
Average window U-value	1.40 W/m^2K	1.20 W/m^2K	0.80 W/m^2K
Average glazing g-value	0.6	0.6	0.5
Thermal bridge y-value[38]	0.10 W/m^2K	0.07 W/m^2K	0.04 W/m^2K
Ventilation	Continuous mechanical extract (MEV) (System 2)[39]	Good quality MVHR with efficiency >90% (System 4)	Designed MVHR system with efficiency >90% (System 4)
Effective system heat recovery efficiency	0%	90%	90%
Ventilation system SFP	0.4 W/l/s	0.6 W/l/s	0.4 W/l/s
Air tightness	<5m^3/m^2h	<3m^3/m^2h	<1m^3/m^2h
Heating system	Identical	Identical	Identical
Energy efficient lighting	100%	100%	100%
PVs	35 kWp	35 kWp	35 kWp

Table 5.11 – Apartment block – energy performance specifications

Part L results (% improvement over Part L 2013)

Apartment block	Improvement over Part L 2013 (%)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	15%		
Medium form factor	15%		
Low form factor	17%		

Table 5.12 – Apartment block – Part L results of various combinations

Similarly to the terrace house, it can be seen from the above table that percentage improvements over Part L 2013 correlate to an increase in specifications with the percentage improvement over Part L become significantly better as U-values and other parameters are improved.

[38] ACD = Accredited Construction Details; BPD = Best Practice calculated thermal bridging
[39] System numbers are as defined in the Building Regulations Approved Document Part F 2010.

However, it can also be seen that the percentage improvement over Part L metric is not suitable for reflecting the efforts made by an architect to improve the energy efficiency of the design: there is virtually no difference between the results achieved for a given set of specifications and several form factors. This is illustrated graphically by the bar chart below.

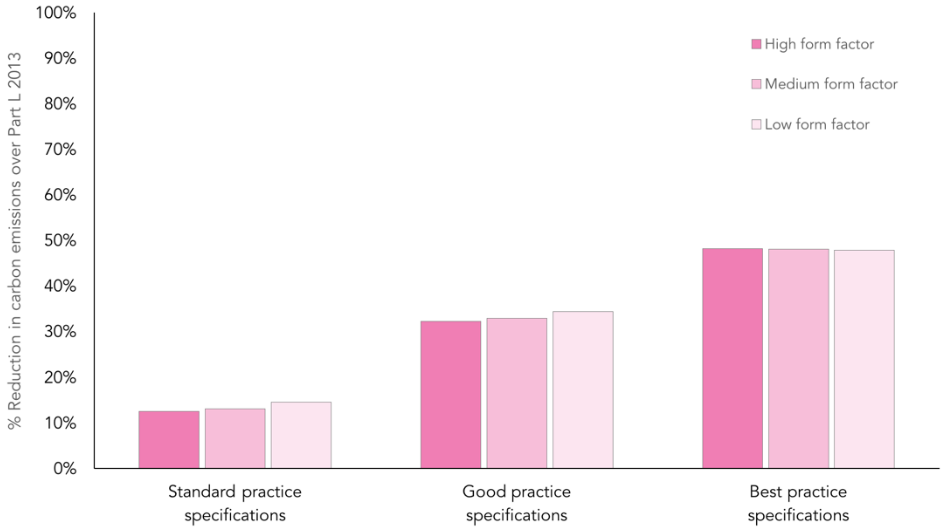


Figure 5.04 – Apartment block – Improvement over Part L of various combinations

The results in Table 5.12 have also been colour-coded to show which combinations would be compliant with the current London Plan (minimum on-site 35% improvement over Part L 2013). The 'standard' specifications would not be sufficient and would require an increase in PV area. The 'good practice' and 'best practice' specifications would be sufficient, whatever the form factor.

FEES results

Apartment block	Fabric Energy Efficiency Standard (FEES)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	41 kWh/m²/yr		
Medium form factor	38 kWh/m²/yr	31 kWh/m²/yr	25 kWh/m²/yr
Low form factor	33 kWh/m²/yr	27 kWh/m²/yr	22 kWh/m²/yr

Table 5.13 – Apartment block – FEES performance of various combinations

In comparison with improvements over Part L, the Fabric Energy Efficiency Standard is much better at valuing both the increase in energy efficient specifications and the efforts made to make the form of the building more efficient. This is illustrated graphically in the bar shown in figure 5.05.

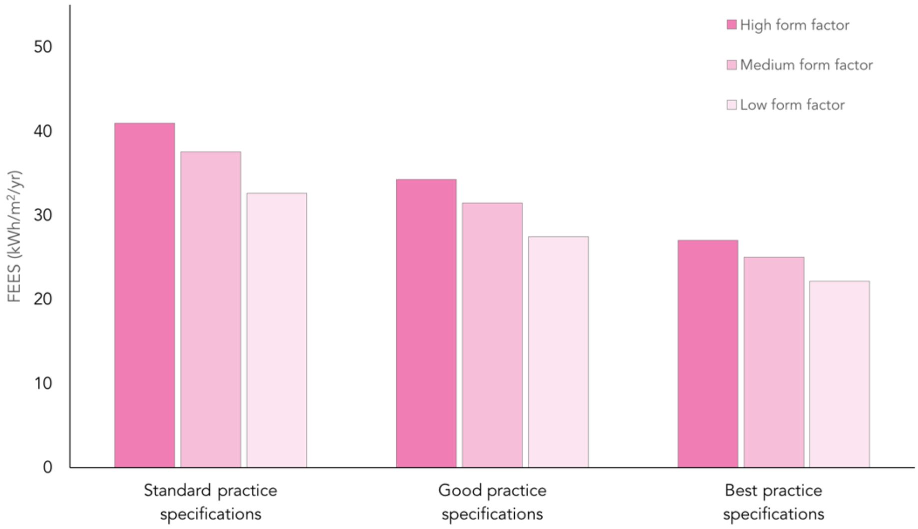


Figure 5.05 – Apartment block – FEES results of various combinations

Cells coloured in green in Table 5.13 show the combinations which would comply with 'full FEES' and those in amber those which comply with 'interim FEES'. It therefore demonstrates that 9 out of the 9 combinations would comply with the new policy. The 'worst' case combination (i.e. high form factor and 'standard practice' specifications) would only become non-policy compliant after 'full FEES' are introduced.

In addition, this metric would be useful to enable clients to quantify the efforts made not only in terms of specifications, but also with the building design itself, without constraining architectural freedom.

5.4.7 Conclusion

This section demonstrates that the Fabric Energy Efficiency Standard can effectively help assessment of changes to both specification and building form, and would be a useful metric to introduce to planning policy. Although Part L can help to assess better specifications, it is not the right tool and metric to assess an applicant's effort to design and build more efficient building forms. As form has a direct influence on energy efficiency through the increased heat loss areas and thermal bridges, it is considered appropriate for planning policy to adopt this more holistic approach towards energy efficiency.

In addition, as the Fabric Energy Efficiency Standard enables more flexibility, it could assist viability: applicants would be able to propose a more efficient building by improving its form factor (which saves costs) not just by increasing the specifications. Changes could therefore be cost neutral or even cost positive.

Finally, it would help the London Borough of Islington to gradually eliminate the worst designs in terms of energy efficiency by preventing poor building design being hidden by high on-site renewable generation.

5.5 Reducing energy demand – Improved predicted energy use during design (using PHPP and/or TM54)

5.5.1 Introduction

Planning and design carbon metrics based exclusively on Part L percentage improvements cannot be measured once a building is in operation. This makes efforts to reduce the performance gap very challenging as there is no simple feedback loop. It also makes it impossible to quantify the impact of planning policy, at a building scale or at a borough level.

Seeking to predict the future energy performance of a building and using a metric which can be verified in operation would help to deliver better buildings in Islington. The prediction can be undertaken pre-planning, checked throughout design/construction and then verified during operation. This would then be reported through the Green Performance Plan already required by the London Borough of Islington.

An annual 'kWh/m^2 (energy use) metric' has the advantage of being a very basic metric which can be easily compared against post occupancy surveys of comparable buildings during the briefing stage, evaluated during the design, checked during operation and translated into both carbon and financial costs and savings throughout the process. In the context of the current and future decarbonisation of the grid, it also helps to make the assessment metric independent from this effect and therefore simplify the monitoring and comparison during the lifetime of a building and its design/construction.

This would also enable the potential future adoption of energy standards based on performance metrics (e.g. Passivhaus, AECB Silver, NABERS , DEC A rating performance contracts, Better Buildings Partnership Landlord Energy Rating).

Predicting the future energy use of buildings in Islington would require evolving the current energy modelling approach towards better energy assessment. There are existing methodologies and tools available (e.g. CIBSE TM54, PHPP) and better energy modelling is essential to ensure that design and construction choices are well informed.

An annual heat demand metric (kWh/m^2) could also potentially be introduced to address the specific and challenging issue of heat demand.

5.5.1 Proposed new policy requirement

Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology.

The kWh/m^2/yr and kWh/yr figures would become GPP indicator targets. Over time these measures can be used to compare actual energy use, and the methodology and targets could be refined.

5.5.2 Energy assessment methodologies/tools

The energy assessment methodologies tools mentioned in this section are:

- Part L, assessed by software adopting the SAP methodology for residential and by approved software such as TAS and IES for non-residential buildings;
- CIBSE TM54, a methodology developed by CIBSE to predict actual energy use at design stage;
- PHPP, a methodology and a tool developed by the Passivhaus Institute.

5.5.3 Review of available evidence

CIBSE TM54

The following text is based on extracts from *CIBSE TM54 – Evaluating operational energy performance of buildings at design stage*, published in 2013.

In the UK, energy models are used at the design stage to compare design options and to check compliance with Building Regulations. These energy models are not intended as predictions of energy use, but are sometimes mistakenly used as such.

In some other countries, total energy use at the design stage is estimated through voluntary standards. For example, the Australian NABERS (a building rating system) encourages the estimation of energy use at the design stage and provides guidance for designers/modellers.

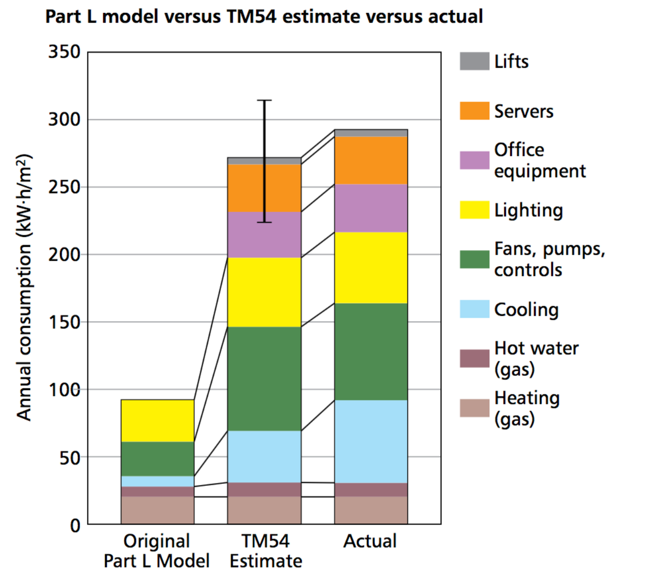


Figure 3 Results of applying the methodology to the case study building

Figure 5.06 – Extracts from CIBSE TM54 – Evaluation operational energy performance of buildings at design stage

PHPP

The CEPHEUS project reviewed the actual energy performance of residential buildings built to the Passivhaus standard and other low energy standards in 14 European locations. The project demonstrated that the effect of building thermal performance on predicted energy consumption can be modelled accurately with PHPP, particularly in terms of heating demand.

Although the data always shows an (expected) statistical spread between residential units, the PHPP results correlated well with the average measured results. PHPP provided more accurate results than conventional calculation methods, which can be partially explained by the fact that it has been developed for energy efficient buildings and validated by empirical data.

5.5.4 Aim of this section

The aim of this section is to justify why requiring assessments of predicted energy use (e.g. TM54, PHPP) rather than Part L only assessments would provide better information to applicants and design teams and therefore drive the design and delivery of better residential and non-residential buildings.

It summarises the energy modelling work carried out on a typical medium-rise apartment block and a typical school. For each building type, three different form factors and three different sets of specifications were modelled:

- **Form factor**: high, medium and low;
- **Energy performance specifications**: standard, good and best practice.

5.5.5 School – energy modelling analysis

Energy use in good-performing schools

A variety of sources have been used to compare the energy modelling results from Part L, PHPP and TM54 to actual energy data.

- Technical Memorandum 46 'Energy benchmarks' sets fossil fuels and electricity consumption benchmarks for a wide range of building types, including schools;
- CIBSE Guide F 2012 'Energy Efficiency in Buildings' provides very broad energy benchmarks for good practice design;
- Post Occupancy Evaluation (POE) data from the Partnership for Schools programme with details on the annual heating and electrical consumption based on measured data obtained from the schools surveyed, collected through their monthly meter readings, utility bills, or from records of energy use collected by the school's LA energy manager;
- The CarbonBuzz database (median actual performance values for existing schools) and detailed building performance feedback from Innovate UK;
- Passivhaus: considered the 'gold standard' of energy efficiency, this standard sets quantitative energy targets: a heat demand of less than 15 $kWh/m^2/yr$ and a total primary energy demand of less than 120 $kWh/m^2/yr$, equivalent to an actual total energy demand of less than 70 $kWh/m^2/yr$ approximately.

The data shows annual heating consumption for existing schools varying between less than 15 $kWh/m^2/yr$ (Passivhaus schools) to approximately 150 $kWh/m^2/yr$, with most schools having an annual heating consumption of over 80 $kWh/m^2/yr$.

The data also shows total energy for existing schools varying between less than 70 $kWh/m^2/yr$ (Passivhaus schools) to approximately 190 $kWh/m^2/yr$, with most schools having an annual energy consumption of over 140 $kWh/m^2/yr$.

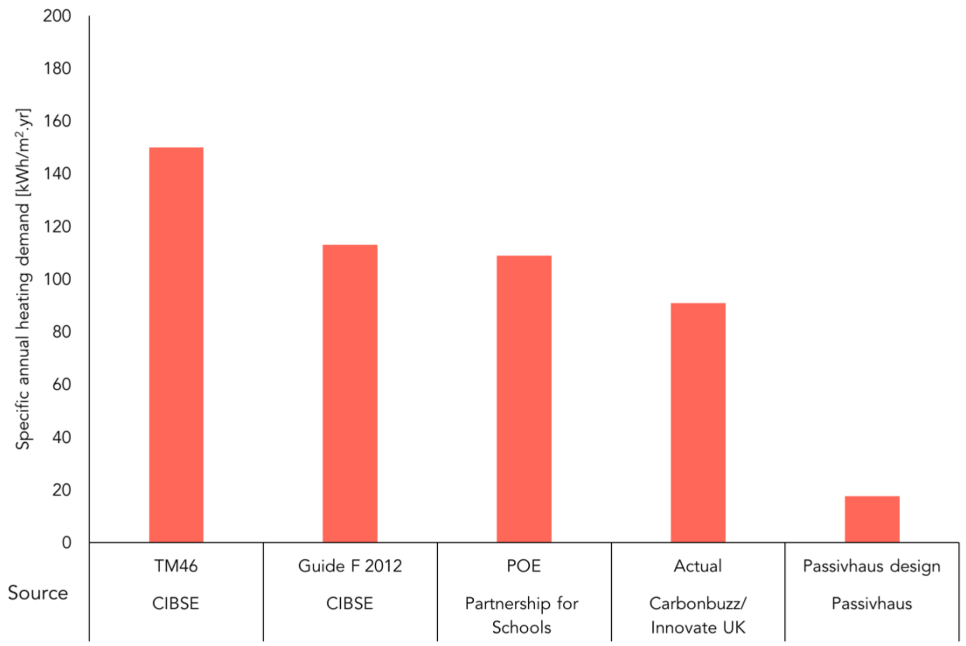


Figure 5.07 – Heating consumption benchmarks for primary schools

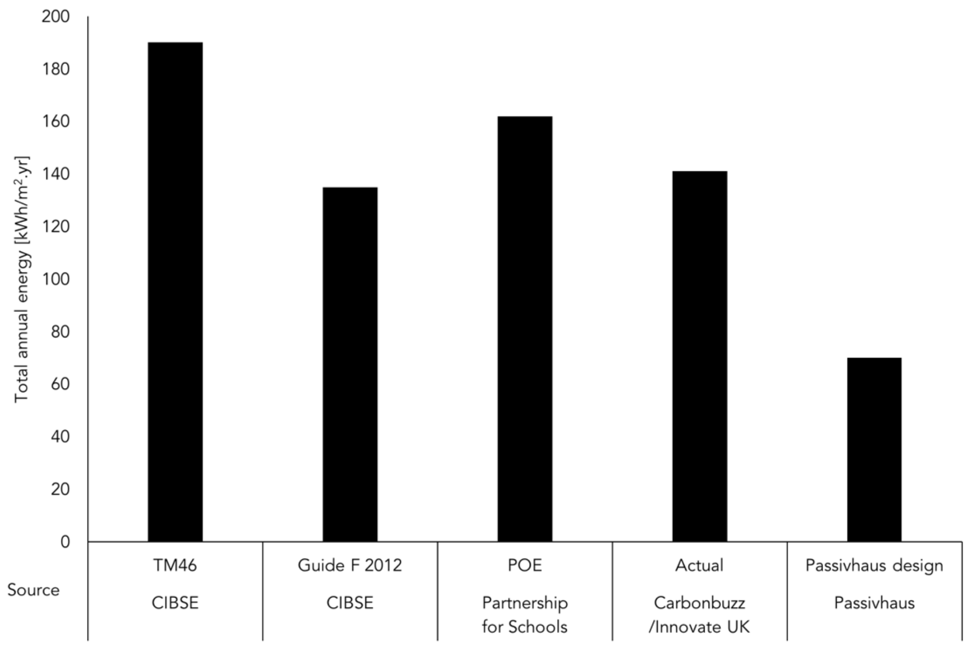


Figure 5.08 – Total energy consumption benchmarks for primary schools

Form factor

The school 'base case' was modified to enable assessments of energy consumption of using either Part L, PHPP or TM54.

The form factor is the ratio between the total envelope area losing heat (e.g. ground floor, external walls, roofs) and the floor area. We have considered three grades of form factor:

- **High:** representing an 'inefficient' form;
- **Medium:** representing a 'standard' form;
- **Low:** representing an efficient form.

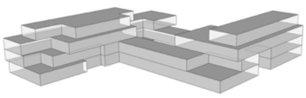
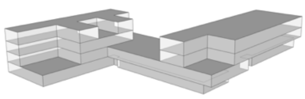
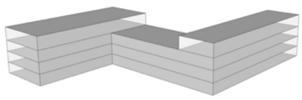
	Form factor		
	High	Medium (base case)	Low
School			
Form factor	1.7	1.3	1.1

Table 5.14 – School - form factors

Energy performance specifications

The energy performance specifications represent the key specifications which will influence the energy performance of a building (e.g. U-values, airtightness, heat recovery). We have considered three grades of energy efficiency.

- Standard;
- Good practice;
- Best practice.

The 'Standard' category is meant to represent the type of specifications expected on developments with no particular focus on energy efficiency, whereas the 'Good practice' and 'Best practice' categories are meant to represent two grades of energy efficient specifications

School	Performance		
	Standard ★	Good practice ★★	Best practice ★★★
Average floor U-value	0.15 W/m²K	0.12 W/m²K	0.09 W/m²K
Average wall U-value	0.20 W/m²K	0.18 W/m²K	0.13 W/m²K
Average roof U-value	0.15 W/m²K	0.13 W/m²K	0.11 W/m²K

Average window U-value	1.40 W/m²K	1.20 W/m²K	0.80 W/m²K
Average g-value	0.6	0.6	0.5
External door U-value	1.60 W/m²K	1.60 W/m²K	1.60 W/m²K
Thermal bridge %	5%	3%	1%
Ventilation	Natural ventilation	Good quality MVHR	Best practice MVHR
Heat recovery efficiency	0%	70%	90%
Ventilation system SFP	0.5 W/l/s	1.6 W/l/s	1.2 W/l/s
Air tightness	<5m³/m²h	<3m³/m²h	<1m³/m²h
Boiler Efficiency	91%	91%	91%
Average Lighting Efficacy	75 lumens/Watt	75 lumens/Watt	75 lumens/Watt
Lighting Controls	PIR Occupancy* + Daylight Dimming	PIR Occupancy* + Daylight Dimming	PIR Occupancy* + Daylight Dimming
Power factor	0.9 to 0.95	0.9 to 0.95	0.9 to 0.95
PVs	80 kWp	80 kWp	80 kWp

** PIR Occupancy sensors in non-teaching spaces only*

Table 5.15 – School – energy performance specifications

Part L results (% improvement over Part L 2013)

School	Improvement over Part L 2013 (%)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	52%	36%	45%
Medium form factor	49%	35%	43%
Low form factor	50%	35%	45%

Table 5.16 – School – Part L results of various combinations

Similarly to the terrace house and the apartment block, it can be seen from the above table that the percentage improvement over Part L metric is not suitable for reflecting the efforts made by an architect to improve the energy efficiency of the design: there is virtually no difference between the results achieved for a given set of specifications and different form factors.

In fact Part L results show that 'standard practice' specifications lead to a greater improvement over Part L 2013 than 'good Practice'. This is unintuitive, and is likely to be due to ventilation strategy: natural ventilation under 'standard practice' rather than MVHR under 'good practice' and 'best practice'.

Further analysis in table 5.17 shows that in reality MVHR is generally a more energy efficient strategy in schools and demonstrates a clear correlation between the chosen specification and the energy performance.

Space heating demand

School	Space heating demand (kWh/m²/yr) – Part L vs PHPP					
	Standard ★		Good practice ★★		Best practice ★★★	
	Part L	PHPP	Part L	PHPP	Part L	PHPP
High form factor	9	62	1	43	1	19
Medium form factor	9	60	1	41	1	18
Low form factor	8	54	1	37	0	15

Table 5.17 –School – Estimate of space heating demand using the different methodologies

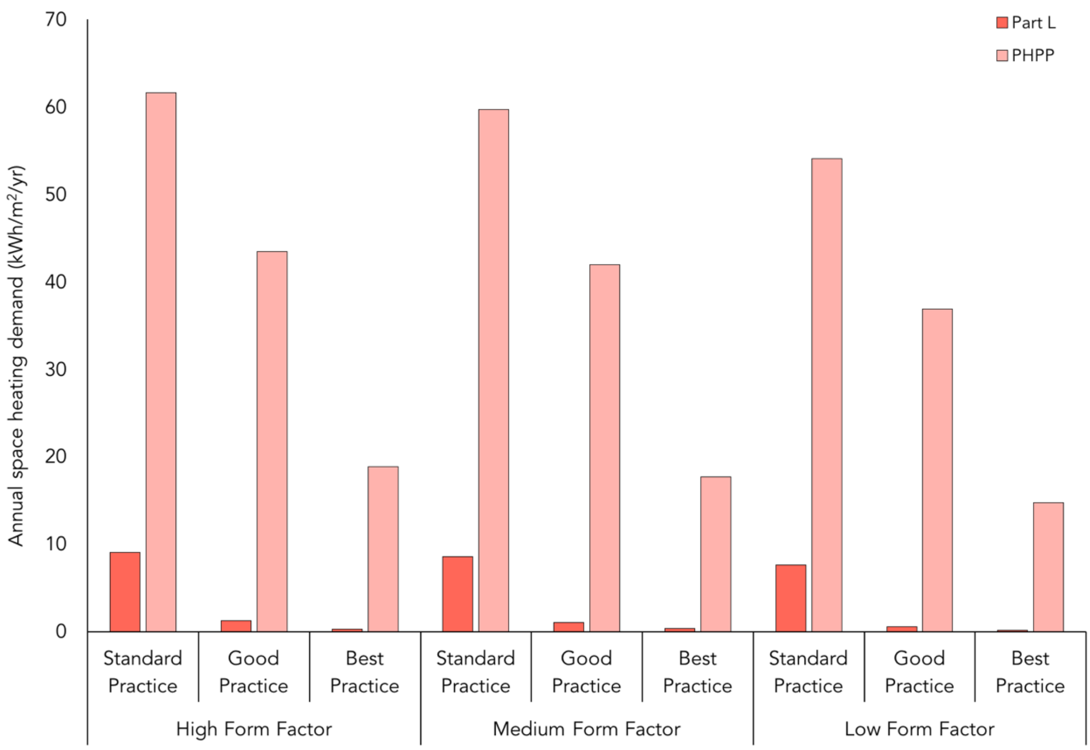


Figure 5.09 – School – Assessment of space heating demand using Part L or PHPP

It is clear that the Part L assessment underestimates space heating demand. This is problematic as design and construction changes (e.g. relaxation of U-value or airtightness target) will have a minor effect on Part L CO_2 emissions, but a much more significant one on actual CO_2 emissions.

Total energy consumption

School	Total energy consumption (kWh/m²/yr) – Part L vs PHPP					
	Standard ★		Good practice ★★		Best practice ★★★	
	Part L	PHPP	Part L	PHPP	Part L	PHPP
High form factor	54	119	54	117	51	110
Medium form factor	54	100	54	98	51	93
Low form factor	51	75	53	73	51	70

Table 5.18 –School – Estimate of total energy consumption using the different methodologies

It is clear from the table that Part L underestimates future energy consumption significantly. It is not impacted by any change in form factor as heating consumption is very small.

Part L vs PHPP vs TM54

Assuming a medium form and standard practice specification, a TM54 assessment was undertaken and compared with the Part L and PHPP energy assessments. Despite some differences, the scale of energy consumption based on PHPP and TM54 is very similar, demonstrating that both methodologies/tools could be used to predict likely future energy consumption.

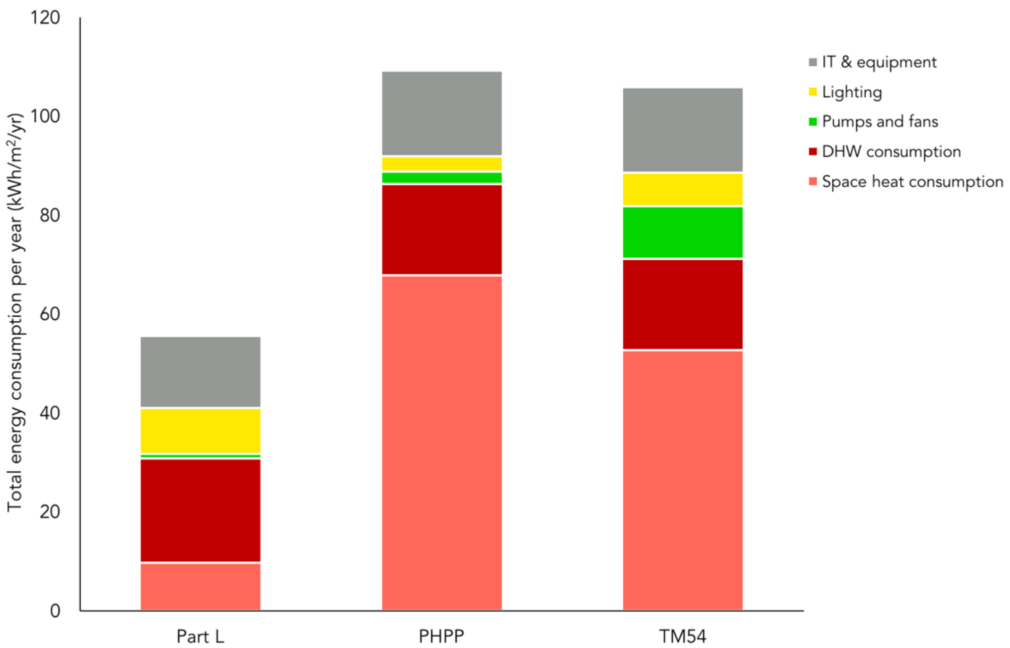


Figure 5.10 – School – Assessment of total energy use using Part L, PHPP or TM54 (medium form factor and standard specifications)

5.5.6 Medium rise apartment block – energy modelling analysis

The medium rise apartment block 'base case' was modified to enable analysis based on energy consumption assessed using Part L and PHPP.

Comparison with energy use in recent apartment blocks

Energy data on recently completed apartment blocks is very difficult to find. Innovate UK published in 2016 the findings of their building performance evaluation programme for domestic projects. The report looked at data from a subset of 76 homes, of which a relatively low number are apartments. Among them, energy consumption of some apartments have been measured in the following apartment blocks.

One Brighton is a mixed-use development comprising 172 apartments with office and community space below. The buildings have an efficient thermal envelope and low-energy appliances. A biomass boiler and PV array provide heat. A community energy services company manages the energy.

Andre Street in London, is a four-storey block of 23 apartments. It uses air source heat pumps drawing energy from exhaust air.

Rotherham estate is a development of 24 two-to four-bedroom homes (including two homes designed to Code for Sustainable Homes Level 5) with solar electric and solar thermal systems. They have air source heat pumps.

Based on this very limited set of data, the average energy consumption in these modern apartments appear to be between 75kWh/m^2/yr and 130 kWh/m^2/yr and the breakdown of the energy use is not detailed. However, it is very important to note that there is a distinct lack of data on actual energy consumption of modern apartments. Therefore we do not believe that this data can be used as robust benchmarks.

Form factor

The same form factors as used in Section 5.4 have been modelled: **high** (representing an 'inefficient' form), **medium** (representing a 'standard' form) and **low** (representing an efficient form).

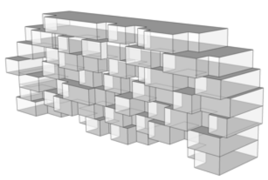
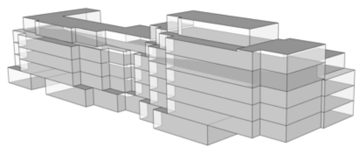
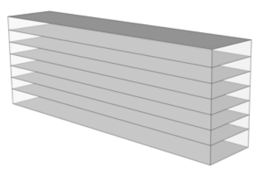
	Form factor		
	High	Medium (base case)	Low
Apartment block			
Form factor	1.5	1.2	0.9

Table 5.19 – Apartment block - form factors considered

Energy performance specifications

The same energy performance specifications as used in Section 5.4 have been modelled (i.e. standard, good practice and best practice). Please refer to table 5.11 for more details.

Part L results (% improvement over Part L 2013)

Apartment block	Improvement over Part L 2013 (%)		
	Standard ★	Good practice ★★	Best practice ★★★
High form factor	15%		
Medium form factor	15%		
Low form factor	17%		

Table 5.20 – Apartment block – Part L results of various combinations

Space heating demand

Apartment block	Space heating demand (kWh/m²/yr)					
	Standard ★		Good practice ★★		Best practice ★★★	
	Part L	PHPP	Part L	PHPP	Part L	PHPP
High form factor	35	51	18	26	8	14
Medium form factor	32	44	15	20	6	10
Low form factor	27	33	11	13	3	5

Table 5.21 – Apartment block – Estimate of space heating demand using the different methodologies

Apartment block	Space heating demand (kWh/m²/yr) – Comparison with Part L estimate					
	Standard ★		Good practice ★★		Best practice ★★★	
	Part L	PHPP	Part L	PHPP	Part L	PHPP
High form factor	Ref	+46%	Ref	+41%	Ref	+85%
Medium form factor	Ref	+38%	Ref	+32%	Ref	+80%
Low form factor	Ref	+22%	Ref	+11%	Ref	+60%

Table 5.22 – Apartment block – Estimate of space heating demand using the different methodologies

The tables above illustrate that there is a significant discrepancy between the estimate of space heating demand by Part L and by PHPP, particularly with best practice specifications (which are likely to become more adopted in the future).

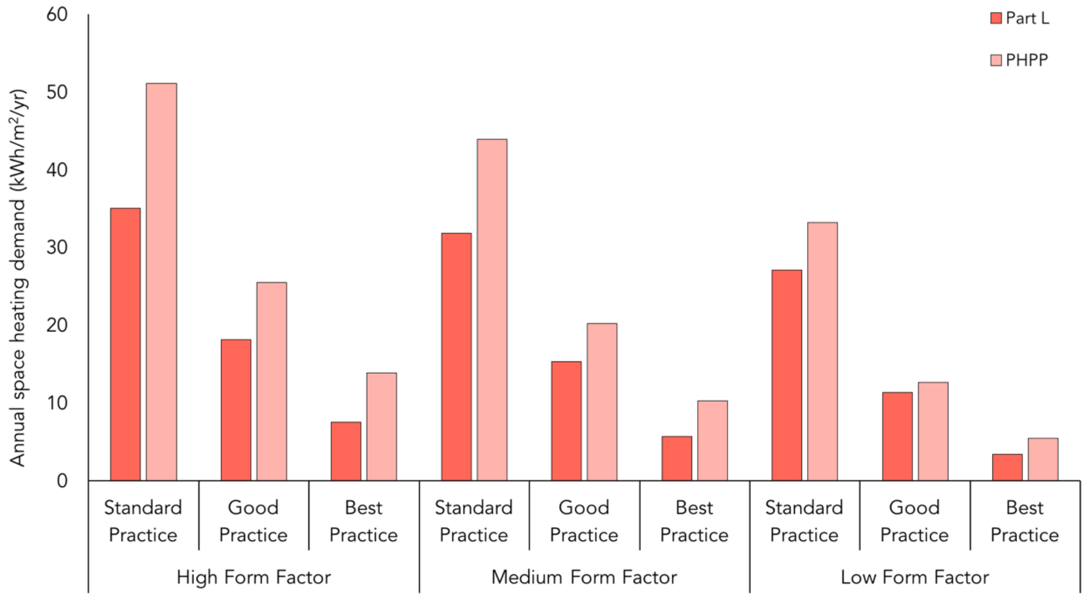


Figure 5.11 – Comparison between predicted annual space heating demand from PHPP and Part L calculations for different form factors and performance.

Total energy consumption

Apartment block	Total energy consumption (kWh/m²/yr)					
	Standard ★		Good practice ★★		Best practice ★★★	
	Part L	PHPP	Part L	PHPP	Part L	PHPP
High form factor	117	98	99	73	86	58
Medium form factor	113	90	96	67	84	54
Low form factor	108	78	92	58	82	48

Table 5.23 –Apartment block – Estimate of energy demand (other than space heating) using the different methodologies

Commentary

Part L consistently estimates a lower heating demand than the PHPP calculation, particularly at better levels of specifications and at higher form factors. This means that the buildings with a complex shape are not impacted as much in Part L. Conversely for other energy uses Part L consistently predicts a much higher consumption than PHPP. This means designers may prioritise considerations other than the fabric performance. The figure below shows the breakdown of consumption by use for the example building assuming a medium form factor and 'standard' specifications.

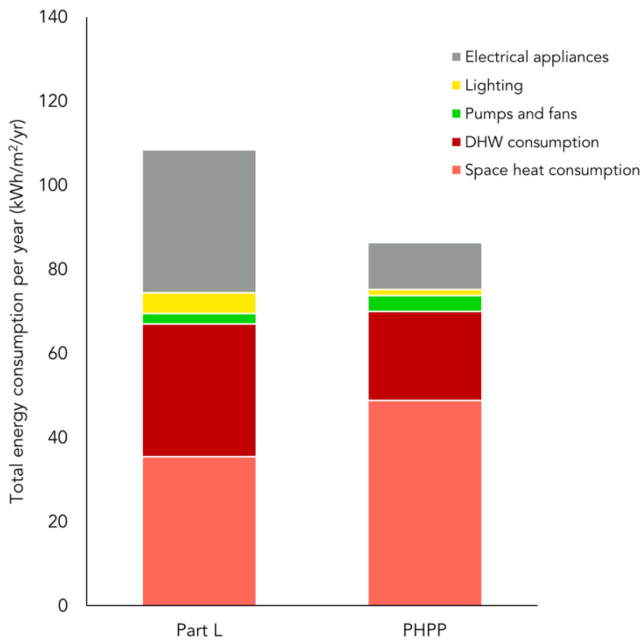


Figure 5.12 – Predicted breakdown of annual energy consumption by use for a block of apartments with medium form factor and a standard specification from Part L and PHPP calculations.

Analysis / commentary

This section demonstrates that requiring assessments of predicted energy use (using PHPP or TM54) rather than Part L only assessments would provide better information to applicants and design teams and therefore drive the design of better residential and non-residential buildings.

5.6 Decarbonising electricity

5.6.1 Proposed new policy requirement

Promoting decarbonisation of the electricity grid generally falls outside the scope of London Borough of Islington's responsibility and is down to national policy, with the exception of encouraging solar PV on buildings and dynamic demand management/peak shaving measures. However, the effects of decarbonisation do have a significant impact on several key policy areas.

The main effects of electricity decarbonisation on the carbon emissions from buildings are:

1. Carbon emissions associated with electricity use for lighting, pumps, fans and other auxiliary services within buildings will fall as the grid decarbonises.
2. Carbon emissions arising from heating systems that either use or produce[40] (indirectly) electricity will change substantially.
3. The effectiveness of solar PV to reduce carbon emissions and improve performance against Part L will diminish[41].

It is important to understand both the rate and magnitude of change in grid carbon emissions, and the effect of these changes, over the period the policy is designed to impact. It is the reason why one of the policy requirement is to require the use of more accurate carbon factors for grid electricity than the one embedded in Part L.

5.6.2 Understanding carbon factors

The carbon factor for grid electricity is a measure of how much carbon dioxide is produced, on average, per unit (or kilowatt hour) of grid electricity. The actual value varies constantly as the output of different generators changes due to variations in demand and in the availability of different energy sources such as the wind and sun. The value is also changing over the longer term as the mix of different generation technologies changes and carbon intensive forms of generation such as coal are replaced with low carbon sources such as wind, solar and nuclear.

A variety of organisations calculate and publish annual average carbon factors for grid electricity. These tend to vary based on the assumptions and the averaging period each organisation uses. While the assumptions tend to make quite small differences[42], using averaging periods greater than one year can significantly skew results.

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[40] For example, gas fired CHP systems.

[41] Paradoxically, more PV is required to decarbonise the grid, yet the more that is deployed the lower the incentive (in carbon terms) to continue to deploy more.

[42] Typical assumptions may include the efficiency of different generators and the carbon content of different fuels.

Some of the published data, such as the carbon factors produced by DEFRA for company reporting, use 3 or 5 year rolling averages. These carbon factors are therefore very slow to respond to changes in the grid carbon content and are not appropriate for use in policy development. More up to date carbon factors are available from BEIS, National Grid and the Drax Group as discussed in Appendix B.

Two important carbon factors used for calculating emissions from buildings are compared below:

Energy type	SAP2012 (Part L)	DUKES 2017 (BEIS)
Electricity	519 g/kWh	254 g/kWh

Table 5.24 – Part L vs actual carbon content of grid electricity

The SAP 2012 figure is currently used to calculate the carbon emissions from every new building in the United Kingdom, for any refurbishments that require Part L assessments, and for the carbon emissions indicated on a property's Energy Performance Certificate.

As shown in figure 5.13, the SAP 2012 figure anticipated that grid emission factors would remain similar to the previous 15 year period, during which they had been relatively stable. This has turned out to be a very conservative estimate however, as over the past five years the country has witnessed the most rapid period of decarbonisation since data became available in the 1970's.

The most up to date government figure for the grid emission factor is only 254gCO_2/kWh, less than half the value that is currently being used to assess buildings. As a result, the results of any calculations based on the carbon factors for electricity contained within SAP 2012 are misleading. This affects all three of the key areas previously outlined in section 5.6.1.

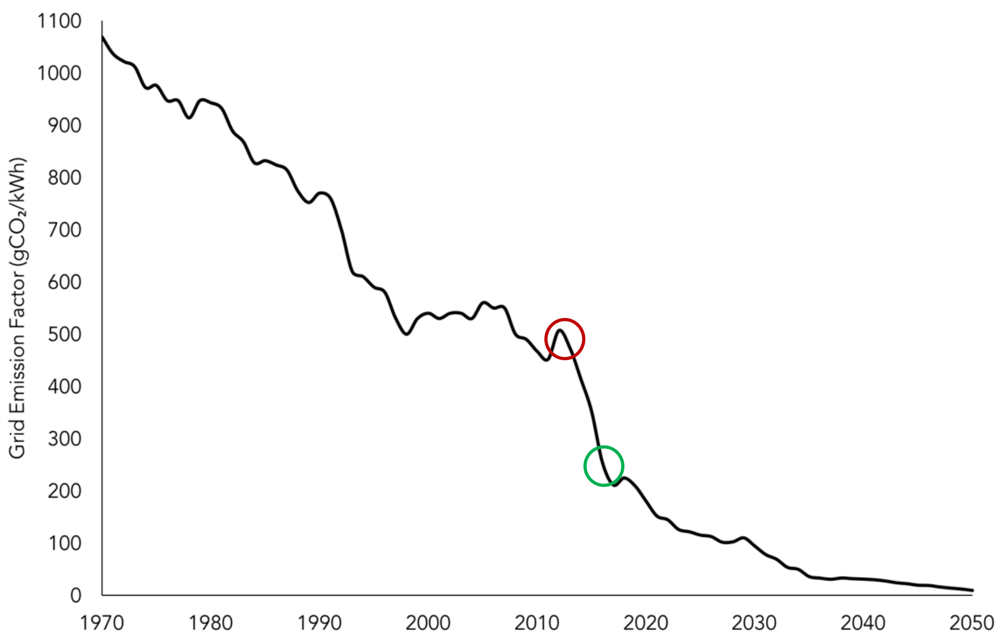

Figure 5.13 – Past and projected future CO_{2e} emissions factors for grid electricity

Figure B.01 (Appendix B) shows a more detailed version of figure 5.13, which includes over 40 years of historical data from a variety of sources and additional scenarios from the National Grid.

5.7 Decarbonising heat – estimating the carbon content of heat

5.7.1 Proposed new policy requirements

Two policy recommendations have been provided to encourage the decarbonisation of heat:

Accurate carbon factors

This would require applicants to calculate the carbon factor of heat using up to date carbon emissions factors for grid electricity. This is necessary as the carbon factor of heat from several key technologies[43] is calculated based on the carbon content of electricity.

It is recommended that the carbon factor for grid electricity is obtained from the most recently available Digest of UK Energy Statistics (DUKES), which is published each year by BEIS. As this figure is updated annually by central government, it would not put the onus on the London Borough of Islington to update the guidance annually. The most recent DUKES was released in July 2017 and indicates that the average grid electricity carbon factor for 2016 was 254 gCO_2/kWh[44].

Alternatively, the London Borough of Islington could produce guidance on which carbon factors should be used by applicants in their energy calculations. The guidance can be updated if and when required.

Setting a maximum carbon content for heat

This would require applicants to specify heating systems with a carbon content of heat below a given level. This would both ensure that high carbon heating systems are no longer installed in new buildings and create a performance indicator at project level against the strategic objective to decarbonise heat.

It should be noted that in order for this recommendation to be effective, it would have to be implemented alongside the recommendation above (accurate carbon factors) to ensure the calculated carbon content of heat is correct.

Initially it is recommended that the maximum permissible carbon content of heat is set at 280 gCO_2/kWh. This would permit the use of both efficient low NOx individual and communal gas boilers, while prohibiting the use of poorly efficient gas boiler systems and district heating with natural gas fired CHP systems[45] with no established plans for low carbon heat in the short to medium term. Over time the level could be reduced further to encourage lower carbon heating technologies to be adopted.

It is important to note that relatively small reductions in the required carbon content of heat will represent tipping points that effectively prohibit the use of certain technologies. For example, reducing the level from 280 gCO_2/kWh to 200 gCO_2/kWh would cause gas boilers to become non-compliant. Applicants would need to specify alternative systems such as low carbon heat networks or

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[43] These include direct electrical heating, heat pumps and combined heat and power systems.
[44] At the time of publication this was a provisional figure, but is in line with other robust data sources including the National Grid Future Energy Scenarios 2017 document suite and DRAX Electric Insights webpage.
[45] When calculating their emissions based on the grid electricity carbon factor from DUKES 2017

heat pumps (or direct electrical heating) to remain compliant with the policy. Therefore, this carbon cap is not proposed for the initial phase.

As direct electrical heating will become lower carbon and is relatively cheap and simple to install compared to heat pumps, this is likely to be popular with applicants. Although direct electrical heating will offer increasingly low carbon heat, electricity typically costs around three times as much as gas. The use of direct electrical heating could therefore be expected to increase fuel poverty unless deployed in buildings with very efficient fabric and low space heat demands.

The efficiencies offered by heat pumps generally offset the increased cost of electricity over gas, therefore these represent a more balanced option in terms of reducing both carbon and running costs. As these are more expensive to purchase and install than direct electrical heating systems, additional policies will be required to encourage applicants to install them.

The maximum permissible carbon content of heat permitted by this policy from now through to 2034 should therefore be carefully developed in conjunction with other policies to avoid unintended consequences. To minimise uncertainty for applicants, it would be sensible to publish the projected trajectory of this requirement. The projections should clearly demonstrate the long-term aspiration to deploy low carbon heating before 2050, while also highlighting key technological tipping points so applicants and industry have time to prepare for the necessary changes.

5.7.2 Review of available evidence

An increasing number of studies recognise the importance of decarbonising heat if buildings are to be fully decarbonised. Whilst the decarbonisation of electricity may be carried out off-site, at scale and at relative speed, this is not possible with heat. A building's heat distribution system is often integral to the building fabric and may only work with certain types of heat source. This can lead to technological lock-in that could jeopardise Islington's carbon reduction targets. Additional policy will be required to accelerate change.

The Committee on Climate Change states that to avoid scrappage schemes for gas boilers, low carbon heating systems will be required from 2035 at the latest, though progress needs to begin as soon as possible[46].

The National Grid's Future Energy Scenarios explore a range of low carbon heating options, however the only scenario to achieve compliance with the UK's greenhouse gas emission reduction targets is based on deployment of 23 million heat pumps, low carbon district heating and solar thermal heating by 2050. This is echoed by the Mayor of London's draft Environment Strategy.

5.7.3 Predicting the carbon content of heat of various heating systems

Accurate carbon factors

The implications of using the outdated SAP 2012 carbon emission factors for grid electricity instead of the most up to date figure from BEIS are illustrated in figure 5.14, with respect to how this affects the carbon emission factor for heat from different technologies. Key observations on each technology are discussed in Table 5.25. A set of detailed assumptions used to derive these carbon emission factors is provided in Appendix G.

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[46] Committee on Climate Change (2016) *Next steps for UK heat policy*

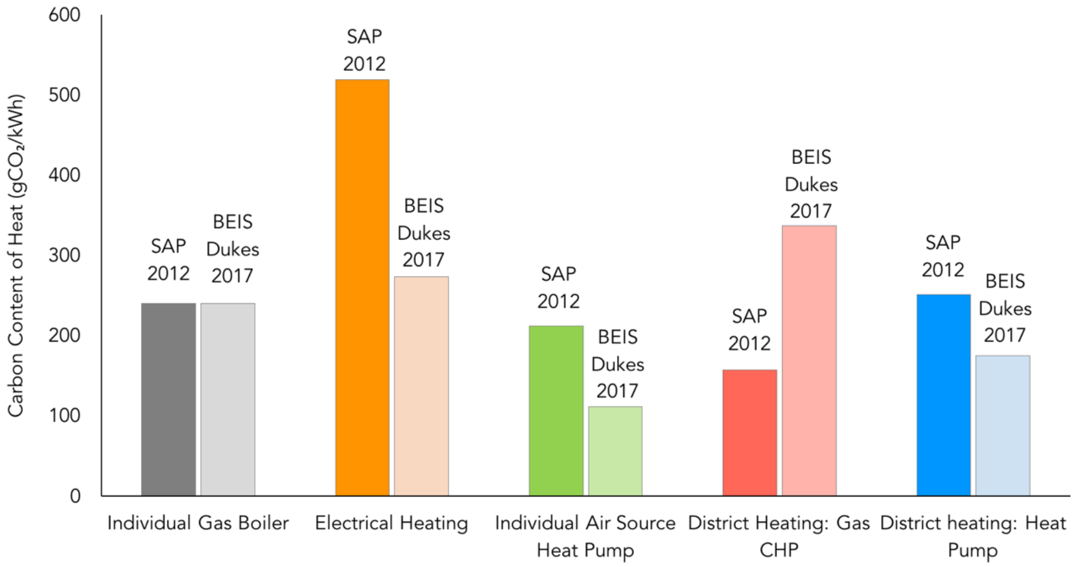

Figure 5.14 – Carbon content of heat depending on electricity carbon factor used (SAP 2012 vs BEIS)

Heating system	Notes
Individual gas boilers	These are included to provide a benchmark for comparison.
Electrical heating	This is directly representative of the assumed carbon factors for grid electricity. Calculations based on SAP 2012 will suggest that direct electrical heating is a very high carbon method of heating, whereas the more accurate DUKES 2017 figure shows that electricity has a very similar carbon content to heat from a gas boiler.
Air source heat pumps	Calculations based on the SAP 2012 carbon factor for grid electricity overestimate the carbon content of heat from heat pumps. The same calculations with the DUKES 2017 figure indicates the heat provided by heat pumps offers the lowest carbon source of all technologies assessed.
District Heating: CHP	The SAP 2012 carbon factors for grid electricity suggest that a district heating system using gas fired CHP (with a gas boiler meeting peak demand) offers the lowest carbon heat of all the technologies assessed. Performing this calculation with the DUKES 2017 figure indicates the exact opposite, undermining the case for district heating with gas fired CHP[47].
District Heating: Heat Pump	The SAP 2012 carbon factors for grid electricity suggest that a district heating system using a heat pump (with a gas boiler meeting peak demand) is only marginally better than an individual gas boiler. Performing this calculation with the DUKES 2017 figure indicates this would actually provide a lower carbon heating solution than individual gas boilers, and a future pathway to decarbonisation.

Table 5.25 – Observations on the effects of different carbon factors for electricity on the carbon factor for heat

[47] Assuming there is no plan to transition to a low carbon heat source in the short to medium term.

This analysis demonstrates that using the SAP 2012 carbon factor for electricity to calculate the carbon emissions for the most common heating technologies produces misleading results. This may lead applicants to unintentionally invest in high carbon heating technologies, most commonly gas fired CHP. The emissions from these systems are likely to be locked in for decades, which will make it harder for Islington to achieve future emission reduction targets. Requiring applicants to use the up to date carbon factor that is already provided annually by BEIS in their DUKES document (or which can be provided by LBI and updated every 2-3 years) offers a simple solution that will result in the deployment of genuinely low carbon heating systems and move Islington closer to achieving its carbon reduction goals.

Setting a maximum carbon content for heat

To ensure that the policy of setting a cap on the maximum permissible carbon content of heat is practical, it is necessary to demonstrate a viable technological pathway for low carbon heating. Understanding how the carbon content of heat from different heating technologies is likely to develop in the future also provides context to inform policy development. Figure 5.15 uses grid electricity emission factors from the National Grid's 'Slow Progression' scenario to project the carbon content of heat for the key technologies previously assessed. This clearly demonstrates three long term trends in the carbon content of heat:

1. Carbon emissions from gas fired CHP systems exceed other heating systems and increase rapidly as the grid decarbonises.
2. Carbon emissions from gas boilers do not increase or reduce over time.
3. Carbon emissions from direct electrical heating and heat pumps are competitive with gas boilers and fall rapidly over time.

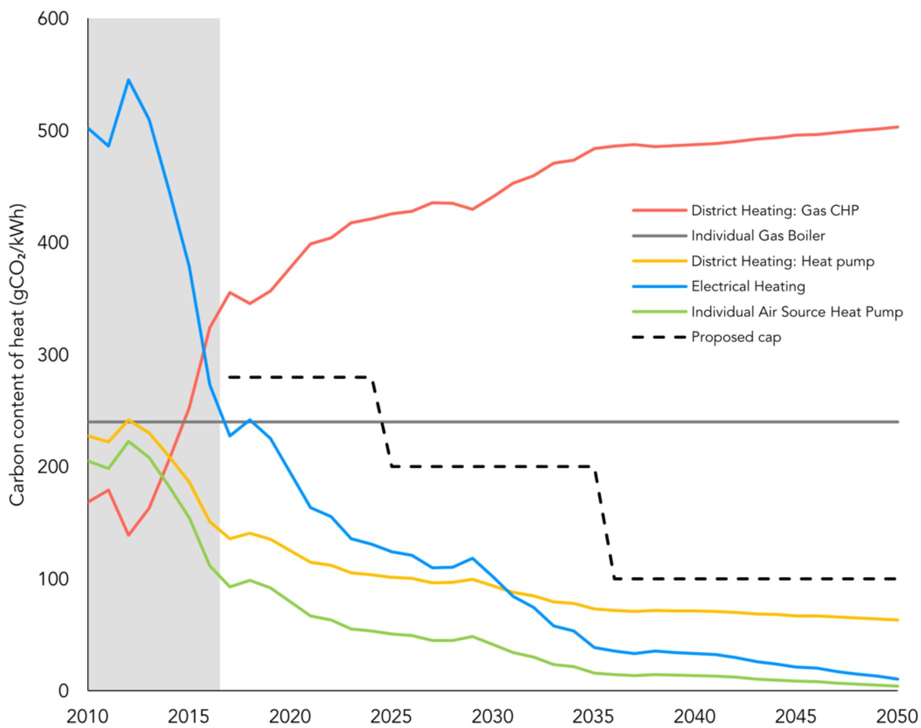

Figure 5.15 – Projected carbon content of heat for key technologies based on National Grid 'Slow Progression' scenario from FES 2017

Figure 5.15 also includes a proposed pathway for the emissions cap, which would achieve two key outcomes:

1. Starting with a maximum permissible carbon content of heat of 280 gCO_2/kWh would cease the deployment of high carbon heating systems in new buildings.
2. Reducing the carbon content of heat to 200 gCO_2/kWh by 2025-2030 would then prohibit the use of gas boilers in new builds. While the long-term trends may justify introduction of this limit sooner, selecting a date in the future will provide applicants and industry with time to prepare for the change.

Beyond 2025, it would be possible to introduce further reductions to the cap if necessary. An indicative reduction to 110gCO_2/kWh is shown to occur in 2035. Such a cap may not effect electrical heating systems due to the projected reductions in the carbon content of electricity, but may be necessary to drive ongoing carbon reductions in other heating technologies such as low carbon district heating systems.

5.8 Decarbonising heat – Islington's strategic masterplan vision for heat networks

Section 4.3 of this report outlines potential recommendations on heat generation and distribution in order to ensure that one of the key strategic objectives of the London Borough of Islington (i.e. decarbonising heat) is delivered. This section complements section 4.3 by outlining Islington's strategic masterplan vision for heat networks. This summary is based on a multi-phase work undertaken by Buro Happold in 2014, which included borough wide energy mapping (Phase 2) and the development of a strategic masterplan vision (Phase 3).

This strategic district heating vision for Islington considers all potential areas for heat networks across the borough. Future heat networks have been split into three separate groups: initial clusters, expansion areas and conversion potential.

5.8.1 Priority clusters

The borough wide energy mapping undertaken in Phase 2 identified 15 priority areas for heat network clusters in Islington.

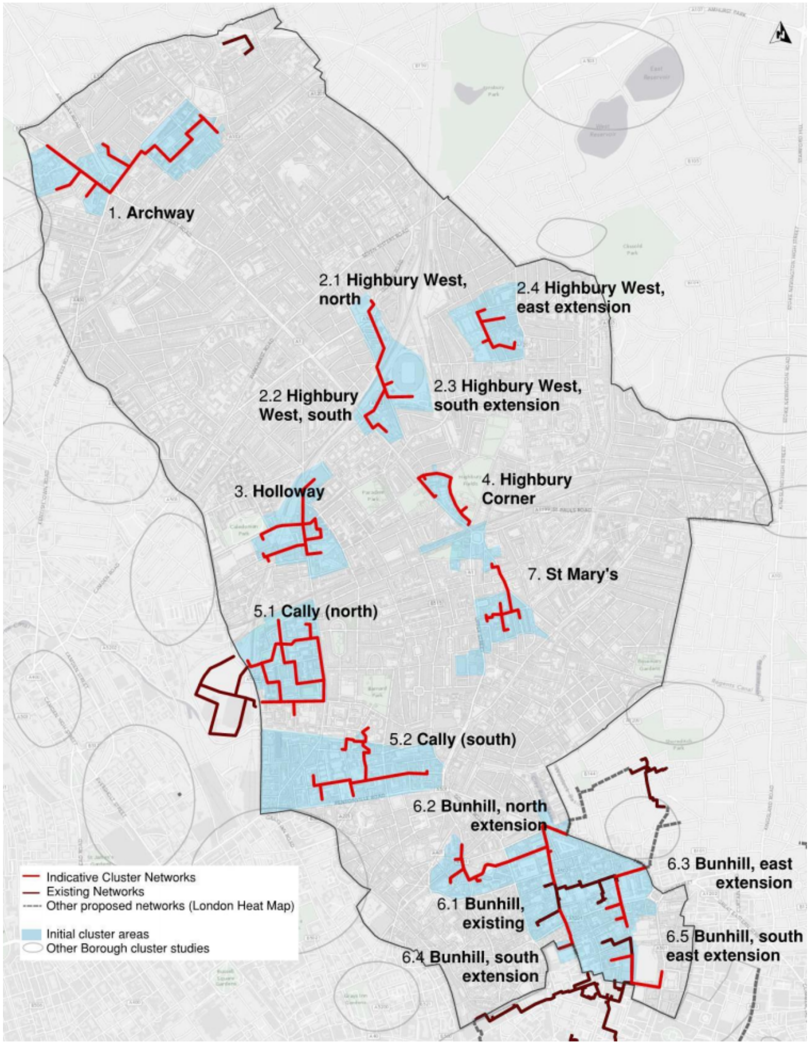

Figure 5.16 – Indicative district heating networks for the 15 clusters identified and areas considered for connection in each cluster (in blue) (© Buro Happold)

Projects have then been prioritised according to a multi-criteria ranking system. LBI's objective to look beyond carbon savings and reduce heat costs for council tenants at risk of fuel poverty has been reflected in the weightings shown below.

	IRR	Investment Required	Carbon Saving	Fuel Poverty Impact	Number of council tenants served	Enabling of a borough wide vision	Heat supply and power export	Physical constraints	weighted total	Priority
Category weighting	2.5%	5%	5%	40%	40%	2.5%	2.5%	2.5%		

Table 5.26 – Criteria for cluster priority matrix – Council tenant led schemes (© Buro Happold)

Islington's strategic vision is to develop the initial clusters and form interlinks within the borough and to adjacent boroughs. A heat network growth corridor for district heating clusters is shown by Buro Happold in the figure below as a north-south path through the borough connecting the majority of priority clusters. Other growth corridors have been indicated which link initial clusters not in the main north-south path or which rely on cluster expansion or future conversion potential. It is anticipated these would be developed generally later than the initial clusters and form spurs from the main spine. Finally, arrows have been added to show potential corridors for cross-borough, picking up heat demand and network clusters that have been identified by similar studies for the bordering boroughs of Camden, Haringey, Hackney and the City (e.g. links to Camden via the Kings Cross scheme or to the City of London via Citigen).

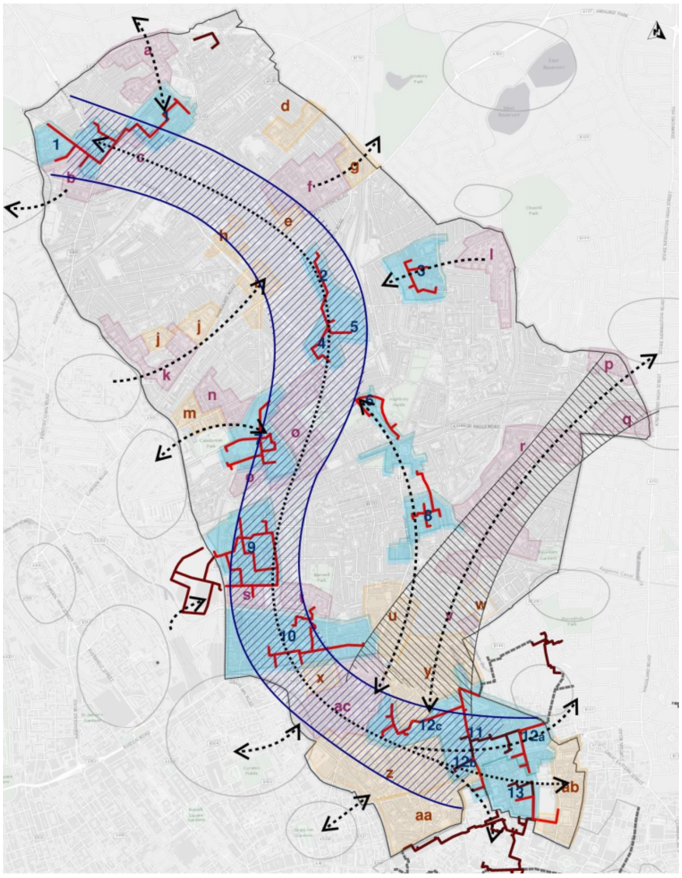

Figure 5.17 – District heating growth corridors (© Buro Happold)

5.8.2 Low or zero carbon energy sources

The strategic vision masterplan estimates that developing all clusters could result in carbon emissions saving of 32,300 tCO_2/yr when compared to a base case supplying heat from gas boilers at a gross efficiency of 80%.

These carbon savings were established assuming that gas-fired CHP would be a low carbon source of heat for all clusters. However, it also highlighted that within the long-term development of the clusters secondary heat sources would need to be integrated into the network heat supply systems. It states that initially proven low carbon CHP technology will be used to start the networks with a future transition to secondary sources as the technology becomes more commercially attractive.

It also states that there is a need to identify long term sources of zero carbon heat to feed the heat network infrastructure. The borough wide energy mapping work undertaken by Buro Happold suggests that there are a number of point sources of low grade heat in the Borough, including Tube ventilation, data centre(s) and substations. For example, secondary sources of heat for the Bunhill cluser include sewer heat rejection, recovery of low grade heat from the Bunhill CHP intercooler, data centre and City Road substation. The Buro Happold modelling found that around 50% of heat demand can be met from secondary heat sources.

Identifying and capturing such sources of low carbon heat will be key to moving beyond natural gas CHP when this is no longer a low carbon option.

6.0

CONCLUSION

6.0 CONCLUSION

There is overwhelming scientific consensus that significant climate change is happening and it is extremely likely that human activity is the predominant cause of climate change through emissions of greenhouse gases (GHG). Public action is needed to substantially reduce GHGs as this would not happen at sufficient scale without intervention.

A number of national commitment and policies aim at reducing greenhouse gases emissions but in its report '*Meeting carbon budgets – 2017 progress report to Parliament: Closing the policy gap*', the Committee on Climate Change, concludes that overall the UK urgently needs new policies to cut greenhouse gas emissions. It also notes that there is no robust evidence to suggest that the introduction of new energy efficiency/low carbon heat standards for new homes would appreciably reduce or delay new housing supply to meet Government targets for new housing.

This is also recommended by the Town and Country Planning Association (TCPA) in their 2016 report '*Planning for climate change*?' which concludes that '*spatial planning has the potential to make a major contribution to both reducing carbon dioxide emissions and preparing for the growing impacts of climate change but that it is failing to fulfil this potential*'.

The Mayor has set a target for London to become a zero carbon city by 2050[48], with a zero carbon transport network and zero carbon buildings and the London Borough of Islington planning officers have identified a number of key planning policy objectives to ensure that by 2020, Islington is on the right trajectory to meet its 2050 carbon emission reduction targets.

Based on the analysis summarised in this report, current policy is not considered sufficient to meet this objective. Therefore, a number of potential recommendations are proposed and grouped in themes: *fuel poverty and affordability of energy*, *fabric energy efficiency*, *heat generation and distribution*, *solar photovoltaics* and *better performing buildings*.

A technical evidence base has been developed and demonstrated that:

- The introduction of a Fabric Energy Efficiency metric for residential developments (both for minor and major applications) would be useful at reducing energy demand without precluding a wide range of residential developments in Islington);
- Requiring assessments of predicted energy use (e.g. TM54, PHPP) rather than Part L only assessments would provide better information to applicants and design teams and therefore drive the design of better residential and non-residential buildings;
- Using more accurate electricity carbon factors is important;
- Requiring applicants report the calculated heat carbon content of their system is also important.

[48] London Environment Strategy – Draft for consultation, Mayor of London (2017)

7.0

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7.0 REFERENCES

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8.0

APPENDICES

A

APPENDIX A

8.1 Appendix A

Historical and projected carbon factors for grid electricity

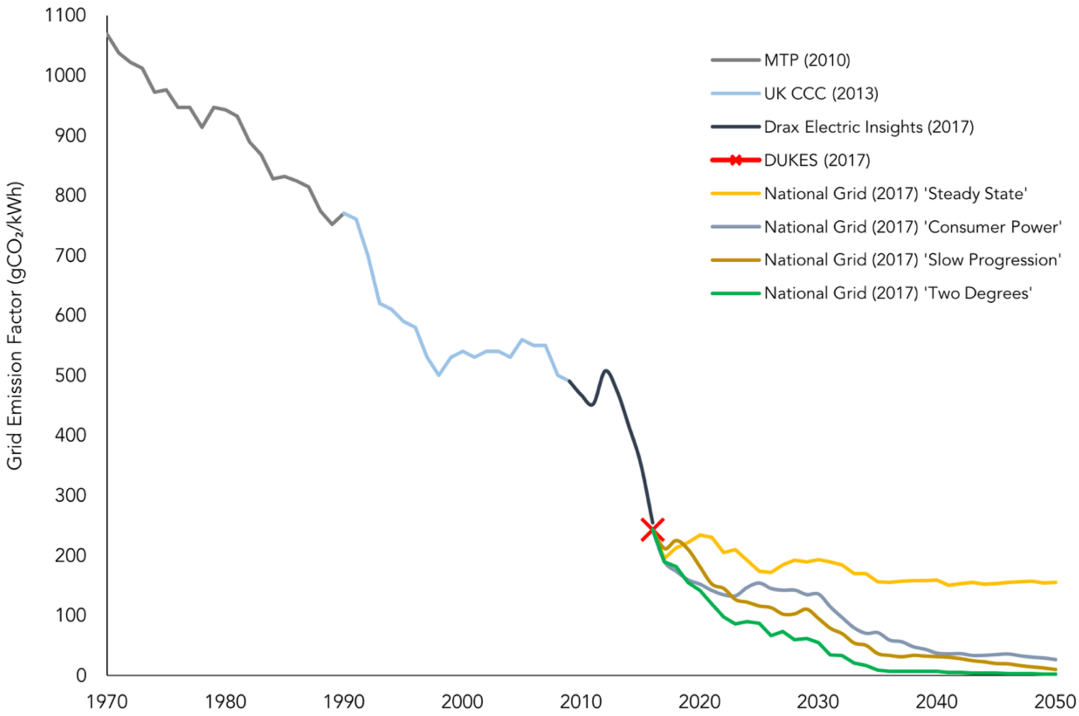

Figure App B-01 – Historical and projected carbon factors for grid electricity (data corrected for continuity between sources)

The **Market Transformation Programme (MTP)** data shows system average values for the years 1970-2005. This historical data provides important context on how rapidly emission reductions for electricity have been achieved in the past, principally through the retirement of coal fired power stations, which have been replaced with gas fired power stations, nuclear generation and increasingly, renewable energy.

The **UK Committee on Climate Change (CCC)** data is taken from the 2013 Fourth Carbon Budget Review. This data is partially based on similar datasets to historic MTP data and is therefore shown overlaid on top of MTP data from 1990 onwards.

The **Drax Electric Insights** data is taken from the Drax Electric Insights web page, which is maintained by the Drax Group and uses data from Elexon and the National Grid. The methodology for acquiring, processing and presenting the data was developed by Dr. Iain Staffell of Imperial College London. The methodology has been written up as an academic paper and published in the journal 'Energy Policy'. The mathematics behind it have been independently reviewed by Dr. Grant Wilson, a leading UK academic.

The **Department for Business, Energy and Industrial Strategy's** single figure for 2016 from the Digest of UK Energy Statistics (DUKES) 2017 is provisional at the time this document is published. This figure is however broadly in line with other datasets including the Drax Electric Insights website and the National Grid's Future Energy Scenarios.

The **National Grid's 2017 Future Energy Scenarios** present four different scenarios for electricity supply and demand through to 2050. While these are not intended as predictions, they do represent plausible pathways for the UK's future electricity mix. In the majority of scenarios there is a consistent trend for rapid decarbonisation of electricity supplies between 2015 and 2020 due to the retirement of coal fired power stations. This is driven by a combination of the EU Large Combustion Plant Directive, the EU Industrial Emission Directive and the UK carbon price floor, all of which present an increasingly adverse regulatory and economic environment for coal power generation.

Whilst changes to these policies may affect the length of time the last few coal power stations in the UK remain open, there is a clear trend towards elimination of coal from the generation mix, with the Longannet, Ferrybridge C and Rugeley closures in 2016 removing around 4GW of coal capacity from the grid and more closures expected soon.

Post 2020, subsequent declines in carbon content occur at a reduced rate due to a more gradual replacement of lower emission gas fired power stations with nuclear power stations and renewable energy. It is during this second phase of decarbonisation (from 200 g of CO_2 per kWh and below), that the scenarios diverge due to differing assumptions on the relative proportions of remaining fossil fuel generation capacity compared to low carbon sources such as renewables and nuclear.

For simplicity and clarity, the report is using this figure to illustrate the decarbonisation of the grid:

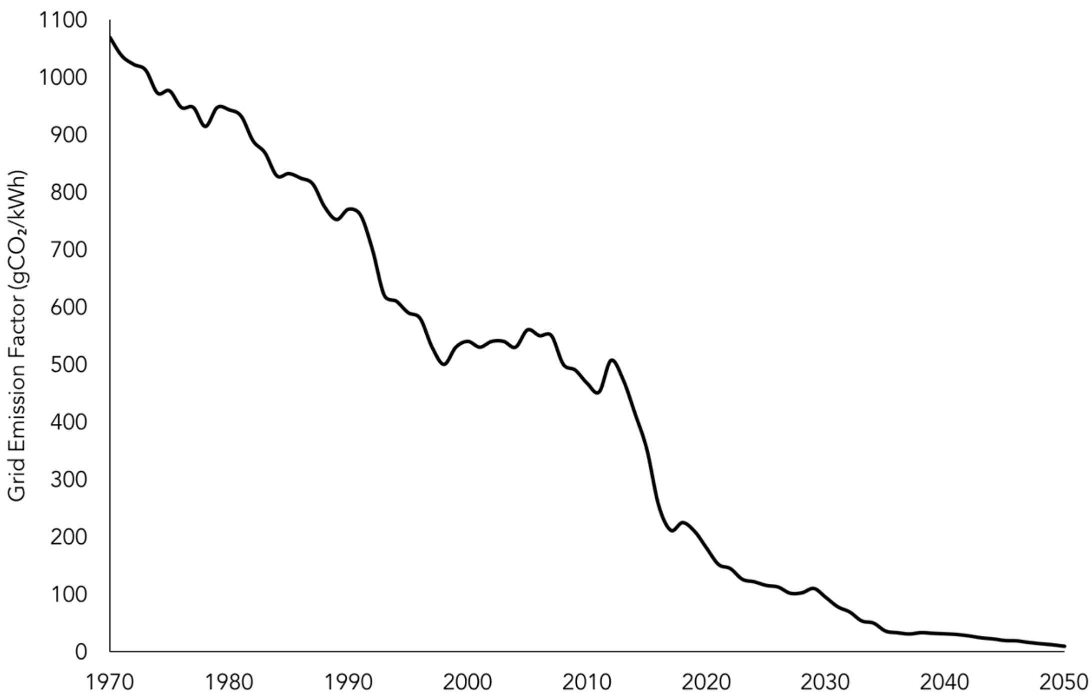

Figure App B-02 – Simplified historical and projected carbon factors for grid electricity (data corrected for continuity between sources)

Past data in this graph is based MTP data for 1970-1990), the UK CCC data for 1990-2009, Drax for 2009-2016 and BEIS for 2016. Projections are based on the National Grid Future Emission Scenario 'Slow progression' option.

B

APPENDIX B

8.2 Appendix B

Potential evolution of the Planning and Energy Act

8.2.1 The Planning and Energy Act (2008)

The Planning and Energy Act (2008) states the following

" 1. Energy policies

(1) A local planning authority in England may in their development plan documents, and a local planning authority in Wales may in their local development plan, include policies imposing reasonable requirements for:

(a) a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;

(b) a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development;

(c) development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations."

8.2.2 The Deregulation Act (2015)

Section 43 of the Deregulation Act 2015 includes a prospective change to section 1c of the Planning and Energy Act:

'Subsection (1)(c) does not apply to development in England that consists of the construction or adaptation of buildings to provide dwellings or the carrying out of any work on dwellings.'

This prospective change would come into force on a day to be appointed by the Secretary of State in a commencement order. To date a commencement order has not been made for the prospective change. The Legislation.gov.uk website sets out information on Section 43:

'Section 43: Amendment of Planning and Energy Act 2008.

This section is related to section 42. It is a corollary of the restriction of technical housing standards to those found in building regulations that an amendment is made to the Planning and Energy Act 2008. Section 1(1)(c) of that Act provides that local planning authorities may include in their plans requirements that development in their area meets higher standards of energy efficiency than are required by building regulations.

This is inconsistent with the consolidation of technical standards for housing in building regulations, and the amendment will disapply the provision in England in relation to development that consists of the construction or alteration of buildings to provide dwellings, or the carrying out of any work on dwellings. ***Government policy meanwhile is that new dwellings meet a zero net carbon emissions standard from 2016.***

The provision to be amended forms part of the law of England and Wales, but the amendment will affect its application in England only. ***It comes into force on a day to be appointed by the Secretary of State in a commencement order****.'*

Section 43 was introduced in the context at that time of tightening national energy efficiency standards. The Government has since announced a change in approach and a delay in implementing the 2016 zero carbon requirements. Amber Rudd noted in her speech of 21st July 2015 that the implementation of zero carbon policy had been 'postponed'. Therefore, the tightening of building regulations anticipated for 2016, and delivery of zero carbon homes, has changed since the Deregulation Act was given assent.

8.2.3 Ministerial statement

A written Ministerial Statement (Planning Update: Written statement - HCWS488 "the Planning Update") stated the following:

'…For the specific issue of energy performance, local planning authorities will continue to be able to set and apply policies in their Local Plans which require compliance with energy performance standards that exceed the energy requirements of Building Regulations until commencement of amendments to the Planning and Energy Act 2008 in the Deregulation Bill 2015.

This is expected to happen alongside the introduction of zero carbon homes policy in late 2016. The government has stated that, from then, the energy performance requirements in Building Regulations will be set at a level equivalent to the (outgoing) Code for Sustainable Homes Level 4. Until the amendment is commenced, we would expect local planning authorities to take this statement of the government's intention into account in applying existing policies and not set conditions with requirements above a Code level 4 equivalent.'

The ministerial statement adds weight to the argument that the commencement of Section 43 of the Deregulation Act was intended to coincide with the new Building Regulations 2016 and Zero Carbon proposals.

8.2.4 Deliberation of the Deregulation Bill

This is further backed up by the Hansard extract from the deliberation of the Deregulation Bill which states:

"In the Grand Committee on the Bill for this Act in the House of Lords the Minister said as follows:

*"****This is in no sense intended to lower standards; it is intended to continue the process of raising energy efficiency standards and to achieve zero-carbon aims****. I was already briefed to make the point that the noble Lord, Lord McKenzie, just helpfully made. This is not intended to commence until it replaces the other standards. The code on which representation has been made is a fairly complex piece of legislation. Those parts will not be abandoned; they will be incorporated into the building regulations.* ***I stress that we are raising standards, not lowering them****. I will make sure that I can say that with confidence again on Report, because I recognise the concerns of noble Lords.*

"By 2016, the Government plan to have tightened building regulations to deliver zero-carbon housing. I repeat that the Section 1(1)(c) amendment will not be commenced until then; meanwhile there will be no dip in standards. We intend to consolidate necessary standards to ensure that sustainable housing can be built. The current situation means that insufficient housing is being built because authorities are applying too many different standards, making sites unviable. This is a

rationalisation, not a deregulation of the sort that lowers standards and enables people to move further away from the zero-carbon housing that we all very much want.'

(Hansard, 30th October, 2014
http://www.publications.parliament.uk/pa/ld201415/ldhansrd/text/141030-gc0001.htm)

8.2.5 Deliberation of the Neighbourhood Planning Bill

Finally, the Hansard extract of the debate on the Neighbourhood Planning Bill in the House of Lords confirms that local authorities are able to set higher standards than the national standards.

"Baroness Parminter

[…] Secondly, can the Minister confirm that the Government will not prevent local councils requiring higher building standards? There is some lack of clarity about whether local authorities can carry on insisting in their local plans on higher standards. Prior to the withdrawal of the zero-carbon homes standards, places such as Brighton required in their local plans higher building standards. Will the Government confirm that they will not prevent local authorities including a requirement for higher building standards?

Lord Bourne of Aberystwyth

[…] ***The noble Baroness asked specifically whether local authorities are able to set higher standards than the national ones, and I can confirm that they are able to do just that.****"*

(Hansard, 6th February 2017
https://hansard.parliament.uk/lords/2017-02-06/debates/76AF5263-A938-4851-929D-8CAE765C56B8/NeighbourhoodPlanningBill)

C

APPENDIX C

Project number: 20170145

Project name: Islington energy evidence base

Document: Assessment of current policy/guidance against key objectives and important considerations

Revision: C

Date: 21/07/2017

Etude

KEY

● / ● ●	Scale of effectiveness to meet key policy objective
o / o o	Scale of effectiveness to address key policy consideration
X	Potential negative effect

				Key policy objectives				Important policy considerations					Other
Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy	Additional comments
CS 10-A	On-site reduction in CO_2 emissions (regulated and unregulated) of at least 40% in comparison with Part L 2006	P		●	●	●	-	-	-	-	-	-	No specific target/requirement against each policy objective. Part L limitations.
CS 10-A	Promote and develop decentralised energy (DE) networks	P		-	●	-	● ●	-	o o	-	o	-	Long-term infrastucture required for decarbonised heat but not sufficient in itself. It needs to be supported by a 'low carbon heat generation vision'.
CS 10-A	All remaining CO_2 emissions to be offset to fund CO_2 reductions in the existing building stock	P		●	-	-	●	-	-	-	o	o	Useful source of revenues to improve energy efficiency and mitigate fuel poverty in existing buildings.
CS 10-A	Highest feasible level of nationally recognised sustainable building standard (e.g. BREEAM, CSH)	P		●	●	●	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
CS 10-E	Demonstration that development is designed to be adapted to climate change (e.g. overheating, flood risk)	P		-	-	-	●	-	-	-	-	o	Adaptation to climate change an important consideration.
CS (3.2.7)	London Plan target of 20% CO_2 reduction through on-site renewable generation (4A.7) where possible	G			●	●	●	-	-	-		-	This element of guidance tends not to be applied in favour of overall carbon reduction policies.
CS (3.2.8)	Clear implementation and monitoring of CO_2 reductions	G		-	-	-	-	-	-	o	-	-	Useful intent to check the implementation and monitoring of CO_2 emissions
DM7.1-A	Requirement to integrate best practice sustainable design standards during design, construction and operation	P		●	-	-	-	o	-	-	-	-	Useful intent but no specific 'design standards' referred to.
DM7.1-B	Renewable energy technologies supported	P		-	●	●	-	-	-	-	-	o	General support but no specific target.
DM7.1-C	Preparation of an Energy Statement	P		●	●	●	-	o	-	-	-	-	Encourages the applicant to report specifically against three of the policy objectives.
DM7.1-E	Preparation of a Green Performance Plan (GPP) detailing measurable outputs for the occupied building (e.g. energy consumption, CO_2)	P		●	-	-	●	o o	-	-	o	o o	The GPP as it stands would not directly address the policy objectives but it is a very important tool to address other important policy considerations.
DM7.1-F	Access to the development and submission of information to the council when requested	P		-	-	-	-	o	-	o	-	o o	Useful intent to check the implementation and monitoring of CO_2 emissions
DM7.2-A	Best practice energy efficiency standards are required	P		●	-	-	●	-	-	-	o	-	Useful intent but the 'best practice energy efficiency standards' are not set out.
DM7.2-B	Minor new build residential developmet to achieve a 25% improvement over Part L 2010	P		●	●	●	-	o	-	-	-	-	No specific target/requirement against each policy objective. Part L limitations.
DM7.2-C	All remaining CO_2 emissions to be offset through a Section 106 legal agreement	P		●	-	-	-	-	-	-	o	-	Useful source of revenues to improve energy efficiency and mitigate fuel poverty in existing buildings.
DM7.2-D	Householders to be encouraged to apply cost-effective energy efficient measures to their property	P		●	-	-	-	-	-	-	-	-	Useful intent but no specific requirement.
DM7.3-A	All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN)	P		-	● ●	-	● ●	-	o o	-	-	-	Enables long-term infrastucture required for decarbonised heat to be developed over time.
DM7.3-A	Minor new build development to be designed to connect to a DEN wherever reasonably possible	P		-	●	-	●	-	-	-	-	-	This policy could have a negative impact on carbon emissions in cases of low density developments.
DM7.3-B	Major developments within 500m and minor developments within 100m of an existing DEN to connect to that network	P		-	●	-	● ●	-	o	-	-	-	Enables (indirectly) existing infrastucture to be improved and decarbonised. The long term performance of the existing network is crucial.
DM7.3-C	Major developments within 500m of a planned DEN to connect to that network in the future	P		-	● ●	-	● ●	-	o	-	-	-	Enables long-term infrastucture required for decarbonised heat to be developed over time.
DM7.3-D	Where connection is not possible, major developments should develop and/or connect to a Shared Heating Network (SHN)	P		-	X	-	-	-	-	-	-	-	This policy could have a negative impact on carbon emissions if the SHN development is not accompanied by a vision for low carbon generation.
DM7.3-E	Where connection to an existing or future DEN is not deemed possible, alternative strategy to be proposed	P		-	●	-	-	-	-	-	-	-	Encourages the applicant to consider an alternative low carbon strategy.
DM7.4-A	Major new build residential developments to achieve Code Level 5 from 2016	P											The Code for Sustainable Homes has been technically withdrawn and cannot be required anymore on new applications.
DM7.4-A	Minor new build residential developments to achieve Code Level 4	P											See above.
DM7.4-D	Major non-residential developments to achieve BREEAM Excellent and make reasonable endeavours to achieve Outstanding	P		●	●	●	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
DM7.5-A	Heating and cooling priority: 1) Passive design 2) Natural ventilation 3) Local mechanical ventilation/cooling 4) Full mechanical ventilation/cooling	G		X	-	-	-	-	-	-	-	-	In many cases, mechanical ventilation with heat recovery is more energy efficient (and better for air quality) than natural ventilation.
SPD-T2.1	Minimum energy efficiency standards	G		●	-	-	-	-	-	-	-	-	Table 2.1 does not reflect current best practice. A 'best practice' column could be aded.
	OVERALL ASSESSMENT			12	14	7	13	6	6	2	5	7	Current policy should be reviewed. Key areas where requirements need to be set out include energy efficiency and fuel poverty/affordabiliy of energy. In addition, policy should address important policy considerations in order for the Council to be on the right trajectory for 2050.

D

APPENDIX D

8.4 Appendix D

London Borough of Islington carbon pathway: carbon emission projection assumptions

The main assumptions used to estimate carbon emissions for the London Borough of Islington are summarised below for comment. Assumptions representing projected reductions are the best feasibly possible, a second scenario showing a conservative estimate will also be considered in the report.

Description	*Assumption*	*Justification*
1990 carbon emissions – residential 1990 carbon emissions – non-resi	462,880 tCO_2e 599,600 tCO_2e	During our work on the energy evidence base for the London Borough of Tower Hamlets we were given a figure for London 1990 total carbon emissions from all sources of **45,100,000 tCO_2e**. The figure is an estimate. It has been compared to national reductions and is within the expected range. Using the breakdown between boroughs and residential/non-residential for an example year in 2005 we have estimated the share for Islington. We have included a net loss of the proportion of non-residential buildings of 1% between 1990 and 2005 based on data from the Employment Land Study carried out for Islington by Ramidus consulting.
2005-2015 carbon emissions	Varies	DECC UK Local authority and regional CO_2 emissions data 2005-2015 (June 2016) - Based on meter readings for gas and electricity. This gives actual carbon emissions. To allow heating projections all historical gas emissions are assumed to be attributed to heating. This has been compared to heating emissions using modelled data and the number of households.
National Grid electricity carbon emission factor	Varies	Using historic data from DECC 2010 DUKES statistics. 2015 to 2030 are based on CCC, DECC and National Grid projections. 2030 to 2050 are based on the worse case "steady state" and a middle projection "slow progress" scenarios from the National Grids 2017 Future Energy Scenarios report.
Baseline 2017 heating carbon emission factor Future 2050 Heating carbon emission factor	0.250 $kgCO_2/kWh$ 0.100 $kgCO_2/kWh$	For the baseline scenario a constant heating emission factor equivalent to gas and including a loss/generation factor (0.250 $kgCO_2/kWh$) has been used. The future carbon factor is based on a proportion of buildings that have moved to a low carbon heat source by 2050. The change between the two is assumed to be non-linear, with little take up before 2030 and then mass roll out which is in line with the CCC scenarios.
Homes heated by CHP & district heating network	**2000 homes**	Estimate.
Proportion of homes heated by a system with a heat carbon content of <0.10 $kgCO_2/kWh$ by 2050.	**95%**	This relates to the decarbonisation of heating. Low carbon heat can be supplied by low carbon heat networks, repurposed gas grid, or local heat pumps. To estimate the effect of this we assume a linear change to a full lower average heat carbon content by 2050.
Projection of total number of residential buildings	Varies	Uses number of households to estimate number of occupied dwellings. Number of households in Islington is taken from the GLA Datastore London Borough Atlas (retrieved 27/06/2017). Data is available at 5 year internals and is interpolated linearly between.

Proportion of current existing dwellings replaced by new build before 2050 Proportion of remaining existing dwellings that are fully refurbished (including additional wall insulation) before 2050	**30%** **90%**	Split between new dwellings, new dwellings replacing existing dwellings, refurbished existing dwellings, retained existing dwellings. Numbers are based on our judgement and discussion with Islington planning department, they are in line with national projections on existing buildings with a higher rate of replacement given the urban context. Listed buildings are particularly hard to treat, although not impossible within the listing and planning policy. Islington has around 4,500 listed buildings (from Islington website), although many of these are not dwellings this represents just more than 3% of the projected number of households in 2050. 38% of Islington is within a conservation area making significant improvements to these buildings again more challenging within planning policy. The current CCC projections assume a 17% improvement in existing building efficiency before 2030. Meeting this target and continuing at the same rate of improvement gives over 90% of all buildings being refurbished before 2050. Given the urban context and higher property value it is assumed that this will be possible by 2050 with only slow adopters who are homeowners and buildings restricted by conservation left with no improvement.
Proportion of flats and houses in total housing stock	85% Flats	London Borough Atlas breakdown by type. Split is assumed constant in all analysis, in reality we understand the density of housing is likely to increase, but have not included this is in the current projection due to the low sensitivity.
Emissions target for 2034	139,500 tCO_2e	This applies the savings required by 2035 from the CCC fifth carbon budget to the total amounts in Islington. 13% reduction of building emissions excluding decarbonised electricity, 35% reduction of grid carbon emission reductions.
Emissions target for 2050	0 tCO_2e	Emissions from buildings need to be net zero by 2050 to meet the national 80% carbon emissions reduction, particularly in an opportunity area such as Islington with high land values, employment, and density. This is to compensate for uses that are still likely to be net emitters, such as air travel and energy storage.
Average dwelling sizes: Flats Houses	 60 m^2 100 m^2	Taken from analysis of London Borough Atlas, number of households, and occupancy data.
Current average energy demand for residential buildings: Heating and hot water Flat House Electricity Flat House	 6,000 kWh/yr 15,000 kWh/yr 3,300 kWh/yr 5,000 kWh/yr	Based on experience and analysis of available metered data including: • UK housing factfile 2013 • Ofgem typical consumption figures 2011 • Energy use in homes BRE 2001 Corroborated against calculated gas and electricity use from total carbon emissions and number of households. Specific figures based on areas below are: Heating and hot water – Flat 100 $kWh/m^2.a$ – House 150 $kWh/m^2.a$ Electricity – 55 $kWh/m^2.a$ (regulated and unregulated energy)
Mandatory heating energy demand target for new buildings	15 $kWh/m^2.a$	Equivalent to Passivhaus. Heating energy reductions below this would be considered onerous.
Date mandatory target introduced	?	Already in place in cities such as Brussels, Frankfurt and parts of New York as a default option. Developers must prove that this cannot be achieved due to site constraints.

Average heating energy demand of refurbished properties	40 kWh/m^2.a	Based on work completed by the AECB. This represents a robust holistic retrofit including significant improvements to wall, roof and floor insulation and a ventilation system with heat recovery.
Electrical equipment use and efficiency for 2050	10% reduction	This is a conservative estimate for improvement in efficiency of equipment (e.g. lighting and appliances) that includes the rebound effect of increased usage. Improvements to efficiency of appliances are outside of the Council's control.

E

APPENDIX E

Project number: 20170145
Project name: Islington energy evidence base
Document: Assessment of proposed energy policy/guidance against key objectives
Revision: (C
Date: 21/07/2017

Etude

KEY	
1	Low level of interest
2	Medium level of interest
3	High level of interest

KEY	
● / ● ●	Scale of effectiveness to meet key policy objective
○ / ○ ○	Scale of effectiveness to address key policy consideration
X	Potential negative effect

				Key policy objectives				Important policy considerations					Other
Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy	Additional comments
TN01-1	Require applicants for domestic refurbishment projects to demonstrate that dwellings post refurbishments will achieve an EPC of C or better	P	2	● ●	-	-	●	-	○	-	○ ○ ○	○	
TN01-2	Require applicants to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of their proposed heating system	P	1	-	-	-	-	-	-	-	○ ○ ○	-	
TN01-3	Develop a simple set of specific information which applicants will be required to provide to estimate future energy bills	G	2	-	-	-	-	-	-	-	○ ○	○	
TN01-4	Require applicants for regeneration projects to develop a fuel poverty strategy involving the identification of fuel poor homes within or around the application site	P	0	-	-	-	●	-	-	-	○ ○	○ ○	
TN02-1	Adopt 'interim' FEES (as defined by the Zero Carbon Hub) for the next 3 years with the aim of increasing the requirement to 'full' FEES afterwards	P	3	● ●	-	-	●	○ ○	○ ○ ○	-	○ ○	○ ○	
TN02-2	Encourage PHPP assessment of energy demand	G	3	● ●	-	-	●	○ ○	○ ○	○ ○ ○	○	○ ○	
TN02-3	Explain and encourage best practice in terms of fabric energy efficiency through the adoption of Passivhaus and AECB Silver standards	G	2	● ● ●	●	●	●	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	
TN02-4	Update Table 2.1 in Islington's Environmental Design Planning Guidance and include a 'best practice' column	G	3	● ●	-	-	●	○	○ ○	-	○ ○	-	
TN02-5 TN05-2	Require applicants to declare assumed construction build up and insulation thickness alongside assumed U-value for the major envelope components	G	1	●	-	-	●	○	-	-	○	-	
TN02-6 TN05-2	Provide guidance to applicants on U-value calculations at application stage	G	2	●	-	-	-	○	-	-	○	-	
TN02-7 TN05-3	Require applicants to estimate and declare the estimated impact of thermal bridges more accurately	G	0	●	-	-	-	○	-	-	○	-	
TN02-8	Require applicants to set out their approach to thermal bridges and how they will improve the thermal performance of junctions	G	2	●	-	-	-	○	-	-	○	-	
TN02-9	Require applicants to set out clearly how their fabric improvements go beyond minimum requirements of Part L and what it will achieve in terms of carbon	P	2	●	-	-	●	○	-	○	○	-	
TN03-1	Require applicants to calculate the carbon factor of heat using more accurate emissions factors	P	3	-	● ● ●	-	● ●	○ ○ ○	○ ○ ○	○ ○	-	○ ○	
TN03-2	Require applicants to specify heating systems with an average annual carbon content of heat of less than 240 gCO_2/kWh (example)	P	?	-	● ●	-	●	○	○ ○ ○	○	-	○	
TN03-3	Explain Islington's infrastructure and DE vision to 2050. Require applicants to demonstrate they have objectively assessed heat network connection vs communal or individual heating systems	G	3	-	● ● ●	-	● ● ●	○ ○ ○	○ ○ ○	○ ○ ○	-	○	
TN03-4	Require applicants to ensure that the future heat network operator will be registered with the Heat Trust Scheme (or any other equivalent/future customer protection scheme)	P/G	1	-	-	-	-	-	-	-	○ ○	-	I think already secure this through commercial agreements for connection. Could be put in guidance as well
TN03-5	Require applicants to install heat meters for each dwelling so heat can be billed fairly and system efficiencies monitored	G	2	-	● ●	-	-	-	-	○	○	○	
TN04-1	Encourage applicants to utilise roof spaces more effectively for PVs by setting a target (100-140W/m^2 of roof area) which they will need to report against	P	3	-	-	● ●	●	○	○	-	-	○	
TN04-2	Reduce the applicant's carbon offset contribution if the on-site carbon target is exceeded	G	?	●	●	●	-	○	○	-	○	○	e.g. a sliding scale of offset price to try and incentivise on-site reductions? This would require a local carbon price to be adopted (possible but need evidence to formulate price).
TN04-3	Encourage applicants to adopt best practices in utilisation of solar photovoltaic technology	G	3	-	-	● ●	●	○ ○	-	-	-	-	
TN04-4	Encourage communication between applicants and community energy groups	G	1	-	-	●	-	-	-	-	-	○ ○	
TN04-5	Enable applications for carbon offset funds to finance 'exemplar' PV systems	G	0	-	-	●	-	○	-	-	-	○	This is more about the management of the carbon fund rather than planning policy
TN05-1	Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology. The kWh/m2/yr and kWh/yr would become GPP indicator targets.	P	2	● ●	-	-	●	○ ○	○ ○ ○	○ ○ ○	○	○ ○	Links to TN02-2.
TN05-4	Require applicants to provide examples of key mechanical and electrical products / design strategies that would meet the detailed energy efficiency standards.	G	1	● ●	-	-	-	○	○	-	-	-	
TN05-5	Require applicants to confirm the actual performance values achieved compared with the original energy targets and to submit the associated evidence (e.g. site photographs for insulation)	P	2	●	-	-	-	○ ○ ○	-	-	○	○ ○	Links to TN02-2 and TN05-1 and could be secured through Energy Strategy and Green Performance Plan
TN05-6	Require applicants to carry out an air tightness test and thermographic survey of all new and refurbished buildings over $500m^2$	P	1	●	-	-	-	○ ○	-	-	-	○ ○	
TN05-7	Require energy and water sub-metering and reporting beyond the minimum Part L requirements	G	2	●	-	-	-	○	-	○ ○ ○	○	-	
TN05-8	Require all applicants for non-residential buildings above $500m^2$ to undertake a DEC assessment and display it at reception	P	0	●	-	-	-	○ ○ ○	○	○ ○ ○	-	○	
	OVERALL ASSESSMENT			25	12	8	17	37	27	23	29	28	

F

APPENDIX F

Project number: 20170145

Project name: Islington energy evidence base

Document: Assessment of combined retained/proposed energy policy/guidance against key objectives

Revision: C

Date: 21/07/2017

KEY	
1	Low level of interest
2	Medium level of interest
3	High level of interest

KEY	
● / ● ●	Scale of effectiveness to meet key policy objective
○ / ○ ○	Scale of effectiveness to address key policy consideration
X	Potential negative effect

Purple text: London policies | Blue text: new LBI policy and guidance

Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Key policy objectives: Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Important policy considerations: Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy	Other: Additional comments
REDUCING ENERGY DEMAND													
LP5.2	Zero carbon buildings (domestic and non-domestic)	P		●	●	●	-	-	-	-	-	○	
LP5.2	35% improvement over Part L 2013 on-site as minimum (regulated energy only)	P		●	●	●	-	-	-	-	-	-	No specific target/requirement against each policy objective. Part L limitations.
LP5.2	Carbon offsetting to Zero Carbon (regulated only) through a s106 agreement	P		●	-	-	●	-	-	-	○	○	Useful source of revenues to improve energy efficiency and mitigate fuel poverty in existing buildings.
DM7.2-A	Best practice energy efficiency standards are required	P		●	-	-	●	-	-	-	○	-	Useful intent but the 'best practice energy efficiency standards' are not set out.
TN02-1	Adopt 'interim' FEES (as defined by the Zero Carbon Hub) for the next 3 years with the aim of increasing the requirement to 'full' FEES afterwards	P	3	● ●	-	-	●	○ ○	○ ○ ○	-	○ ○	○ ○	
DM7.1-C	Preparation of an Energy Statement	P		●	●	●	-	○	-	-	-	-	Encourages the applicant to report specifically against three of the policy objectives.
DM7.1-E	Preparation of a Green Performance Plan (GPP) detailing measurable outputs for the occupied building(e.g. energy consumption, CO_2)	P		●	-	-	●	○ ○	-	-	○	○ ○	The GPP as it stands would not directly address the policy objectives but it is a very important tool to address other important policy considerations.
TN05-1	Require applicants to submit an assessment of future energy use based on PHPP, CIBSE TM54 or any equivalent methodology. The kWh/m2/yr and kWh/yr would become GPP indicator targets.	P	2	● ●	-	-	●	○ ○	○ ○ ○	○ ○ ○	○	○ ○	Links to TN02-2.
TN05-5	Require applicants to confirm the actual performance values achieved compared with the original energy targets and to submit the associated evidence (e.g. site photographs for insulation)	P	2	●	-	-	-	○ ○ ○	-	-	○	○ ○	Links to TN02-2 and TN05-1 and could be secured through Energy Strategy and Green Performance Plan
TN05-6	Require applicants to carry out an air tightness test and thermographic survey of all new and refurbished buildings over 500m[2]	P	1	●	-	-	-	○ ○	-	-	-	○ ○	
DM7.1-F	Access to the development and submission of information to the council when requested	P		-	-	-	-	○	-	○	-	○ ○	Useful intent to check the implementation and monitoring of CO_2 emissions
DM7.2-D	Householders to be encouraged to apply cost-effective energy efficient measures to their property	P		●	-	-	-	-	-	-	-	-	Useful intent but no specific requirement.
TN02-9	Require applicants to set out clearly how their fabric improvements go beyond minimum requirements of Part L and what it will achieve in terms of carbon	P	2	●	-	-	●	○	-	○	○	-	
TN02-2	Encourage PHPP /TM54 assessment of energy demand	G	3	● ●	-	-	●	○ ○	○ ○	○ ○ ○	○	○ ○	
SPD-T2.1	Minimum energy efficiency standards	G		●	-	-	-	-	-	-	-	-	Table 2.1 does not reflect current best practice. A 'best practice' column could be aded.
TN02-4	Update Table 2.1 in Islington's Environmental Design Planning Guidance and include a 'best practice' column	G	3	● ●	-	-	●	○	○ ○	-	○ ○	-	
TN02-5 TN05-2	Require applicants to declare assumed construction build up and insulation thickness alongside assumed U-value for the major envelope components	G	1	●	-	-	●	○	-	-	○	-	
TN02-6 TN05-2	Provide guidance to applicants on U-value calculations at application stage	G	2	●	-	-	-	○	-	-	○	-	
TN02-8	Require applicants to set out their approach to thermal bridges and how they will improve the thermal performance of junctions	G	2	●	-	-	-	○	-	-	○	-	
TN02-3	Explain and encourage best practice in terms of fabric energy efficiency through the adoption of Passivhaus and AECB Silver standards	G	2	● ● ●	●	●	●	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	
TN05-4	Require applicants to provide examples of key mechanical and electrical products / design strategies that would meet the detailed energy efficiency standards.	G	1	● ●	-	-	-	○	○	-	-	-	
CS (3.2.8)	Clear implementation and monitoring of CO_2 reductions	G		-	-	-	-	-	-	○	-	-	Useful intent to check the implementation and monitoring of CO_2 emissions
TN05-7	Require energy and water sub-metering and reporting beyond the minimum Part L requirements	G	2	●	-	-	-	○	-	○ ○ ○	○	-	
DECARBONISING HEAT													
TN03-1	Require applicants to calculate the carbon factor of heat using more accurate emissions factors	P	3	-	● ● ●	-	● ●	○ ○ ○	○ ○ ○	○ ○	-	○ ○	
DM7.3-A	All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN)	P		-	● ●	-	● ●	-	-	-	-	-	Enables long-term infrastructure required for decarbonised heat to be developed over time.
DM7.3-B	Major developments within 500m ~~and minor developments within 100m~~ of an existing DEN to connect to that network	P		-	●	-	● ●	-	○	-	-	-	Enables (indirectly) existing infrastructure to be improved and decarbonised. The long term performance of the existing network is crucial.
DM7.3-C	Major developments within 500m of a planned DEN to connect to that network in the future	P		-	● ●	-	● ●	-	○	-	-	-	Enables long-term infrastructure required for decarbonised heat to be developed over time.
DM7.1-B	Renewable energy technologies supported	P		-	●	●	-	-	-	-	-	○	General support but no specific target.
TN03-2	Require applicants to specify heating systems with an average annual carbon content of heat of less than 240 gCO_2/kWh (example)	P	?	-	● ●	-	●	○	○ ○ ○	○	-	○	

				Key policy objectives				Important policy considerations					Other
Reference	Key energy/carbon requirement	Policy (P) or Guidance (G)?	Initial ranking	Reducing energy demand	Decarbonise heat	Decarbonise electricity	Energy resilience	Ensure delivery of low/zero energy buildings	Step down emissions over time towards 2050	Enable reporting against carbon targets	Mitigate fuel poverty and ensure affordable heat	Collaboration / skills for low carbon economy	Additional comments
TN03-3	Explain Islington's infrastructure and DE vision to 2050. Require applicants to demonstrate they have objectively assessed heat network connection vs communal or individual heating systems	G	3	-	● ● ●	-	● ● ●	○ ○ ○	○ ○ ○	○ ○ ○	-	○	
TN03-5	Require applicants to install heat meters for each dwelling so heat can be billed fairly and system efficiencies monitored	G	2	-	● ●	-	-	-	-	-	○	○	
DECARBONISING ELECTRICITY													
DM7.1-B	Renewable energy technologies supported	P		-	●	●	-	-	-	-	-	○	General support but no specific target.
TN04-1	Encourage applicants to utilise roof spaces more effectively for PVs by setting a target (100-140W/m² of roof area) which they will need to report against	P	3	-	-	● ●	●	○	○	-	-	○	
TN04-3	Encourage applicants to adopt best practices in utilisation of solar photovoltaic technology	G	3	-	-	● ●	●	○ ○	-	-	-	-	
TN04-4	Encourage communication between applicants and community energy groups	G	1	-	-	●	-	-	-	-	-	○ ○	
OTHERS													
TN01-2	Require applicants to estimate the anticipated heat unit supply price (£/kWh), annual standing charge and estimated annual maintenance costs of their proposed heating system	P	1	-	-	-	-	-	-	-	○ ○ ○	-	
CS 10-A	Highest feasible level of nationally recognised sustainable building standard (e.g. BREEAM, CSH)	P		●	●	●	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
CS 10-E	Demonstration that development is designed to be adapted to climate change (e.g. overheating, flood risk)	P		-	-	-	●	-	-	-	-	○	Adaptation to climate change an important consideration.
DM7.1-A	Requirement to integrate best practice sustainable design standards during design, construction and operation	P		●	-	-	-	○	-	-	-	-	Useful intent but no specific 'design standards' referred to.
DM7.4-D	Major non-residential developments to achieve BREEAM Excellent and make reasonable endeavours to achieve Outstanding	P		●	●	●	-	-	-	-	-	-	Incentivises low carbon buildings indirectly.
TN01-3	Develop a simple set of specific information which applicants will be required to provide to estimate future energy bills	G	2	-	-	-	-	-	-	-	○ ○	○	
TN03-4	Require applicants to ensure that the future heat network operator will be registered with the Heat Trust Scheme (or any other equivalent/future customer protection scheme)	G	1	-	-	-	-	-	-	-	○ ○	-	I think already secure this through commercial agreements for connection. Could be put in guidance as well
	OVERALL ASSESSMENT			31	23	13	25	35	26	21	26	31	

G

APPENDIX G

8.7 Appendix G

Assumptions used for assessing the carbon content of heat

Heating system	Assumptions
Individual gas boilers	Type: Modern condensing combination boiler Efficiency: 90% Carbon content of mains gas: 216gCO_2/kWh[49]
Electrical heating	Type: Electrical resistance based heating unit Efficiency: 100% Transmission & distribution losses: 7%[50,51]
Air source heat pumps	Type: Monoblock air to water heat pump Efficiency: 245%[52] Transmission & distribution losses: 7%
District heating: Gas CHP	Third generation medium temperature district heating network with gas fired CHP as primary heat source (70% of annual heat generated) and condensing gas boiler to provide additional heat during periods of high demand (30% of annual heat generated). District heat network losses: 20% Gas fired CHP thermal efficiency: 45% Gas fired CHP electrical efficiency: 35% Gas boiler efficiency: 90% Carbon emissions from heat produced by the gas fired CHP are calculated using the SAP 2012 methodology. The grid average electricity emissions at point of use (including transmission and distribution losses) are subtracted from the emissions produced when generating a kilowatt hour of electricity via the CHP.
District heating: Heat pump	Fourth generation medium-low temperature district heating network with heat pump as primary heat source (80% of annual heat generated) and condensing gas boiler to provide additional heat during periods of high demand (20% of annual heat generated). District heat network losses: 15% Heat pump efficiency: 282%[52] Gas boiler efficiency: 90%

[49] Taken from SAP 2012
[50] Transmission and distribution losses only apply to the BEIS provisional grid carbon emission figure of 254 gCO_2/kWh for 2016 as this is for electricity supply. The SAP 2012 figure of 519 gCO_2/kWh includes these losses already.
[51] BEIS (2017) *Digest of United Kingdom Energy Statistics*
[52] Energy Saving Trust (2013) *The heat is on: heat pump field trials phase 2*