



Energy Statement

CORNERWAYS HOUSE (2), LONDON

FEBRUARY 2023

GreenBuild Consult Head Office |
Suite 3, Churchgate Court, 3 Church
Rd, Whitchurch, Cardiff, CF14 2DX

London Office | Kemp
House, 152 City Road, London
EC1V 2NX

W: www.greenbuildconsult.co.uk | T: 0333355 3610

Document Control

Project	The Cornerways House (2), London
GBC Job Number	7586

Document Checking:

Prepared By:

Buwani Kilpatrick

Signed:



Checked By:

Buwani Kilpatrick

Signed:



Verified By:

Daryl Fisher

Signed:



Issue	Date	Status
1	01.02.2023	Draft issue
2	16.02.2023	Final issue

Contents

Document Control.....	1
1. EXECUTIVE SUMMARY.....	3
2. INTRODUCTION	6
Site Proposal	6
3. POLICY & LEGISLATIVE CONTEXT	8
BUILDING REGULATIONS	8
National Policy Drivers.....	8
National Planning Policy Framework.....	8
Regional Policy Drivers	8
The London Plan 2021	8
Local Policy Drivers.....	12
Haringey's Local Plan: Strategic Policies 2021-2026 (March 2021).....	12
Haringey Development Management DPD (July 2017).....	13
4. METHODOLOGY.....	15
On-Site Carbon Savings – The Energy Hierarchy	15
Off-Site Carbon Savings – Carbon Offsetting	16
5. ENERGY ASSESSMENT.....	17
‘Be Lean’ – Reduce the Energy Demand	17
Passive Design Measures	17
Active Design Measures	18
Reducing Overheating Risks	19
‘Be Lean’ Stage - Energy Use & CO2 Emissions Performance	19
‘Be Clean’ – Supply Energy Efficiently	22
Communal Heating	22
Site Wide CHP Network	22
Connection to an Existing Network.....	22
‘Be Clean’ Stage - Energy Use & CO2 Emissions Performance	23
Be Green’ – Use Renewable Energy	24
Renewable Energy Appraisal	24
Detailed Assessment of Air Source Heat Pump	26
‘Be Green’ Stage - Energy Use & CO2 Emissions Performance	27
Carbon Offsetting.....	28
6. CONCLUSIONS	29
Appendix A	31

1. EXECUTIVE SUMMARY

- 1.1 This report outlines the energy strategy for the proposed development at The Cornerways House (2), Highgate in line with the requirements set out by the London Plan and the London Borough of Haringey. The proposed development comprises a single dwelling that comprises two storeys above ground and an additional basement level.
- 1.2 The Haringey Local Plan policy SP4 requires all new residential developments to achieve carbon emission reduction targets in line with the London Plan. Therefore, even as a minor development, the proposed dwelling would need to achieve a 'zero carbon' target in terms of its regulated CO₂ emission; and a minimum site-wide regulated CO₂ emissions reduction of at least 35% against a Building Regulations Part L (2021) compliant scheme, in line with London Plan policy S1 2.

CO₂ emissions reductions via the Energy Hierarchy

- 1.3 The methodology used to determine the expected operational CO₂ emissions for the development is in accordance with the London Plan's Energy Hierarchy and the CO₂ savings achieved for each step are outlined below.
- **Be Lean** - The first step addresses reduction in energy demand, through the adoption of passive and active design measures. The proposed energy efficiency measures include levels of insulation beyond Building Regulation requirements, low air tightness levels, efficient lighting as well as energy saving controls for space conditioning and lighting. A site-wide regulated CO₂ emissions reduction of 17% has been noted at this stage of the energy assessment, complying with the requirements of the London Plan 2021.
 - **Be Clean** - No existing or proposed community heating networks were noted in close proximity to the proposed scheme. Due to the small size of the proposed scheme no assessments have been undertaken to demonstrate how it may be capable of connecting to a district heat network at a future date. In addition, a CHP unit was not considered feasible due to small scale of the development and the large plant space that would be required. Therefore, no CO₂ emissions savings have been noted within the 'Be Clean' stage of the energy hierarchy.
 - **Be Green** - The renewable technologies feasibility study carried out for the development identified an air source heat pump as a suitable technology for the site. The incorporation of this type of renewable technology will further reduce the regulated CO₂ emissions on site by a further 33%. Therefore, the proposed scheme is shown to achieve Haringey Council's Local Plan policy SP4 which requires that 20% of the regulated CO₂ emissions reduction be achieved via renewable energy generation.
- 1.4 The energy monitoring and metering strategy for the proposed will be considered in detail at RIBA Stage 4, to satisfy the requirements of the 'Be Seen' category of the energy hierarchy.

1.5 The regulated CO₂ emissions reduction via the first three elements of the energy hierarchy is presented within Figure 1, Table 1 and Table 2.

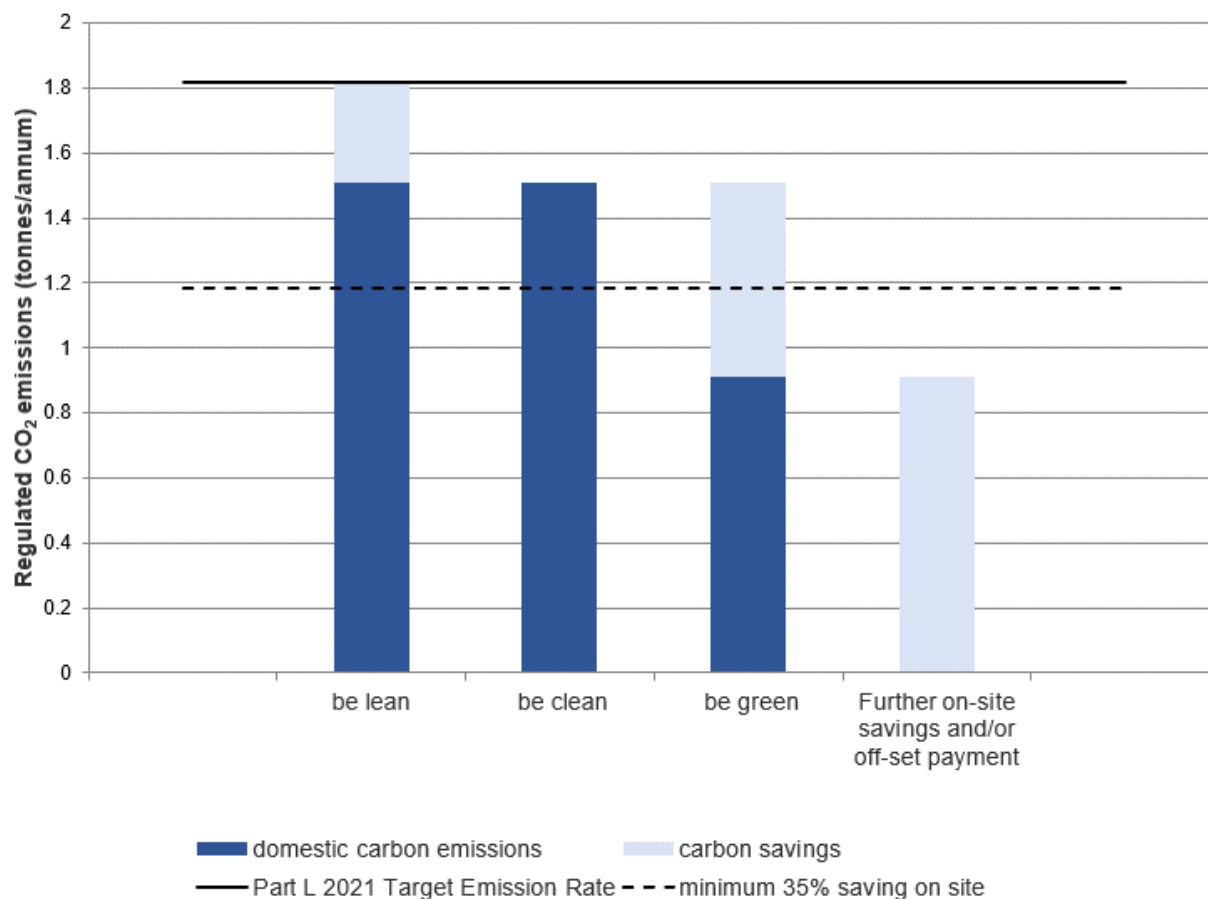


Figure 1: Regulated CO₂ emissions reduction via the energy hierarchy: comparison to Part L (2021) baseline and London Plan target (site-wide emissions reduction)

Table 1: Site-wide - CO₂ emissions compared to Part L (2021) baseline

Site-wide – Carbon dioxide emissions (Tonnes CO ₂ /year)		
	Regulated CO ₂ emissions	Unregulated CO ₂ emissions
Part L Baseline	1.8	0.5
Be lean: following energy demand reduction	1.5	0.5
Be Clean: following heat network appraisal	1.5	0.5
Be green: following renewable energy appraisal	0.9	0.5

Table 2: Site-wide – Regulated CO2 emissions savings

Site-wide – Regulated carbon dioxide savings		
	Savings (TonnesCO2/year)	Savings (%)
Be lean: savings from energy demand reduction	0.3	17%
Be clean: savings from heat network	0	0%
Be green: Savings from renewable energy	0.6	33%
Total Savings	0.9	50%

- 1.6 The proposed scheme is shown to achieve a site-wide regulated CO2 emissions reduction of 50%, via a combination of an energy efficient building fabric and appropriate systems. Therefore, it is set to exceed the minimum regulated CO2 emissions reduction target of at least 35%, set for major developments within the London Plan.
- 1.7 In addition, the proposed scheme will comply with Haringey Council's Local Plan policy SP4 of aiming for 'zero carbon' for all new residential developments by reducing regulated CO2 emissions as far as possible. The remaining regulated CO2 emissions are to be met via a carbon offset payment, in line with the London Plan 2021 and Haringey Council's Development Management policy DM21 recommendations.

Carbon Offsetting

- 1.8 To achieve the 'Zero Carbon' status required by policy SI 2 of the London Plan, the remaining regulated CO2 emissions following the application of the energy hierarchy strategies must be offset through a payment contribution to the local authority. This payment has been calculated at a rate of £95/tonne for a period of 30 years as recommended in the New London Plan. A payment of £2,600 would be required to offset the remainder of the regulated CO2 emissions of the proposed scheme.

2. INTRODUCTION

- 2..1 GreenBuild Consult has been commissioned to prepare an Energy Statement for the proposed dwelling at Cornerways House 2 in Highgate, within the London Borough of Haringey.
- 2..2 This report presents the energy appraisal of the proposed development and outlines the features that have been incorporated into the design proposal to decrease energy use and carbon dioxide emissions in line with the requirements of the London Plan and Haringey Council's local policies.
- 2..3 In line with the above, a reduction in regulated CO2 emissions against a Building Regulations Part L Volume 1: Dwellings (2021) notional figure will be required, to ensure a policy compliant scheme. The methodology used to determine the anticipated regulated CO2 emissions is in accordance with the London Plan's Energy Hierarchy (Policy SI 2);
- **Be Lean**; use less energy – Reduce the energy demand of a scheme via the adoption of an energy efficient building fabric and services strategy.
 - **Be Clean**; supply energy efficiently – Delivery energy efficiently to a development by connecting to existing District Heat Networks or site energy centre consisting of CHP or CCHP units.
 - **Be Green**; use renewable energy – Utilise appropriate renewable or low carbon technologies to offset grid-based energy use within the proposed development.
- 2..4 Please note that the London Plan now includes a fourth step, Be Seen; monitor, verify and report on energy performance, which is to be considered during the Technical Design stage (RIBA Stage 4) of the proposed development.

Site Proposal

- 2..5 The proposed scheme is to be located on the junction of Ellington Road and Cranley Gardens, which is located in close proximity to Highgate Woods and a number of local amenities in the Highgate and Muswell Hill areas in London.
- 2..6 The proposed scheme will comprise 1 no. residential building three storeys in height with two storeys above ground including three bedrooms, in addition to a lower ground level including a kitchen/living/dining area. The location of the proposed site is highlighted in Figure 2 and the proposed south elevation is shown in Figure 3.



Figure 2: Proposed Site Location (courtesy of Wolff Architects)

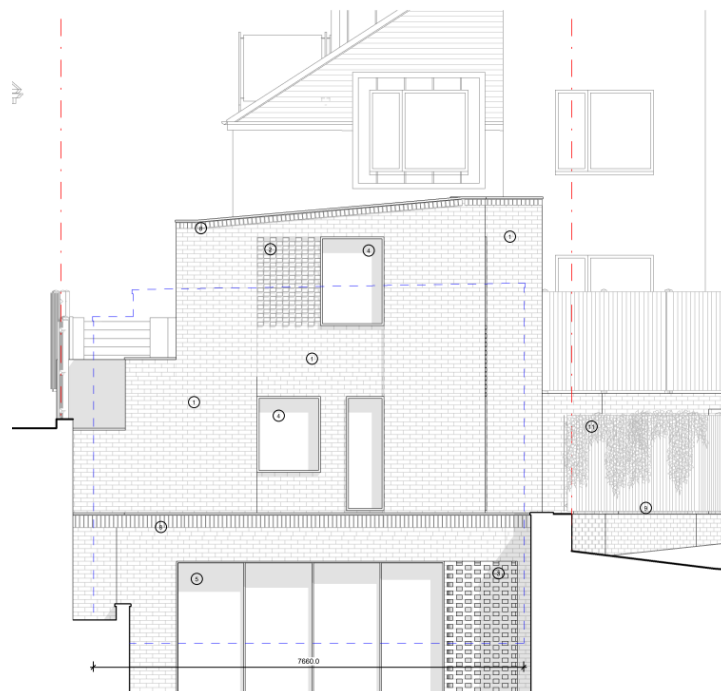


Figure 3: Proposed South Elevation (courtesy of Wolff Architects)

3. POLICY & LEGISLATIVE CONTEXT

- 3..1 There are several national policy drivers for energy efficiency and reduced carbon dioxide (CO₂) emissions, which have been introduced to address the issue of global warming and the implications of climate change including the Energy White Paper, National Planning Policy Framework (NPPF) and Building Regulations Approved Document Part L (2021 edition). On a regional level, the London Plan provides the policy drivers for major developments within Greater London and at the local level the relevant policies are within Haringey Council's Local Plan: Strategic Policies 2021-2026 (2021) and Development Management DPD (2017).

BUILDING REGULATIONS

- 3..2 There are several national policy drivers for energy efficiency and reduced carbon dioxide (CO₂) emissions, which have been introduced to address the issue of global warming and the implications of climate change including Building Regulations Approved Document Part L (2021 edition).
- 3..3 Approved Document 'Part L *Conservation of fuel and power* Volume 1: Dwellings' stipulates that a target emission rate (TER) must be calculated using an approved tool such as SAP, which sets an emissions baseline in kgCO₂/m². The actual dwelling emission rate (DER) is then calculated by modelling the proposed building fabric and services inputs, which must improve upon the TER to achieve Part L1 compliance.

National Policy Drivers

National Planning Policy Framework

- 3..4 The National Planning Policy Framework (NPPF) was revised in July 2021, setting out a key part of the Government's reforms to make the planning system less complex and more accessible, whilst protecting the environment and promoting sustainable growth. The NPPF supersedes the previous national planning guidance.
- 3..5 At the heart of the NPPF are key measures to achieve sustainable development and a presumption in favour of sustainable development.

Regional Policy Drivers

The London Plan 2021

- 3..6 The London Plan (2021) 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. The latest version of the London Plan replaces previous ones and was published for use on 2nd March 2021.

3..7 Section 9 ‘Sustainable Infrastructure’ of the London Plan covers the mitigation of and adaptation to climate change and the management of natural resources. While most of these policies are applicable to major developments only, some are applicable to minor developments such as single dwellings in line with the London Borough of Haringey’s Local Plan and Development Management DPD. The key policies regarding climate change mitigation and adaptation which are applicable to the proposed scheme are presented as follows.

Policy SI 2 Minimising Greenhouse Gas Emissions

A - Major developments should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1) *be lean: use less energy and manage demand during operation.*
- 2) *be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.*
- 3) *be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.*
- 4) *be seen: monitor, verify and report on energy performance.*

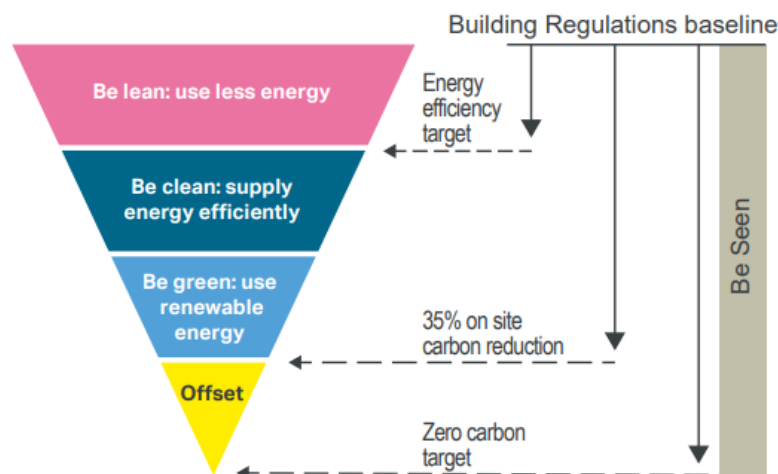


Figure 4: Energy Hierarchy and associated targets (London Plan 2021)

B - Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C - A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly

demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

- 1) through a cash in lieu contribution to the borough's carbon offset fund, or*
- 2) off-site provided that an alternative proposal is identified, and delivery is certain.*

D – Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E – Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

Policy SI 3 Energy infrastructure

D – Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

- 1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:*
 - a. connect to local existing or planned heat networks.*
 - b. use zero-emission or local secondary heat sources (in conjunction with heat pump, if required).*
 - c. use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network).*
 - d. use ultra-low NOx gas boilers.*
- 2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality.*
- 3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.*

E - Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

Policy SI 4 Managing heat risk

A - Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B - Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

- 1. reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.*
- 2. minimise internal heat generation through energy efficient design.*
- 3. manage the heat within the building through exposed internal thermal mass and high ceilings.*
- 4. provide passive ventilation.*
- 5. provide mechanical ventilation.*
- 6. provide active cooling systems.*

3..8 The London Plan also includes the following policy section on supporting residential development on small sites.

Policy H2 Small sites

A - Boroughs should pro-actively support well-designed new homes on small sites (below 0.25 hectares in size) through both planning decisions and plan-making in order to:

- 1. significantly increase the contribution of small sites to meeting London's housing needs.*
- 2. diversify the sources, locations, type and mix of housing supply.*
- 3. support small and medium-sized housebuilders.*
- 4. support those wishing to bring forward custom, self-build and community led housing.*
- 5. achieve the minimum targets for small sites set out in Table 4.2 as a component of the overall housing targets set out in Table 4.1.*

B - Boroughs should:

- 1. recognise in their Development Plans that local character evolves over time and will need to change in appropriate locations to accommodate additional housing on small sites.*
- 2. where appropriate, prepare site-specific briefs, masterplans and housing design codes for small sites.*
- 3. identify and allocate appropriate small sites for residential development.*

4. *list these small sites on their brownfield registers.*
5. *grant permission in principle on specific sites or prepare local development orders.*

Local Policy Drivers

Haringey's Local Plan: Strategic Policies 2021-2026 (March 2021)

- 3..9 The Haringey Local Plan refers to the London Plan when addressing the topic of reducing CO2 emissions from all proposed developments and mitigating climate change. The following policies within the document are applicable to all schemes within the borough.

Policy SP4: Working Towards A Low Carbon Haringey

1. *In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:*
 - a. *From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards;*
2. *The Council will promote low- and zero-carbon energy generation through the following measures:*
 - a. *Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;*
 - b. *Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;*
 - c. *Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and*
 - d. *All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on-site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.*

- 3..10 It should be highlighted that on the 25th March 2015 a written ministerial statement set out the conclusions to the government's Housing Standards Review. The following extracts from the statement are thought to be relevant to the requirements for this development:

'From the date the Deregulation Bill 2015 is given Royal Assent, local planning authorities and qualifying bodies preparing neighbourhood plans should not set in their emerging Local Plans, neighbourhood plans, or supplementary planning documents, any additional local technical standards

or requirements relating to the construction, internal layout or performance of new dwellings. This includes any policy requiring any level of the Code for Sustainable Homes to be achieved by new development; the government has now withdrawn the code, aside from the management of legacy cases.

- 3..11 Therefore, the government's policy is that planning permissions should not be granted requiring, or subject to conditions requiring, compliance with any technical housing standards other than for those areas where authorities have existing policies on access, internal space, or water efficiency. With this statement in mind the new build residential element of this development has not been assessed against the Code for Sustainable Home criteria.

Haringey Development Management DPD (July 2017)

- 3..12 Haringey Council's Development Management DPD includes the following policies which have been incorporated within the energy strategy of the proposed scheme.

Policy DM21: Sustainable design, layout and construction

- A. *All new development, including building and landscape works, will be expected to consider and implement sustainable design, layout and construction techniques. Proposals should:*
 - a) *Apply the energy hierarchy to minimise energy use in order to meet, and if possible exceed, minimum carbon dioxide reduction requirements;*
 - b) *Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems;*
- C. *Proposals that fail to demonstrate adequate consideration for sustainable design, layout and construction techniques will be resisted.*
- D. *Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.*



Figure 5: Haringey Local Policy documents

4. METHODOLOGY

- 4..1 The methodology used to estimate the energy demand from the building at the site has been informed by the following publications:
- The London Plan (2021)
 - National Calculation Methodology (NCM) modelling guide
 - Energy Assessment Guidance – GLA guidance on preparing energy assessments as part of planning applications (June 2022)
- 4..2 The software used to generate the Regulation baseline is approved by the DCLG as being compliant with the NCM.
- 4..3 As of June 2022, applicants are encouraged to use updated SAP 10.2 carbon emission factors in line with the implementation of Part L (2021). The carbon factors used in our calculations are as follows;
- Grid Natural Gas: 0.210 kgCO₂/kWh
 - Grid Electricity: 0.136 kgCO₂/kWh
- The outputs from the software used have been manually converted using the new SAP 10.2 carbon factors, in line with the GLA guidance on preparing energy assessments (2022).

On-Site Carbon Savings – The Energy Hierarchy

- 4..4 The methodology employed to develop the energy strategy for the scheme and achieve on-site carbon savings is in line with the GLA's Guidance on preparing energy assessments and is as follows:
- The baseline CO₂ emissions are first established, i.e., the emissions of a scheme that is compliant with Part L (2021) of the Building Regulations. The updated GLA Guidance (2022) indicates that an improvement of 10% over Part L 'notional' CO₂ emissions must be shown for domestic schemes, in line with the London Plan.
 - The software used to model and calculate the energy performance and carbon emissions of the domestic scheme is Stroma FSAP 10 (Version - 1.0.75).
 - The same approach is followed to determine the energy performance and CO₂ emissions of the proposed scheme for each step of the Energy Hierarchy. The CO₂ emissions are estimated based on the Dwelling Emission Rate (DER) figures. The Energy Hierarchy aims at delivering significant carbon savings on-site.

- 4..5 The steps of the Energy Hierarchy applicable to the proposed scheme are:
- **Be Lean** - whereby the demand for energy is reduced through a range of passive and active energy efficiency measures - as part of this step the Cooling Hierarchy is implemented (see London Plan policy SI 2) and measures are proposed to reduce the demand for active cooling;
 - **Be Clean** - whereby as much of the remaining energy demand is supplied as efficiently as possible (e.g. by connecting to a district energy network or developing a site-wide CHP network); and
 - **Be Green** - whereby renewable technologies are incorporated to offset part of the carbon emissions of the development. The uptake of renewable technologies is based on feasibility and viability considerations, including their compatibility with the energy system determined in the previous step.
- 4..6 As the local policy DM21 indicates that the energy hierarchy is to be used to minimise energy use, the 'Be Seen' category of the energy hierarchy is not being applied to this minor development at this stage of its design.
- 4..7 The implementation of the Energy Hierarchy determines the total regulated carbon savings that can be feasibly and viably achieved on site. The % improvement against the baseline emissions is compared to the relevant targets for each element and in case of a shortfall, savings through off-site measures should be achieved.

Off-Site Carbon Savings – Carbon Offsetting

- 4..8 The London Plan 2020 has established provisions to ensure that the shortfall in carbon savings is met off-site; this comprises a carbon offset payment with a figure of £95/tonne for a period of 30 years in accordance with the GLA Guidance for Energy Statements (2022).
- 4..9 The cash in lieu contribution is calculated and summed to provide the total carbon offset payment to be made to the Council.
- 4..10 The structure of the Energy Assessment follows the methodology presented above and comprises the following sub-sections:
- Be Lean;
 - Be Clean;
 - Be Green.
- 4..11 The Conclusions section summarises the energy strategy and associated carbon savings for the proposed development.

5. ENERGY ASSESSMENT

‘Be Lean’ – Reduce the Energy Demand

- 5.1 In order to achieve a building that improves upon the baseline compliance threshold of Part L (2021), the proposal incorporates a range of passive and active design measures that will reduce the energy demand for space conditioning, hot water and lighting.

Passive Design Measures

Improved U-values

- 5.2 The heat loss of different building fabric elements is dependent upon their U-value. A building with low U-values provides better levels of insulation and reduced heating demand during the cooler months. The proposed development will incorporate high levels of insulation for all solid elements and high-performance glazing beyond Part L 2021 targets and notional building specifications, in order to reduce the demand for space conditioning (heating and cooling) as far as possible.
- 5.3 Table 3 presents the improved performance of the proposed building fabric beyond the Building Regulations requirements for the proposed scheme.

Table 3: Proposed building fabric U-values

The Cornerways House (2): Building Fabric U-value comparison with Part L (2021) recommendations			
Element	Sub-Element	Building Regulations Part L Volume 1: Dwellings – New Dwellings	Proposed Scheme
Walls	Lower Ground (LG), Ground (GF) & first floor (1F) External Walls	0.26 W/m ² K	0.15 W/m ² K
Walls	Basement walls (LG, GF) in contact with the ground	0.30 W/m ² K	0.15 W/m ² K (0.13 W/m ² K when ground impact is considered)
Floors	LG Floor	0.18 W/m ² K	0.12 W/m ² K
Roof	Flat roof (1F)	0.16 W/m ² K	0.12 W/m ² K
Roof	Exposed roofs (LG and GF)	0.20 W/m ² K	0.12 W/m ² K
Windows	All glazing (windows and glazed doors)	1.60 W/m ² K (g-value 0.63)	1.40 W/m ² K (g-value 0.50 for all windows)
Rooflights	All rooflights	2.20 W/m ² K (g-value 0.63)	1.40 W/m ² K (g-value 0.50 for all windows)
Doors	All doors	1.60 W/m ² K (All types of doors)	1.60 W/m ² K (Solid entrance door)

Air Tightness

- 5..4 Heat losses that occur due to air infiltration can be minimised via good construction detailing and the use of best practice construction techniques. The proposed development will aim to improve upon the Part L Volume 1: Dwellings (2021) minimum standard for air tightness of 8m³/m².h at 50Pa, by targeting an air permeability rate of 5m³/m².h at 50Pa for all areas.

Thermal Bridging

- 5..5 It is envisaged that the construction details for the proposed dwelling will be designed to minimise heat losses via the junctions of the building as far as possible. An overall ψ -value of 0.06 has been assigned within the SAP calculations for the proposed scheme at this stage.
- 5..6 As Accredited Construction Details are not applicable to proposed dwellings under the revised Part L (2021) guidance, the junction details of the proposed scheme will be modelled via a thermal bridge analysis software at RIBA Stage 4 – *Technical Design* to ensure that the proposed junctions achieve at most half of their 'default' ψ -values as indicated within SAP 10.2 Appendix K.

Reducing the Need for Artificial Lighting

- 5..7 The development has been designed to maximise daylight as much as possible as a way of improving the health and wellbeing of its occupants. All habitable areas will benefit from appropriate areas of glazing to increase the amount of daylight within the internal spaces. This is expected to reduce the need for artificial lighting whilst delivering pleasant, healthy spaces for occupants. Please refer to the proposed scheme internal daylight analysis within the *Daylight, Sunlight and Overshadowing Assessment* report presented with this planning submission for further details.

Active Design Measures

Mechanical Ventilation with Heat Recovery

- 5..8 The proposed building services strategy includes mechanical ventilation systems utilising heat recovery in order to achieve ventilation in the most energy-efficient way (see Table 4 for further details).

Energy Efficient lighting

- 5..9 Low energy light fittings will be incorporated throughout the development. All light fittings will be specified as LED luminaires only as shown in Table 4. This will enable the proposal to reduce energy use and internal gains as much as possible.

Building Energy Monitoring

- 5..10 The development will incorporate smart meters monitoring the consumption of energy and water, either directly or indirectly (using third-party equipment or software) of all areas of the proposed scheme.
- 5..11 In addition, comprehensive metering of the proposed heating system will future proof the scheme for changes in the energy market, including enabling the occupier / building owner to take advantage of a 'demand side' response strategy. This will enable the proposed scheme to meet the requirements of the 'Be Seen' portion of the London Plan's energy hierarchy.

Reducing Overheating Risks

- 5..12 The potential risk of overheating will be mitigated as far as possible by incorporating passive and active design measures, in line with London Plan (2021) Policy SI 4 and its cooling hierarchy.

The Cooling Hierarchy

Energy Efficient Pipework

- 5..13 The heating infrastructure of the proposed dwelling will be designed to reduce the lateral lengths of pipework, which will be sufficiently insulated (following CIBSE CoP1 guidelines), thereby increasing the energy efficiency of the services design and reducing internal heat gains within the development.

External & Internal shading

- 5..14 In addition, it is assumed that internal blinds will be included within the dwelling to further reduce the amount of heat entering their spaces.

Thermal Mass

- 5..15 It is envisaged that the internal floors of the building will provide a degree of thermal massing to absorb and store excess heat during the hottest periods of a day. The building will release its heat in the cooler times of a day to dampen the peak diurnal weather conditions.

Natural Ventilation

- 5..16 While a mechanical ventilation with heat recovery system will be present within the dwelling, passive ventilation will be employed as the main strategy for providing fresh air and dissipating heat across the proposed scheme during the summer months. The dwelling will consist of openable windows which will allow the crossflow of air to remove excessive heat from internal spaces.

'Be Lean; Stage - Energy Use & CO2 Emissions Performance

- 5..17 Table 4 presents the services inputs used within the 'Lean Stage calculations of the energy assessment for the proposed scheme.

- 5..18 The heating system proposed incorporates an energy efficient air source heat pump (ASHP) system, which can be considered as a renewable or low carbon energy source. The impact of this system has been considered in the 'Be Green' stage of the calculations and the 'notional' model systems criteria for Part L Volume 1 (2021) have been used as the space and hot water heating services at the 'Be Lean Stage' of the energy calculations In line with the GLA guidance for energy assessments (2022). Details of the 'notional' model specification can be found within the SAP 10.2 document Appendix R.

Table 4: Building Services Inputs - Lean Stage

Building Services Inputs – Lean Stage	
Ventilation Strategy	Mechanical ventilation with heat recovery units (similar to Nuaire MRXBOXAB-ECO4, up to 95% efficient)
Heating	Heating only – 89.5% efficient gas boilers (performance as specified in SAP 10.2 Appendix R)
	Controls - Time and temperature zone control by suitable arrangement of plumbing and electrical services
Hot Water System	From main heating system - includes wastewater heat recovery systems (WWHRS) for all showers similar to Hei-tech Showersave Recoh-vert RV3 system
Lighting	100% Energy efficient lighting (90 lm/W performance)

- 5..19 Table 5 presents the CO2 emissions for the proposed scheme when compared to the Part L baseline figures. In addition, Table 6 presents the resulting regulated CO2 emissions savings at the 'Be Lean' stage of the GLA's energy hierarchy. A 17% regulated CO2 emissions saving can be noted at the 'Lean' stage from the proposed site.

Although the proposed scheme is a minor development, it can be noted that it will meet the London Plan requirements for regulated CO2 emissions savings at the 'Be Lean' stage for major domestic schemes (i.e., a minimum 10% saving). The Fabric Energy Efficiency Standard (FEES) comparison between the Part L baseline and the proposed building fabric is shown in Table 7.

Table 5: Lean Stage: Site-wide - CO2 emissions compared to Part L (2021) baseline

Site-wide - Carbon dioxide emissions (Tonnes CO2/year)		
	Regulated CO2 emissions	Unregulated CO2 emissions
Part L 2021 baseline	1.8	0.5
Be Lean	1.5	0.5

Table 6: Lean Stage: Site-wide - Regulated CO2 emissions savings

Site-wide – Regulated carbon dioxide savings		
	Savings (TonnesCO ₂ /year)	Savings (%)
Be lean: savings from energy demand reduction	0.3	17%
Total Savings	0.3	17%

Table 7: Lean Stage: Domestic - FEES Comparison to Part L (2021) baseline

Lean Stage: Domestic – FEES Result and improvement over Part L			
	Target Fabric Energy Efficiency (MWh/year)	Design Fabric Energy Efficiency (MWh/year)	Improvement
Development Total	47.90	47.80%	0.2%

5..20 The updated GLA guidance for energy statements (2022) indicates that the overall energy use intensity (EUI) and space heating demand of the proposed scheme should be presented within an Energy Statement, with an aim to be below the recommended target figures presented within Table 4 of the GLA guidance. These have been presented within Table 8.

Table 8: Proposed scheme EUI and Space heating demand figures compared to GLA recommendations.

Building type	EUI (kWh/m ² /year) (excluding renewable energy)	Space heating demand (kWh/m ² /year) (excluding renewable energy)	EUI value from Table 4 of the GLA guidance (kWh/m ² /year) (excluding renewable energy)	Space heating demand from Table 4 of the GLA guidance(kWh/m ² /year) (excluding renewable energy)
Residential	33.5	21.4	35	15

'Be Clean' – Supply Energy Efficiently

- 5..21 The energy system for the development has been selected in accordance with the London Plan decentralised energy hierarchy. The hierarchy listed in Policy SI 3 states that energy systems should consider:
- Communal heating
 - Site wide CHP network; and,
 - Connection to existing or future proposed heating networks.

Communal Heating

- 5..22 Local heat and power sources minimise distribution losses and achieve greater efficiencies when compared to separate energy systems, thus reducing CO₂ emissions. In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network of insulated pipes to surrounding residences. However, no communal energy centres have been identified in close proximity to the proposed site. Therefore, this option would not be appropriate for the proposed dwelling.

Site Wide CHP Network

- 5..23 Combined Heat and Power generation (CHP), or co-generation, is the production of electricity and useful heat from a single engine. Unlike conventional electricity generation, heat is re-used in a CHP system, primarily for hot water, thereby improving the overall energy conversion from 25-35% to around 80%.
- 5..24 A CHP unit is not considered feasible for the proposed development due to its size and the plant space that would be required. Therefore, it has not been included within the proposed scheme at The Cornerways House (2).

Connection to an Existing Network

- 5..25 The London Heat Map identifies existing and potential opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study. An excerpt from the London Heat Map can be seen in Figure 6.
- 5..26 No existing or proposed heat networks have been noted in close proximity to the proposed scheme at The Cornerways House (2). In addition, the proposed scheme is a single dwelling, therefore, no assessments have been undertaken to demonstrate how it could be capable of connecting to any district heat network due to its small size.

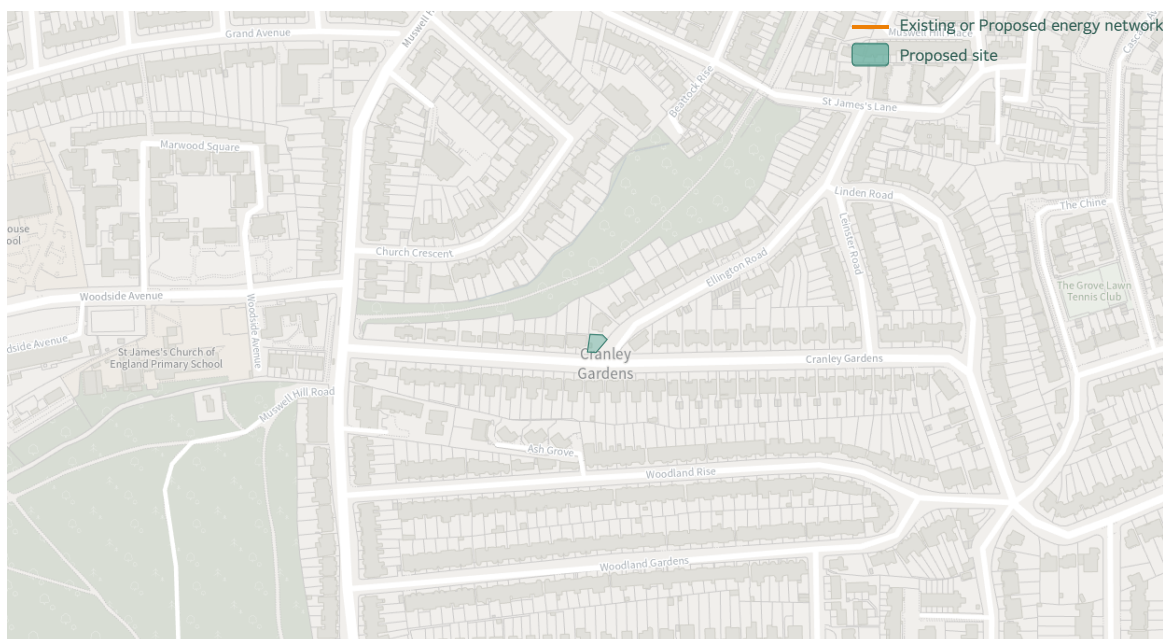


Figure 6: The Cornerways House (2) - Location in London Heat Map

'Be Clean' Stage - Energy Use & CO2 Emissions Performance

5..27 Table 9 presents the site-wide CO2 emissions for the proposed scheme when compared to the Part L baseline and 'Be Lean' calculation figures, while Table 10 presents the resulting regulated CO2 emissions savings at the 'Be Clean' stage of the GLA's energy hierarchy. As no connection to a district or communal heating system or site-wide CHP system is proposed, no regulated CO2 emissions saving can be noted at this stage.

Table 9: Clean Stage: Site-wide - CO2 emissions compared to Part L (2021) baseline

Site-wide – Carbon dioxide emissions (Tonnes CO2/year)		
	Regulated CO2 emissions	Unregulated CO2 emissions
Part L Baseline	1.8	0.5
Be lean: following energy demand reduction	1.5	0.5
Be Clean: following heat network appraisal	1.5	0.5

Table 10: Clean Stage: Site-wide - Regulated CO2 emissions savings

Site-wide – Regulated carbon dioxide savings		
	Savings (TonnesCO2/year)	Savings (%)
Be lean: savings from energy demand reduction	0.3	17%
Be clean: savings from heat network	0	0%
Total Savings	0.3	17%

Be Green' – Use Renewable Energy

5..28 Methods of generating on-site renewable energy have been assessed, once Lean and Clean measures have been considered. The proposed development will benefit from an energy efficient building fabric which will reduce the energy consumption of the proposed development in the first instance. In addition, a range of renewable technologies were considered, including:

- Biomass;
- Photovoltaic panels
- Solar thermal panels
- Ground source heat pump;
- Air source heat pump; and
- Wind energy.

5..29 In determining the appropriate renewable technology for the site, the following factors were considered:

- CO2 savings achieved;
- Site constraints;
- Any potential visual impacts, and,
- Compatibility with the energy loads of the proposal.

Renewable Energy Appraisal

5..30 Table 11 summarises the factors considered in determining the appropriate renewable technologies for this project. This includes estimated capital cost, anticipated lifespan, level of maintenance and level of impact on external appearance. The final column indicates the feasibility of the technology in relation to the site conditions. It is important to note that the information provided is indicative and based upon early project stage estimates.

Table 11: Renewable energy feasibility table

Technology Considered	Comments	Estimated Lifespan	Maintenance	Impact on external appearance	Overall feasibility
Biomass	Burning of wood pellets releases high NOx emissions and there are limitations for their storage and delivery within an urban location.	20 yrs.	High	High	Not feasible
PV	Roof space of development is limited and too low to allow PV installation without partial overshadowing.	25 yrs.	Low	Medium	Feasible – but not adopted within proposed scheme

Technology Considered	Comments	Estimated Lifespan	Maintenance	Impact on external appearance	Overall feasibility
Solar thermal	Additional plumbing and kit requirement too significant to warrant effective CO2 emissions reductions from solar thermal array.	25 yrs.	Low	Medium	Not feasible
GSHP	The site does not have an external space that would allow for the installation of ground loops.	20 yrs.	High	Low	Not feasible
ASHP	The proposed scheme has adequate external space to allow for an external condenser unit and a utility area to allow for the internal unit.	20 yrs.	Low	Medium	Feasible – adopted within proposed scheme
Wind	Site is too small for the installation of wind turbines and they will have a significant visual impact on the existing building.	25 yrs.	Medium	High	Not feasible

- 5..31 The feasibility study demonstrates that an air source heat pump (ASHP) would be a suitable renewable technology for the proposed scheme as it has the external space which could accommodate the installation of an external condenser (Figure 7).
- 5..32 While photovoltaics (PV) could be a feasible option for the proposed scheme, the roof space of the proposed scheme would experience partial overshadowing from neighbouring properties. In addition, it has been the client's aspiration to utilise capital costs for the use of a renewable system as the primary energy source for the proposed dwelling. Therefore, PV panels have not been included within the proposed scheme.

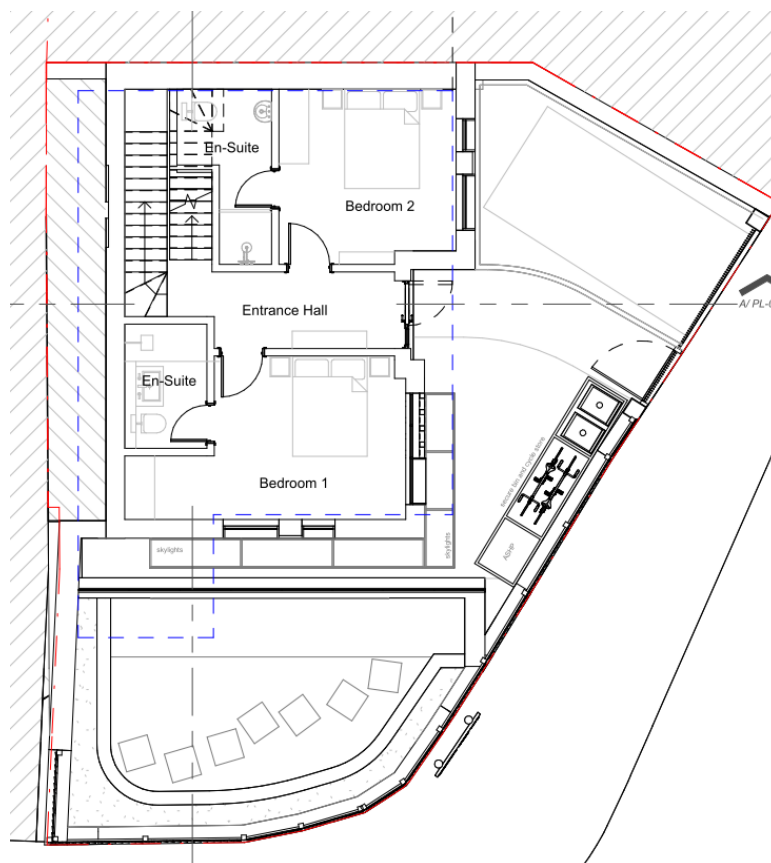


Figure 7: Proposed Ground floor plan with external area

Detailed Assessment of Air Source Heat Pump

- 1.1 A suitable air source heat pump system (ASHP) for the site would include a, external condenser unit and an internal unit, similar to the size of a regular gas boiler. Table 12 outlines the CO₂ savings achieved via this technology for this proposed scheme. A regulated CO₂ emission saving of 50% is shown. An ASHP would be suitable for the proposed dwelling due to the following.
- The limited footprint of the site leaves enough space for small garden where an external condenser unit can be installed.
 - The system could potentially be used to provide energy efficient cooling if required at a later date, thereby future proofing the dwelling; and
 - The CO₂ emissions saving achieved is far greater than other renewable energy options, such as PV panels.

Table 12: Air Source Heat Pump system details

Air Source Heat Pump – System Details	
Carbon intensity of electricity (kgCO ₂ /kWh)	0.136
Proportion of space heating met by ASHP	100%
Energy met by ASHP (kWh/year)	8,000
Energy used by ASHP (kWh/year)	4,700

Air Source Heat Pump – System Details	
Total CO2 savings (Tonnes CO2/year)	0.9
Regulated baseline CO2 emissions (Tonnes CO2/year)	1.8
Total baseline CO2 emissions (Tonnes CO2/year)	2.3
% Regulated CO2 reduction – from baseline	50%
% Total CO2 reduction – from baseline	39%

‘Be Green’ Stage - Energy Use & CO2 Emissions Performance

- 5..33 The ‘Be Green’ stage energy calculations have been carried out including the proposed ASHP system. Therefore, the full building services design of the proposed scheme, as presented within Table 13, has been used to carry out the energy calculations at this stage.

Table 13: Building Services Inputs – Green Stage

Building Services Inputs – Lean Stage	
Ventilation Strategy	Mechanical ventilation with heat recovery units (similar to Nuaire MRXBOXAB-ECO4, up to 95% efficient)
Heating	Heating only – ASHP system similar to Vaillant Arotherm 7kW air source heat pump with under floor heating (< 35°C flow temperature)
	Controls - Time and temperature zone control by suitable arrangement of plumbing and electrical services
Hot Water System	From main heating system – 300 litre storage tanks with 70mm factory insulation. Single immersion heater and fully insulated pipework throughout.
Lighting	100% Energy efficient lighting (90 lm/W performance)

- 5..34 Table 14 presents the CO2 emissions for the proposed scheme compared to the Part L baseline, ‘Be Lean’ and ‘Be Clean’ calculation figures. Table 15 presents the resulting regulated CO2 emissions savings at the ‘Be Green’ stage of the GLA’s energy hierarchy for the proposed scheme,
- 5..35 A significant regulated CO2 emissions reduction of 33% can be seen via the incorporated renewable energy strategy for the site, thereby meeting the requirements of Haringey Council’s Local Plan policy SP4. A total regulated CO2 emissions reduction of 50% can be noted for the proposed scheme.
- 5..36 It should be noted that although the proposed scheme is a minor development, it exceeds the minimum regulated CO2 emissions reduction target of at least 35%, set for major developments within the London Plan. In addition, the proposed scheme is set to comply with Haringey Council’s Local Plan policy SP4 of aiming for ‘zero carbon’ for all new developments within the borough, by reducing regulated CO2 emissions as far as possible. The carbon offset payment required for the remaining emissions is discussed within the next section.

Table 14: Green Stage: Site-wide - CO₂ emissions compared to Part L (2021) baseline

Site-wide – Carbon dioxide emissions (Tonnes CO ₂ /year)		
	Regulated CO ₂ emissions	Unregulated CO ₂ emissions
Part L Baseline	1.8	0.5
Be lean: following energy demand reduction	1.5	0.5
Be Clean: following heat network appraisal	1.5	0.5
Be green: following renewable energy appraisal	0.9	0.5

Table 15: Green Stage: Site-wide - Regulated CO₂ emissions savings

Site-wide – Regulated carbon dioxide savings		
	Savings (TonnesCO ₂ /year)	Savings (%)
Be lean: savings from energy demand reduction	0.3	17%
Be clean: savings from heat network	0	0%
Be green: Savings from renewable energy	0.6	33%
Total Savings	0.9	50%

Carbon Offsetting

- 5..37 The development is achieving a 54% reduction in regulated CO₂ emissions from the Part L baseline figure of 1.8 tonnes of CO₂ per year. Therefore, a further 50% reduction in regulated CO₂ emissions will be needed to achieve compliance with The London Plan, which equates to approximately 0.9 tonnes of CO₂ per year.
- 5..38 The GLA's guidance for Energy Statements (2020) indicates that a carbon offset rate of £95/tonne for a period of 30 years is applicable. Using this rate, a payment of £2,600 would be needed to make the development 'zero-carbon', as shown in Table 16.

Table 16: The Cornerways House (2) - Shortfall in regulated carbon dioxide savings and estimated offset payment.

Carbon Offset Payment		
	Annual Shortfall (tonnes CO ₂ /yr)	Cumulative Shortfall over 30 years (tonnes CO ₂)
Zero-carbon Target Savings	1.8	-
On-site Carbon Savings	0.9	-
Carbon Shortfall	0.9	27
Cash-in lieu contribution	£2,600	

6. CONCLUSIONS

- 6..1 In accordance with the London Plan, GLA guidance and Haringey Council's local policies, the baseline energy figures derived from Part L compliant energy calculations have indicated that the proposed scheme will have a regulated CO2 emissions 'notional' baseline of 1.8 tonnes of CO2 per year (tCO2/year).
- 6..2 In the 'Be Lean' stage of the London Plan's energy hierarchy, a 0.3 tCO2/year regulated CO2 emission saving associated with the proposed fabric energy efficiency measures has been predicted for the proposed scheme. This is equivalent to a 17% reduction in regulated CO2 emissions from the Part L (2021) baseline.
- 6..3 For the 'Be Clean' stage, no existing community heating system was noted in close proximity to the proposed development. As the proposed scheme is a single dwelling, no assessments have been undertaken to demonstrate how the proposed development could be capable of connecting to a district heat network at a future date. A CHP unit was not considered feasible due to size of the development and the large plant space that would be required. Therefore, no CO2 emissions savings have been noted within the 'Be Clean' stage of the energy hierarchy.
- 6..4 A significant CO2 emissions reduction was noted at the 'Be Green' stage of the energy hierarchy, via the inclusion of an air source heat pump system. A further regulated CO2 emission saving of 0.6 tCO2/year has been noted from the proposed scheme. This accounts for a further 33% reduction in CO2 emissions from the 'be green' stage alone.
- 6..5 Therefore, it can be ascertained that a significant CO2 emissions saving has been calculated for the proposed development at The Cornerways House (2). A total carbon reduction of 0.9 tCO2/year, equivalent to a 50% reduction in regulated CO2 emissions over the Part L (2021) baseline, can be achieved through the energy strategy demonstrated in this report. The remaining regulated CO2 emissions are to be met via a carbon offset payment, in line with the London Plan 2021 and Haringey Council's Development Management policy DM21 recommendations.
- 6..6 The proposed scheme exceeds the minimum regulated CO2 emissions reduction target of at least 35%, set for major developments within the London Plan. In addition, the proposed scheme is set to comply with Haringey Council's Local Plan policy SP4 of aiming for 'zero carbon' for all new residential developments by reducing regulated CO2 emissions as far as possible.
- 6..7 Table 17 and Table 18 summarise the implementation of the energy hierarchy for the proposed scheme and detail the CO2 emissions and savings against the Part L baseline for each step of the hierarchy.

Table 17: Site-wide - CO2 emissions compared to Part L (2021) baseline

Site-wide – Carbon dioxide emissions (Tonnes CO2/year)		
	Regulated CO2 emissions	Unregulated CO2 emissions
Part L Baseline	1.8	0.5
Be lean: following energy demand reduction	1.5	0.5
Be Clean: following heat network appraisal	1.5	0.5
Be green: following renewable energy appraisal	0.9	0.5

Table 18: Site-wide - Regulated CO2 emissions savings

Site-wide – Regulated carbon dioxide savings		
	Savings (TonnesCO2/year)	Savings (%)
Be lean: savings from energy demand reduction	0.3	17%
Be clean: savings from heat network	0	0%
Be green: Savings from renewable energy	0.6	33%
Total Savings	0.9	50%

Appendix A

Part L Compliance Documents – Dwelling SAP Sheets

Sample SAP Worksheet

The following pages includes the documents for the SAP 10.2 calculations of the proposed dwelling. The documents included within this Appendix are as follows;

- SAP Worksheet (Lean stage and Green stage)
- Part L Volume 1: Dwellings (2021) Compliance sheet (Green stage)

Dwelling Reference: CH_Lean Stage

Dwelling Type: New Dwelling Design Stage

The Cornerways
Ellington Road
LONDON
N10 3DD

1. Overall dwelling dimensions

	Area(m ²)	Av. Height(m)	Volume(m ³)
Basement	65.53 (1a) x 2.85	(2a) =	186.77 (3a)
Ground Floor	51.58 (1b) x 2.85	(2b) =	147 (3b)
First Floor	43.79 (1c) x 2.39	(2c) =	104.66 (3c)
Total floor area TFA			160.9 (4)
Dwelling volume			438.43 (5)

2. Ventilation Rate

Chimneys/Flues	0	x 80 =	0	(6a)
Open chimneys	0	x 20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x 10 =	0	(6c)
Flues attached to solid fuel boiler	0	x 20 =	0	(6d)
Flues attached to other heater	0	x 35 =	0	(6e)
Number of blocked chimneys	0	x 20 =	0	(6f)
Number of intermittent extract fans	4	x 10 =	40	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
Air changes per hour				
Number of storeys in the dwelling (ns)		0.09	0.09	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc		0	0	(9)
Additional infiltration		0	0	(10)
Structural infiltration		0	0	(11)
Suspended wooden ground floor		0	0	(12)
No draught lobby		0	0	(13)
Percentage of windows and doors draught proofed		0	0	(14)
Window infiltration		0	0	(15)
Infiltration rate		0	0	(16)
Air permeability value, AP50, (m ³ /h/m ²)		5	5	(17)
Air permeability value, AP4, (m ³ /h/m ²)		0	0	(17a)
Air permeability value)		0.34	0.34	(18)
Number of sides on which dwelling is sheltered		2	2	(19)

Shelter factor													0.85	(20)
Infiltration rate incorporating shelter factor													0.29	(21)
Infiltration rate modified for monthly wind speed														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34	3.81	(22b)
Calculate effective air change rate for the applicable case:														
													0.5	(23a)
													0.5	(23b)
													83.7	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0.45	0.44	0.44	0.4	0.39	0.36	0.36	0.35	0.37	0.39	0.41	0.42		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air change rate														
	0.45	0.44	0.44	0.4	0.39	0.36	0.36	0.35	0.37	0.39	0.41	0.42		(25)
Effective air change rate from PCDB:														
	0.45	0.44	0.44	0.4	0.39	0.36	0.36	0.35	0.37	0.39	0.41	0.42		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k-value

ELEMENT	Gross area (m ²)	Openings m ²	Net Area A ,m ²	U-value W/m ² K	A X U (W/K)	k-value kJ/m ² ·K	A X k kJ/K
Solid door						3.15	(26)
Semi-glazed door						3.15	(26a)
Window						43.35	(27)
Roof window						7.2	(27a)
Basement floor				7208.74		7.86	(28)
Ground floor				0		0	(28a)
Exposed floor				0		0	(28b)
Basement wall				17806.2		14.01	(29)
External wall				5727.19		14.88	(29a)

Roof	540.94	7.21	(30)
Total area of external elements $\sum A$, m ²		383.66	(31)
Party Wall		0	(32)
Party floor		0	(32a)
Party ceiling		0	(32b)
Internal wall **		0	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = $\sum (A \times U)$		97.67	(33)
Heat capacity Cm = $\sum (A \times k)$		31283.07	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K		250	(35)
Linear Thermal bridges: $\sum (L \times \Psi)$ calculated using Appendix K		23.02	(36)
Point Thermal bridges: $\sum \chi$ (W/K) if significant point thermal bridge present and values available		23.02	(36a)
Total fabric heat loss H = $\sum (A \times U) + \sum (L \times \Psi) + \sum \chi$		120.69	(37)
Ventilation heat loss calculated monthly			
65.3 64.25 63.2 57.95 56.9 51.66 51.66 50.61 53.76 56.9 59 61.1			(38)
Heat transfer coefficient, W/K			
185.98 184.93 183.89 178.64 177.59 172.34 172.34 171.3 174.44 177.59 179.69 181.79			(39)
Heat loss parameter (HLP), W/m ² K			
1.16 1.15 1.14 1.11 1.1 1.07 1.07 1.06 1.08 1.1 1.12 1.13			(40)
Number of days in month (Table 1a)			
31 28 31 30 31 30 31 31 30 31 30 31			(41)

4. Water heating energy requirement

Assumed occupancy, N	2.95	(42)
Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)		
73.68 72.58 70.96 67.88 65.6 63.06 61.61 63.21 64.97 67.7 70.85 73.4		(42a)
Hot water usage in litres per day for baths, Vd,bath (from Appendix J)		
31.81 31.34 30.67 29.45 28.53 27.51 26.96 27.62 28.34 29.43 30.68 31.7		(42b)
Hot water usage in litres per day for other uses, Vd,other (from Appendix J)		
44.84 43.21 41.58 39.95 38.32 36.69 36.69 38.32 39.95 41.58 43.21 44.84		(42c)
Annual average hot water usage in litres per day Vd,average (from Appendix J)	138.39	(43)
Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)		
150.34 147.13 143.22 137.27 132.45 127.26 125.26 129.15 133.26 138.71 144.74 149.95	1658.73	(44)
Energy content of hot water used = $4.18 \times Vd,m \times nm \times DTm$ / 3600 kWh/month (from Appendix J)		
238.1 209.51 220.12 187.92 178.3 156.48 151.49 159.92 164.32 188.22 206.21 234.78	2295.37	(45)
Distribution loss (46) = 0.15 x (45)		
35.71 31.43 33.02 28.19 26.74 23.47 22.72 23.99 24.65 28.23 30.93 35.22		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		

a) If manufacturer's declared loss factor is known (kWh/day):	0	(48)
Temperature factor from Table 2b	0	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.14	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0	(55)
Water storage (or HIU) loss calculated for each month (56) = (55) x (41)		
0 0 0 0 0 0 0 0 0 0 0 0		(56)
If the vessel contains dedicated solar storage or dedicated WWHRS storage, (57)m = (56)m x [(47) - Vs] ÷ (47), else (57)m = (56)m where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).		
0 0 0 0 0 0 0 0 0 0 0 0		(57)
Primary circuit loss for each month from Table 3 modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)		
23.26 21.01 23.26 22.51 23.26 0 0 0 0 23.26 22.51 23.26		(59)
Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)		
0 0 0 0 0 0 0 0 0 0 0 0		(61)
Total heat required for water heating calculated for each month (62) = 0.85 x (45) + (46) + (57) + (59) + (61)		
261.36 230.52 243.38 210.43 201.56 156.48 151.49 159.92 164.32 211.49 228.73 258.04 2477.71		(62)
CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)		
56.89 50.31 52.68 43.62 40.66 34.79 32.61 34.68 35.99 42.43 48.07 55.83		(63a)
PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)		
0 0 0 0 0 0 0 0 0 0 0 0		(63b)
Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)		
0 0 0 0 0 0 0 0 0 0 0 0		(63c)
FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)		
0 0 0 0 0 0 0 0 0 0 0 0		(63d)
Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)		
204.47 180.21 190.7 166.81 160.9 0 0 0 0 169.05 180.65 202.21 1455		(64)
Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)		
0 0 0 0 0 0 0 0 0 0 0 0		(64a)
Heat gains from water heating, kWh/month 0.25 x [0.85 x (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]		
97.78 86.47 91.8 80.49 77.89 52.03 50.37 53.17 54.64 81.19 86.58 96.67		(65)
include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network		

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01	(66)
---	------

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

38.23 33.96 27.62 20.91 15.63 13.19 14.26 18.53 24.87 31.58 36.86 39.3 (67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

495.75 500.89 487.93 460.33 425.5 392.75 370.88 365.73 378.7 406.3 441.13 473.88 (68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 (69)

Pumps and fans gains (Table 5a)

3 3 3 3 3 0 0 0 0 3 3 3 (70)

Losses e.g. evaporation (negative values) (Table 5)

-118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 (71)

Water heating gains (Table 5)

131.42 128.68 123.39 111.8 104.7 72.26 67.7 71.47 75.88 109.13 120.24 129.94 (72)

Total internal gains

783.06 781.18 756.59 710.69 663.47 592.86 567.49 570.39 594.11 664.67 715.89 760.77 (73)

6. Solar gains

Solar gains in watts, calculated for each month

281.86 511.08 766.55 1038.05 1225.53 1239.58 1185.9 1045.66 862.16 584.44 343.61 237.14 (83)

Total gains – internal and solar (watts)

1064.92 1292.27 1523.14 1748.74 1889.01 1832.44 1753.4 1616.05 1456.27 1249.11 1059.5 997.9 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, $\eta_{1,m}$ (see Table 9a)

1 0.99 0.97 0.91 0.78 0.59 0.43 0.48 0.75 0.95 0.99 1 (86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.92 20.09 20.35 20.66 20.85 20.93 20.94 20.94 20.89 20.61 20.21 19.91 (87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.96 19.96 19.97 19.99 20 20.02 20.02 20.03 20.01 20 19.99 19.98 (88)

Roof

Utilisation factor for gains for rest of dwelling, $\eta_{2,m}$ (see Table 9a)

1 0.99 0.97 0.89 0.72 0.5 0.34 0.38 0.67 0.93 0.99 1 (89)

Roof

Mean internal temperature in the rest of dwelling T2

18.97 19.15 19.4 19.71 19.88 19.96 19.97 19.97 19.93 19.68 19.29 18.98 (90)

Living area fraction

0.32 (91)

Mean internal temperature (for the whole dwelling)

19.28 19.45 19.71 20.02 20.19 20.27 20.28 20.28 20.24 19.98 19.59 19.28 (92)

Adjusted mean internal temperature:

19.13 19.3 19.56 19.87 20.04 20.12 20.13 20.13 20.09 19.83 19.44 19.13 (93)

8. Space heating requirement

Utilisation factor for gains,

0.99	0.99	0.96	0.88	0.72	0.51	0.35	0.39	0.68	0.93	0.99	1	(94)
------	------	------	------	------	------	------	------	------	------	------	---	------

Useful gains, mGm , W

1059.32	1274.51	1463.43	1541.69	1365.43	937.51	607.04	636.8	985.9	1160.26	1046.99	994.05	(95)
---------	---------	---------	---------	---------	--------	--------	-------	-------	---------	---------	--------	------

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
-----	-----	-----	-----	------	------	------	------	------	------	-----	-----	------

Heat loss rate for mean internal temperature

2757.44	2663.3	2401	1959.46	1481.77	951.74	608.47	639.52	1044.41	1639.82	2217.13	2713.6	(97)
---------	--------	------	---------	---------	--------	--------	--------	---------	---------	---------	--------	------

Space heating requirement for each month

1263.4	933.27	697.55	300.79	86.56	0	0	0	0	356.8	842.5	1279.35	(98a)
--------	--------	--------	--------	-------	---	---	---	---	-------	-------	---------	-------

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space heating requirement for each month after solar contribution

1263.4	933.27	697.55	300.79	86.56	0	0	0	0	356.8	842.5	1279.35	(98c)
--------	--------	--------	--------	-------	---	---	---	---	-------	-------	---------	-------

Space heating requirement in kWh/m²/year

35.8 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space cooling requirement for month, whole dwelling, continuous (kWh)

0	0	0	0	0	0	0	0	0	0	0	0	(104)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Cooled fraction

												0 (105)
--	--	--	--	--	--	--	--	--	--	--	--	---------

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space cooling requirement for month

0	0	0	0	0	0	0	0	0	0	0	0	(107)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space cooling requirement in kWh/m²/year

0 (108)

8f. Space heating requirement

Fabric Energy Efficiency,

0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,	0												0	(201)		
Fraction of space heat from main system(s),													1	(202)		
Fraction of main heating from main system 2,													0	(203)		
Fraction of total space heat from main system 1,													1	(204)		
Fraction of total space heat from main system 2,													0	(205)		
Efficiency of main space heating system 1 (in %),													89.5	(206)		
Efficiency of main space heating system 2 (in %),													0	(207)		
Efficiency of secondary/supplementary heating system, %,													0	(208)		
Cooling System Seasonal Energy Efficiency Ratio,	0												0	(209)		
Space heating requirement (calculated above),																
	0	0	0	0	0	0	0	0	0	0	0	0	0	(210)		
Space heating fuel (main heating system 1), kWh/month	0												0			
	1411.62	1042.76	779.38	336.08	96.71	0	0	0	0	398.65	941.34	1429.44		(211)		
Space heating fuel (main heating system 2), kWh/month	0												0			
	0	0	0	0	0	0	0	0	0	0	0	0		(213)		
Space heating fuel (secondary), kWh/month	0												0			
	0	0	0	0	0	0	0	0	0	0	0	0		(215)		
Output from water heater),	0												79.4	(216)		
Efficiency of water heater																
	87.94	87.69	87.12	85.62	82.66	0	0	0	0	85.98	87.53	87.97		(217)		
Fuel for water heating																
	232.51	205.49	218.89	194.83	194.65	0	0	0	0	196.61	206.38	229.85	1679.22	(219)		
Space Cooling																
	0	0	0	0	0	0	0	0	0	0	0	0		(221)		
Annual totals													kWh/year	kWh/year		
Space heating fuel used, main system 1													6436	(211)		
Space heating fuel used, main system 2													0	(213)		
Space heating fuel used, secondary													0	(215)		
Water heating fuel used													1679.22	(219)		
Electricity for instantaneous electric shower(s)													0	(64a)		
Space cooling fuel used													0	(221)		
Electricity for pumps, fans and electric keep-hot																
Mechanical vent fans - balanced, extract or positive input from outside	0												0	441.28	(230a)	
warm air heating system fans													0	(230b)		
Heating circulation pump or water pump within warm air heating unit													41	(230c)		
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)		
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)		
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)		
Pump for solar water heating													0	(230g)		
Pump for storage WWHRS													0	(230h)		
Total electricity for the above													527.28	(231)		
Electricity for lighting													270.09	(232)		

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0 0 0 0 0 0 0 0 0 0 0 0 0 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0 0 0 0 0 0 0 0 0 0 0 0 0 (234a)

Electricity generated by hydro-electric generators

0 0 0 0 0 0 0 0 0 0 0 0 0 (235a)

Electricity used or net electricity generated by micro-CHP

0 0 0 0 0 0 0 0 0 0 0 0 0 (235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0 0 0 0 0 0 0 0 0 0 0 0 0 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0 0 0 0 0 0 0 0 0 0 0 0 0 (234b)

Electricity generated by hydro-electric generators

0 0 0 0 0 0 0 0 0 0 0 0 0 (235b)

Electricity used or net electricity generated by micro-CHP

0 0 0 0 0 0 0 0 0 0 0 0 0 (235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>

Fuel kWh/year

energy saved 0 (236a)

energy used 0 (237a)

Total delivered energy for all uses 9544.8

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year
Space heating - main system 1 (electric off-peak tariff			
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		234.27 (240a)
Low-rate fraction	0		234.27 (240b)
High-rate cost	0		0 (240c)
Low-rate cost	0		0 (240d)
Space heating - main system 1 cost (other fuel)	0		0 (240e)
Space heating - main system 2 (electric off-peak tariff			
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		234.27 (241a)
Low-rate fraction	0		234.27 (241b)
High-rate cost	0		0 (241c)
Low-rate cost	0		0 (241d)
Space heating - main system 2 cost (other fuel)	0		0 (241e)
Space heating - secondary (electric off-peak tariff)			
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		234.27 (242a)

Low-rate fraction	0	234.27	(242b)
High-rate cost	0	0	(242c)
Low-rate cost	0	0	(242d)
Space heating - secondary cost (other fuel)	0	0	(242e)
Water heating (electric off-peak tariff)			
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0	0	(243)
Low-rate fraction	0	0	(242b)
High-rate cost	0	0	(242c)
Low-rate cost	0	0	(242d)
Water heating cost (other fuel)	0	61.12	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247))			
Energy For instantaneous electric shower(s)	0	0	(247a)
Space cooling	0	0	(248)
Pumps, fans And electric keep-hot	0	86.95	(249)
Energy For lighting	0	44.54	(250)
Additional standing charges	0	92	(251)
Energy saving/generation technologies	0	0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved Or generated	0	0	(253)
energy used	0	0	(254)
Total energy cost	0	623.13	(255)
11a. SAP rating – Individual heating systems including micro-CHP			
Energy cost deflator	0	0	(256)
Energy cost factor (ECF)	0	0	(257)
SAP rating	0	0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.09	(257)
SAP rating	82.34	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			1351.56	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			352.64	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1704.2	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		73.14	(267)
Electricity for lighting		38.98	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO ₂ , kg/year		1889.87	(272)
Dwelling CO ₂ Emission Rate		11.75	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO ₂ /year	
Space heating - main system 1			7272.68	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			1897.52	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			9170.2	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			797.67	(281)
Electricity for lighting			414.27	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			11285.3	(286)
Dwelling PE Rate			70.14	(287)

Dwelling Reference: CH_Green Stage

Dwelling Type: New Dwelling Design Stage

The Cornerways
Ellington Road
LONDON
N10 3DD

1. Overall dwelling dimensions

	Area(m ²)	Av. Height(m)	Volume(m ³)
Basement	65.53 (1a) x 2.85	(2a) =	186.77 (3a)
Ground Floor	51.58 (1b) x 2.85	(2b) =	147 (3b)
First Floor	43.79 (1c) x 2.39	(2c) =	104.66 (3c)
Total floor area TFA			160.9 (4)
Dwelling volume			438.43 (5)

2. Ventilation Rate

Chimneys/Flues	0	x 80 =	0	(6a)
Open chimneys	0	x 20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x 10 =	0	(6c)
Flues attached to solid fuel boiler	0	x 20 =	0	(6d)
Flues attached to other heater	0	x 35 =	0	(6e)
Number of blocked chimneys	0	x 20 =	0	(6f)
Number of intermittent extract fans	4	x 10 =	40	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
Air changes per hour				
Number of storeys in the dwelling (ns)		0.09	0.09	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc		0	0	(9)
Additional infiltration		0	0	(10)
Structural infiltration		0	0	(11)
Suspended wooden ground floor		0	0	(12)
No draught lobby		0	0	(13)
Percentage of windows and doors draught proofed		0	0	(14)
Window infiltration		0	0	(15)
Infiltration rate		0	0	(16)
Air permeability value, AP50, (m ³ /h/m ²)		5	5	(17)
Air permeability value, AP4, (m ³ /h/m ²)		0	0	(17a)
Air permeability value)		0.34	0.34	(18)
Number of sides on which dwelling is sheltered		2	2	(19)

Shelter factor													0.85	(20)
Infiltration rate incorporating shelter factor													0.29	(21)
Infiltration rate modified for monthly wind speed														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34	3.81	(22b)
Calculate effective air change rate for the applicable case:														
													0.5	(23a)
													0.5	(23b)
													83.7	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0.45	0.44	0.44	0.4	0.39	0.36	0.36	0.35	0.37	0.39	0.41	0.42		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air change rate														
	0.45	0.44	0.44	0.4	0.39	0.36	0.36	0.35	0.37	0.39	0.41	0.42		(25)
Effective air change rate from PCDB:														
	0.45	0.44	0.44	0.4	0.39	0.36	0.36	0.35	0.37	0.39	0.41	0.42		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k-value

ELEMENT	Gross area (m ²)	Openings m ²	Net Area A, m ²	U-value W/m ² K	A X U (W/K)	k-value kJ/m ² ·K	A X k kJ/K
Solid door						3.15	(26)
Semi-glazed door						3.15	(26a)
Window						43.35	(27)
Roof window						7.2	(27a)
Basement floor				7208.74		7.86	(28)
Ground floor				0		0	(28a)
Exposed floor				0		0	(28b)
Basement wall				17806.2		14.01	(29)
External wall				5727.19		14.88	(29a)

Roof	540.94	7.21	(30)
Total area of external elements ΣA , m ²		383.66	(31)
Party Wall		0	(32)
Party floor		0	(32a)
Party ceiling		0	(32b)
Internal wall **		0	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = $\Sigma (A \times U)$		97.67	(33)
Heat capacity Cm = $\Sigma (A \times k)$		31283.07	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K		250	(35)
Linear Thermal bridges: $\Sigma (L \times \Psi)$ calculated using Appendix K		23.02	(36)
Point Thermal bridges: $\Sigma \chi$ (W/K) if significant point thermal bridge present and values available		23.02	(36a)
Total fabric heat loss H = $\Sigma (A \times U) + \Sigma (L \times \Psi) + \Sigma \chi$		120.69	(37)
Ventilation heat loss calculated monthly			
65.3 64.25 63.2 57.95 56.9 51.66 51.66 50.61 53.76 56.9 59 61.1			(38)
Heat transfer coefficient, W/K			
185.98 184.93 183.89 178.64 177.59 172.34 172.34 171.3 174.44 177.59 179.69 181.79			(39)
Heat loss parameter (HLP), W/m ² K			
1.16 1.15 1.14 1.11 1.1 1.07 1.07 1.06 1.08 1.1 1.12 1.13			(40)
Number of days in month (Table 1a)			
31 28 31 30 31 30 31 31 30 31 30 31			(41)

4. Water heating energy requirement

Assumed occupancy, N	2.95	(42)
Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)		
71.82 70.72 69.1 66.61 64.38 61.25 58.78 61.67 63.12 66.22 69.44 71.76		(42a)
Hot water usage in litres per day for baths, Vd,bath (from Appendix J)		
31.1 30.63 29.96 28.96 28.06 26.82 25.88 27.03 27.63 28.86 30.14 31.08		(42b)
Hot water usage in litres per day for other uses, Vd,other (from Appendix J)		
44.84 43.21 41.58 39.95 38.32 36.69 36.69 38.32 39.95 41.58 43.21 44.84		(42c)
Annual average hot water usage in litres per day Vd,average (from Appendix J)	136.01	(43)
Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)		
147.77 144.57 140.65 135.52 130.76 124.76 121.35 127.02 130.71 136.66 142.8 147.68	1630.24	(44)
Energy content of hot water used = $4.18 \times Vd,m \times nm \times DTm / 3600$ kWh/month (from Appendix J)		
217.54 191.29 200.98 177.03 168.5 144.28 134.09 149.51 151.62 176.1 192.99 216.87	2120.8	(45)
Distribution loss (46) = $0.15 \times (45)$		
32.63 28.69 30.15 26.55 25.27 21.64 20.11 22.43 22.74 26.42 28.95 32.53		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		

a) If manufacturer's declared loss factor is known (kWh/day):	0	(48)
Temperature factor from Table 2b	0	(49)
Energy lost from water storage, kWh/day (48) x (49) =	300	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
Volume factor from Table 2a	0.74	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day	1.48	(54)
Enter (50) or (54) in (55)	1.48	(55)
Water storage (or HIU) loss calculated for each month (56) = (55) x (41)		
46 41.55 46 44.52 46 44.52 46 46 44.52 46 44.52 46		(56)
If the vessel contains dedicated solar storage or dedicated WWHRS storage, (57)m = (56)m $\square$ [(47) - Vs] $\div$ (47), else (57)m = (56)m where Vs is V _{ww} from Appendix G3 or (H12) from Appendix H (as applicable).		
46 41.55 46 44.52 46 44.52 46 46 44.52 46 44.52 46		(57)
Primary circuit loss for each month from Table 3 modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)		
23.26 21.01 23.26 22.51 23.26 0 0 0 0 23.26 22.51 23.26		(59)
Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)		
0 0 0 0 0 0 0 0 0 0 0 0		(61)
Total heat required for water heating calculated for each month (62) = 0.85 x (45) + (46) + (57) + (59) + (61)		
286.8 253.85 270.25 244.06 237.76 188.8 180.1 195.51 196.13 245.37 260.02 286.14 2844.8		(62)
CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)		
0 0 0 0 0 0 0 0 0 0 0 0		(63a)
PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)		
0 0 0 0 0 0 0 0 0 0 0 0		(63b)
Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)		
0 0 0 0 0 0 0 0 0 0 0 0		(63c)
FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)		
0 0 0 0 0 0 0 0 0 0 0 0		(63d)
Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)		
286.8 253.85 270.25 244.06 237.76 0 0 0 0 245.37 260.02 286.14 2084.26		(64)
Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)		
0 0 0 0 0 0 0 0 0 0 0 0		(64a)
Heat gains from water heating, kWh/month 0.25 x [0.85 x (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]		
127.74 113.65 122.24 112.49 111.44 83.59 81.39 86.51 86.03 113.97 117.79 127.52		(65)
include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network		

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01 177.01	(66)
---	------

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

38.23 33.96 27.62 20.91 15.63 13.19 14.26 18.53 24.87 31.58 36.86 39.3 (67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

495.75 500.89 487.93 460.33 425.5 392.75 370.88 365.73 378.7 406.3 441.13 473.88 (68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 55.65 (69)

Pumps and fans gains (Table 5a)

3 3 3 3 3 0 0 0 0 3 3 3 (70)

Losses e.g. evaporation (negative values) (Table 5)

-118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 -118.01 (71)

Water heating gains (Table 5)

171.7 169.13 164.3 156.23 149.78 116.1 109.39 116.28 119.48 153.18 163.6 171.4 (72)

Total internal gains

823.34 821.64 797.5 755.13 708.56 636.7 609.18 615.2 637.71 708.72 759.25 802.23 (73)

6. Solar gains

Solar gains in watts, calculated for each month

281.86 511.08 766.55 1038.05 1225.53 1239.58 1185.9 1045.66 862.16 584.44 343.61 237.14 (83)

Total gains – internal and solar (watts)

1105.2 1332.72 1564.05 1793.17 1934.09 1876.28 1795.09 1660.86 1499.87 1293.16 1102.86 1039.36 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, $\alpha_{1,m}$ (see Table 9a)

1 0.99 0.97 0.91 0.77 0.57 0.42 0.47 0.74 0.95 0.99 1 (86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.94 20.11 20.36 20.67 20.85 20.93 20.94 20.94 20.89 20.63 20.23 19.93 (87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.96 19.96 19.97 19.99 20 20.02 20.02 20.03 20.01 20 19.99 19.98 (88)

Roof

Utilisation factor for gains for rest of dwelling, $\alpha_{2,m}$ (see Table 9a)

1 0.99 0.96 0.88 0.71 0.49 0.33 0.37 0.65 0.92 0.99 1 (89)

Roof

Mean internal temperature in the rest of dwelling T2

18.72 18.94 19.26 19.65 19.85 19.94 19.95 19.95 19.91 19.62 19.12 18.72 (90)

Living area fraction

0.32 (91)

Mean internal temperature (for the whole dwelling)

19.11 19.32 19.62 19.98 20.18 20.26 20.27 20.27 20.22 19.94 19.48 19.11 (92)

Adjusted mean internal temperature:

19.11 19.32 19.62 19.98 20.18 20.26 20.27 20.27 20.22 19.94 19.48 19.11 (93)

8. Space heating requirement

Utilisation factor for gains,

0.99	0.98	0.96	0.88	0.72	0.51	0.35	0.4	0.67	0.92	0.99	1	(94)
------	------	------	------	------	------	------	-----	------	------	------	---	------

Useful gains, mGm , W

1098.32	1312.01	1497.6	1571.41	1390.27	960.97	630.81	660.38	1010.01	1193.76	1087.62	1034.51	(95)
---------	---------	--------	---------	---------	--------	--------	--------	---------	---------	---------	---------	------

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
-----	-----	-----	-----	------	------	------	------	------	------	-----	-----	------

Heat loss rate for mean internal temperature

2754.56	2666.36	2412.43	1979.39	1505.47	975.63	632.4	663.32	1068.4	1659.12	2224.51	2710.46	(97)
---------	---------	---------	---------	---------	--------	-------	--------	--------	---------	---------	---------	------

Space heating requirement for each month

1232.24	910.12	680.63	293.75	85.71	0	0	0	0	346.23	818.56	1246.91	(98a)
---------	--------	--------	--------	-------	---	---	---	---	--------	--------	---------	-------

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space heating requirement for each month after solar contribution

1232.24	910.12	680.63	293.75	85.71	0	0	0	0	346.23	818.56	1246.91	(98c)
---------	--------	--------	--------	-------	---	---	---	---	--------	--------	---------	-------

Space heating requirement in kWh/m ² /year												34.89	(99)
---	--	--	--	--	--	--	--	--	--	--	--	-------	------

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space cooling requirement for month, whole dwelling, continuous (kWh)

0	0	0	0	0	0	0	0	0	0	0	0	(104)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Cooled fraction

												0	(105)
--	--	--	--	--	--	--	--	--	--	--	--	---	-------

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space cooling requirement for month

0	0	0	0	0	0	0	0	0	0	0	0	(107)
---	---	---	---	---	---	---	---	---	---	---	---	-------

Space cooling requirement in kWh/m²/year

												0	(108)
--	--	--	--	--	--	--	--	--	--	--	--	---	-------

8f. Space heating requirement

Fabric Energy Efficiency,

												0	(109)
--	--	--	--	--	--	--	--	--	--	--	--	---	-------

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,	0												0	(201)		
Fraction of space heat from main system(s),													1	(202)		
Fraction of main heating from main system 2,													0	(203)		
Fraction of total space heat from main system 1,													1	(204)		
Fraction of total space heat from main system 2,													0	(205)		
Efficiency of main space heating system 1 (in %),													170	(206)		
Efficiency of main space heating system 2 (in %),													0	(207)		
Efficiency of secondary/supplementary heating system, %,													0	(208)		
Cooling System Seasonal Energy Efficiency Ratio,	0												0	(209)		
Space heating requirement (calculated above),																
	0	0	0	0	0	0	0	0	0	0	0	0	0	(210)		
Space heating fuel (main heating system 1), kWh/month	0												0			
	724.85	535.37	400.37	172.79	50.42	0	0	0	0	203.66	481.51	733.48		(211)		
Space heating fuel (main heating system 2), kWh/month	0												0			
	0	0	0	0	0	0	0	0	0	0	0	0		(213)		
Space heating fuel (secondary), kWh/month	0												0			
	0	0	0	0	0	0	0	0	0	0	0	0		(215)		
Output from water heater),	0												170	(216)		
Efficiency of water heater																
	170	170	170	170	170	170	170	170	170	170	170	170		(217)		
Fuel for water heating																
	168.71	149.33	158.97	143.56	139.86	0	0	0	0	144.34	152.96	168.32	1226.03	(219)		
Space Cooling																
	0	0	0	0	0	0	0	0	0	0	0	0		(221)		
Annual totals													kWh/year	kWh/year		
Space heating fuel used, main system 1													3302.44	(211)		
Space heating fuel used, main system 2													0	(213)		
Space heating fuel used, secondary													0	(215)		
Water heating fuel used													1226.03	(219)		
Electricity for instantaneous electric shower(s)													0	(64a)		
Space cooling fuel used													0	(221)		
Electricity for pumps, fans and electric keep-hot																
Mechanical vent fans - balanced, extract or positive input from outside	0												0	441.28	(230a)	
warm air heating system fans													0	(230b)		
Heating circulation pump or water pump within warm air heating unit													0	(230c)		
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)		
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													0	(230e)		
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)		
Pump for solar water heating													0	(230g)		
Pump for storage WWHRS													0	(230h)		
Total electricity for the above													441.28	(231)		
Electricity for lighting													270.09	(232)		

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--------

Appendix Q items: annual energy

Appendix Q, <item 1 description>

Fuel kWh/year

energy saved	0	(236a)
--------------	---	--------

energy used	0	(237a)
-------------	---	--------

Total delivered energy for all uses	6000.39	
-------------------------------------	---------	--

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		544.57	(240a)
Low-rate fraction	0		544.57	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		544.57	(241a)
Low-rate fraction	0		544.57	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		544.57	(242a)

Low-rate fraction	0	544.57	(242b)
High-rate cost	0	0	(242c)
Low-rate cost	0	0	(242d)
Space heating - secondary cost (other fuel)	0	0	(242e)
Water heating (electric off-peak tariff)			
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0	0	(243)
Low-rate fraction	0	0	(242b)
High-rate cost	0	0	(242c)
Low-rate cost	0	0	(242d)
Water heating cost (other fuel)	0	202.17	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247))			
Energy For instantaneous electric shower(s)	0	0	(247a)
Space cooling	0	0	(248)
Pumps, fans And electric keep-hot	0	72.77	(249)
Energy For lighting	0	44.54	(250)
Additional standing charges	0	0	(251)
Energy saving/generation technologies	0	0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved Or generated	0	0	(253)
energy used	0	0	(254)
Total energy cost	0	989.46	(255)
11a. SAP rating – Individual heating systems including micro-CHP			
Energy cost deflator	0	0	(256)
Energy cost factor (ECF)	0	0	(257)
SAP rating	0	0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.73	(257)
SAP rating	71.96	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			516.39	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			184.87	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		0	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		61.21	(267)
Electricity for lighting		38.98	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		889.92	(272)
Dwelling CO2 Emission Rate		5.53	(273)
EI rating		94	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			5214.16	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			1910.4	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			0	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			667.57	(281)
Electricity for lighting			414.27	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			9292.86	(286)
Dwelling PE Rate			57.75	(287)

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Wed 01 Feb 2023 17:56:03

Project Information			
Assessed By	Owain Morgan	Building Type	House, Detached
OCDEA Registration	STRO029902	Assessment Date	2022-12-20

Dwelling Details			
Assessment Type	As designed	Total Floor Area	161 m ²
Site Reference	Cornerways	Plot Reference	CH_1
Address	The Cornerways, Ellington Road, LONDON, N10 3DD		

Client Details	
Name	Steven Carson
Company	Not Provided
Address	Not Provided, Not Provided, WF10 5QU

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	11.45 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.67 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	60.14 kWh _{PE} /m ²		
Dwelling primary energy	59.19 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	47.9 kWh/m ²		
Dwelling fabric energy efficiency	47.8 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.14	GF walls exposed (0.15)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.12	Basement floor (0.12)	OK
Roofs	0.16	0.12	Basement roof (0.12)	OK
Windows, doors, and roof windows	1.6	1.41	1 (1.6)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Basement wall: Basement walls	75.069	0.132 (!)
Basement wall: GF walls in ground	43.639	0.132 (!)
Exposed wall: GF walls exposed	24.81024	0.15
Exposed wall: 1F walls exposed	69.98	0.15
Exposed wall: Basement walls exposed	4.4202	0.15
Basement floor: Basement floor	65.534	0.12
Exposed roof: Basement roof	8.53	0.12
Exposed roof: Ground floor roof	7.79	0.12
Exposed roof: Top roof	43.79	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
1, Doors	1.97036	East	N/A	1.6
2, Windows (1)	14.5608	South	0.9	1.4
3, Windows (1)	1.51875	South	0.9	1.4
4, Windows (1)	1.346625	South	0.9	1.4
5, Windows (1)	1.9035	East	0.9	1.4
6, Windows (1)	2.6325	East	0.9	1.4
7, Windows (1)	1.51875	East	0.9	1.4
8, Windows (1)	1.346625	East	0.9	1.4

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
9, Windows (1)	1.771875	South	0.9	1.4
10, Windows (1)	1.4805	East	0.9	1.4
11, Windows (1)	2.0475	East	0.9	1.4
12, Windows (1)	1.51875	East	0.9	1.4
13, Windows (1)	1.054025	East	0.9	1.4
14, Roof windows (1)	3.315	South	0.9	1.4
15, Roof windows (1)	2.109	East	0.9	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part **1 - Main Dwelling**: SAP default ψ -value (0.2 W/m²K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference	not yet	

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	170.0%
Emitter type	Underfloor
Flow temperature	
System type	
Manufacturer	
Model	
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	300 litres
Declared heat loss	N/A
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by device in PCDB

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed

Manufacturer	
Model	

7 Lighting

Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	90 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.66 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	93%	OK
Manufacturer/Model	The Nuaire Group MRXBOXAB-ECO4	
Commissioning	not yet / not yet	
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		