Energy & Sustainability Statement

Lower Ground Floor, 95 Avenue Road, London NW8 6HY

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CONTENTS

DOCUMENT CONTROL

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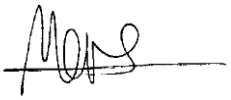
Checked By:	Marcus Eves	Signed:	

Revision History

Revision	Date	Details
-	22/12/23	First issue
A	10/05/24	Revised MVHR model number

1. EXECUTIVE SUMMARY

1.1. This Energy and Sustainability Statement has been prepared in support of a planning application for 95 Avenue Road, London NW8 6HY. The application consists of the redevelopment of existing storage space below an apartment building to accommodate 2no apartments. The conversion will result in 2no 2-bedroom dwellings totalling 191.60m^2.

1.2. This report outlines the predicted energy demand and resultant carbon emissions from the proposed development. It also shows how the proposal has incorporated energy efficiency measures and given consideration to low carbon and renewable technologies.

1.3. The calculations have been assessed against the new Part L, Volume 1 Dwellings (June 2022). The SAP calculations have been completed using the Elmhurst Design SAP 10 software. The calculations have followed the methodology set out in The Greater London Authorities Energy Assessment Guidance (June 2022). Calculations have been performed using the energy hierarchy, Be Lean, Be Clean and Be Green. All carbon emissions referenced in this report are based on the SAP 10.2 emissions factors.

1.4. As the proposal is for the redevelopment of an existing building, a Baseline assessment has been completed to establish the Target Emission Rate. This has been completed in line with the GLA Energy Assessment Guidance Sections 6.1-6.2. From this point forward this document will refer to the baseline assessment as the Target Emission Rate (TER).

1.5. As described in the Camden Planning Guidance Energy Efficiency & Adaptation document the proposal would be classed as "*Minor, up to 4 units and less than 500m^2*." The appropriate targets for this type of development are outlined below;

- All development in Camden is expected to reduce carbon dioxide emissions through the energy hierarchy.
- All new build residential development (of 1-9 dwellings) must meet 19% carbon dioxide reduction. Please note under Camden Policy this target would not apply to the proposal as a change of use application however to ensure best practice it will be targeted.
- National water standards (110L/p/d).
- Submit sustainability & energy proforma.

1.6. At the be Lean stage the dwellings have achieved a reduction in CO_2 emissions of 14% against the Target Emission Rate (TER) through energy efficiency measures.

1.7. The dwellings fabric energy efficiency (DFEE) has improved upon the target fabric energy efficiency (TFEE) by a margin of 9%. This improvement demonstrates that the proposed dwellings have a highly efficient building fabric.

1.8. At the Be Clean Stage, the effectiveness of a district/community heating connection has been evaluated. The proposed heating system will be a community system, with a connection to the recently replaced gas boilers serving the existing apartment block at 95 Avenue Road. As community heating is being implemented in the final proposal it has been used in the baseline and be lean stage. Through the increased efficiency of the installed gas boilers (95%) against the SAP Appendix R efficiency (89.5%) a reduction in total CO_2 emissions of 5% has been achieved at the Be Clean stage.

1.9. At the Be Green Stage consideration has been given to renewable technologies. In this instance with the proposal being for the conversion of an existing storage area underneath an apartment block there are no suitable renewable technologies that could be implemented.

1.10. Although no renewable technologies have been implemented the proposal is deemed to satisfy Part L1 of the Building Regulations, the Camden and the London Plan emissions reduction targets. The

proposal has gone as far as possible to minimise the energy demand and reduce CO_2 emissions. A summary of the site wide emissions at each stage of the energy hierarchy is shown below.

1.11. Unregulated Energy has been calculated using the BREDEM methodology. This assumes a regular electric cooker and hob to both dwellings (See Appendix A).

Carbon dioxide emissions

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	7.0	0.8
After energy demand reduction (be lean)	6.0	0.8
After heat network connection (be clean)	5.7	0.8
After renewable energy (be green)	5.7	0.8

Figure 1: Summary of domestic emissions

Regulated carbon dioxide savings

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	1.0	14%
Be clean: savings from heat network	0.3	5%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	**1.3**	**19%**
Annual savings from off-set payment	3.2	-
(Tonnes CO_2)		
Cumulative savings for off-set payment	170	-
Cash in-lieu contribution (£)	**16,120***	

Figure 2: Summary of domestic emissions savings

*Please note in Line with Policy CC1 & SI2 only major residential developments are required to pay the offset to achieve the zero carbon standards. As a minor proposal the development is required to meet the 19% reduction in CO_2 emissions.

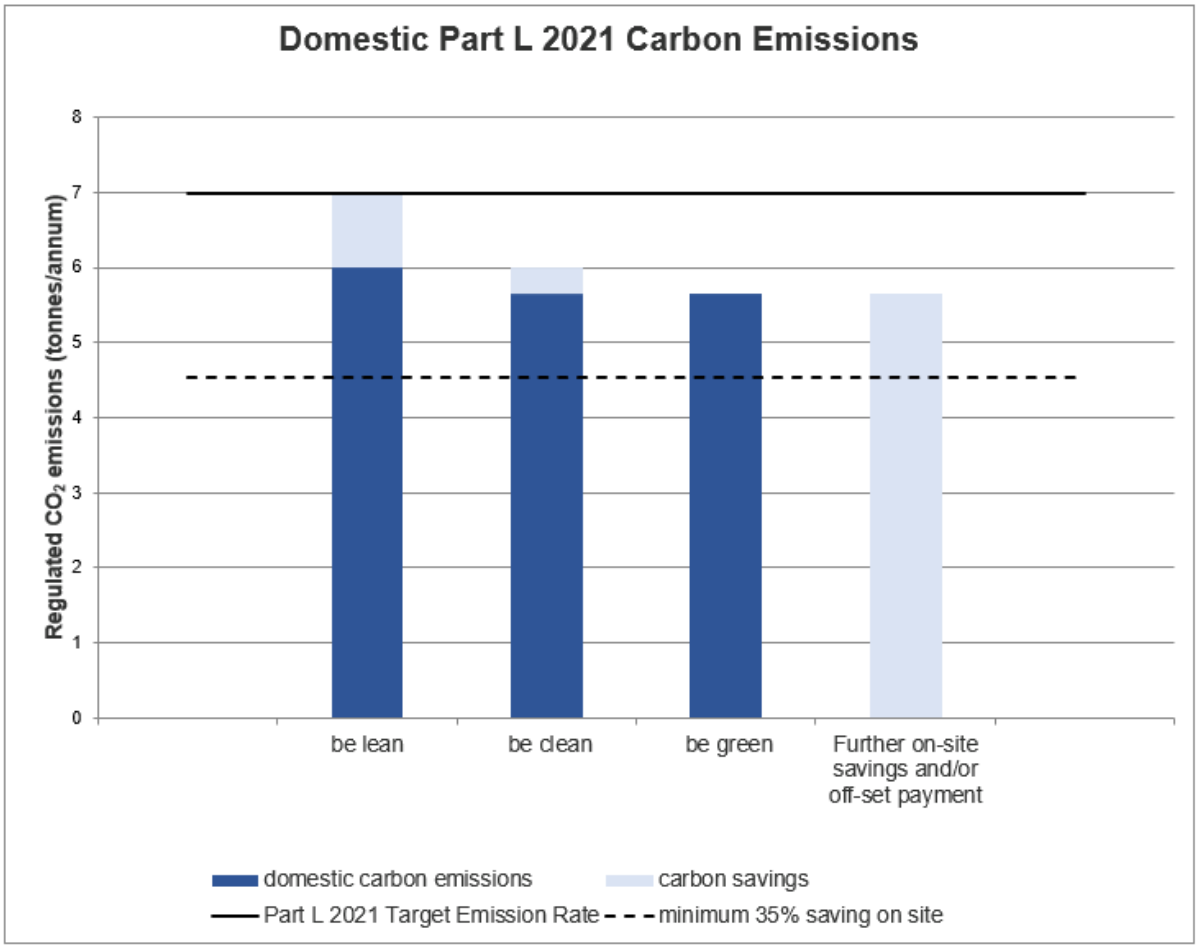


Figure 3: Summary of domestic emissions

2. INTRODUCTION

2.1. E & S Bristol have prepared this energy statement on behalf of Carnell Warren Associates, in support of a planning application at 95 Avenue Road. The application consists of the redevelopment of an existing storage space below an apartment building to accommodate 2no semi-detached residential dwellings. The conversion will result in 2no 2-bedroom dwellings totalling 191.60m^2.

2.2. The following statement outlines how the proposed development complies with the National Planning Policy Framework with regards to achieving a sustainable development. The objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own need.

2.3. This statement sets out the approach to satisfying the environmental objectives of planning policy. This will be achieved by contributing to protecting and enhancing our natural, built, and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change.

2.4. The following documents have been used and referred to in this statement in order to deliver compliance with National, Regional and Local Policy;

- The National Planning Policy Framework (2021)
- The London Plan (2021)
- The Greater London Authorities (GLA) Energy Assessment Guidance (June 2022)
- The Greater London Authorities (GLA) Carbon Emissions Reporting Spreadsheet
- Camden Local Plan (2017)
- Camden Planning Guidance: Energy Efficiency & Adaptation (January 2021)
- Camden Sustainability & Energy Proforma
- Approved Document L Conservation of Fuel and Power, Volume 1: Dwellings (2021)

2.5. Consideration has been given to the current and future intentions of the Building Regulations and planning policy for sustainable development.

3. POLICY REVIEW

London Plan Chapter 9 Sustainable Infrastructure

3.1. This report has been designed to show compliance with the relevant policies of Sustainable Infrastructure contained within Chapter 9 of the London Plan 2021. This report has been produced following the London Plan Energy Assessment Guidance June 2022.

3.2. The core policy which this document relates to is Policy SI 2 Minimising greenhouse gas emissions which is detailed below;

A *Major development 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.

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.*

F *Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.*

Camden Local Plan Policy CC1 Climate Change Mitigation

3.3. Camden Local Plan Policy CC1 is outlined below;

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. support and encourage sensitive energy efficiency improvements to existing buildings;

e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;

h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and

i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

Camden Planning Guidance: Energy Efficiency and Adaptation

3.4. The requirements as outlined in the Camden Planning guidance are detailed below;

Energy reduction

KEY MESSAGES

- *All development in Camden is expected to reduce carbon dioxide emissions through the application of the energy hierarchy.*
- *All new build major development to demonstrate compliance with London Plan targets for carbon dioxide emissions.*
- *Deep refurbishments (i.e. refurbishments assessed under Building Regulations Part L1A/L2A) should also meet the London Plan carbon reduction targets for new buildings.*
- *All new build residential development (of 1 – 9 dwellings) must meet 19% carbon dioxide reduction; and*

- *Developments of five or more dwellings and/or more than 500sqm of any gross internal floorspace to achieve 20% reduction in carbon dioxide emissions from on-site renewable energy generation*

Table 2a: Energy reduction targets, domestic

Development should comply with these standards/provide this information	***Residential Refurbishment (assessed under L1B)***		
	Major (10+ units or >1,000 sqm new floor space)	*Medium (5-9 units, >500sq.m and <1,000 sqm new floor space)*	*Minor (up to 4 units and <500 sqm new floor space)*
Energy and carbon reduction targets			
Overall carbon reduction targets:	*Greatest possible reduction - meeting Part L1B for retained thermal elements (London Plan, Local Plan CC1)*	*Greatest possible reduction - meeting Part L1B for retained thermal elements (London Plan, Local Plan CC1)*	*Greatest possible reduction - meeting Part L1B for retained thermal elements (London Plan, Local Plan CC1)*
Reduction in CO_2 from onsite renewables (after all other energy efficiency measures have been incorporated)	*20% (London Plan, Local Plan CC1)*	*20% (London Plan, Local Plan CC1)*	*Incorporate renewables where feasible*

Policy Summary

3.5. The Camden Energy Efficiency and adaptation planning guidance document has been consulted; Table 2A suggests the development is minor and is required to meet and exceed the L1B targets for retained thermal elements and incorporate renewables where feasible.

3.6. Although not strictly required by Policy CC1 this proposal will target the residential new build requirement of a 19% reduction in carbon dioxide emissions.

3.7. The full requirements for a minor residential refurbishment assed under the L1B regulations are outlined below.

- All development in Camden is expected to reduce carbon dioxide emissions through the energy hierarchy.
- All new build residential development (of 1-9 dwellings) must meet 19% carbon dioxide reduction. Please note under Camden Policy this target would not apply to the proposal as a change of use application however to ensure best practice it will be targeted.
- National water standards (110L/p/d).
- Submit sustainability & energy proforma.

3.8. The proposal is being assessed against the New Part L 2022 limiting standards in existing dwellings which has replaced the 2013 Part L1B Building Regulations. As the London Plan, GLA Guidance and building regulations have all been updated since the production of the Camden Planning Policy Guidance, these shall be followed, which results in a building going beyond the Camden CC1 targets.

4. THE ENERGY HIERARCHY

4.1. As required by Policy CC1 of the Local Plan and Policy SI2 of the London Plan the development has been designed in line with the principles of the energy hierarchy. The energy assessment will first establish the regulated CO_2 emissions assuming the development complied with Part L 2021 of the Building Regulations and following the London Plan notional specification. Subsequently the regulated emissions and energy demand will be calculated at the Be Lean, Be Clean, Be Green stages of the Energy Hierarchy following the outcome of investigation at these stages.

4.2. At the Be Lean stage sustainable design principles will be implemented to go beyond the Part L Building Regulations. This aims to encourage developers to design in a way that reduces the energy demand of the development. Achieving compliance with Part L at the Be Lean stages requires an uplift in fabric standards, including glazing specifications, lower air permeability targets and improved building services efficiencies.

4.3. At the Be Clean stage the feasibility of decentralised energy supply will be examined. Developers must consider the provision of heat and energy – either by connecting into an existing district heating network where possible or providing an on-site communal heat network, with central plant such as gas fired CHP.

4.4. Finally, at the Be Green stage a feasibility study for renewable technologies will be undertaken. This will seek to maximise opportunities for renewable energy by producing and using renewable energy on site. Depending upon the results of the technical feasibility and the performance of the development following the Be Clean stage, renewable technologies will be considered for implementation.

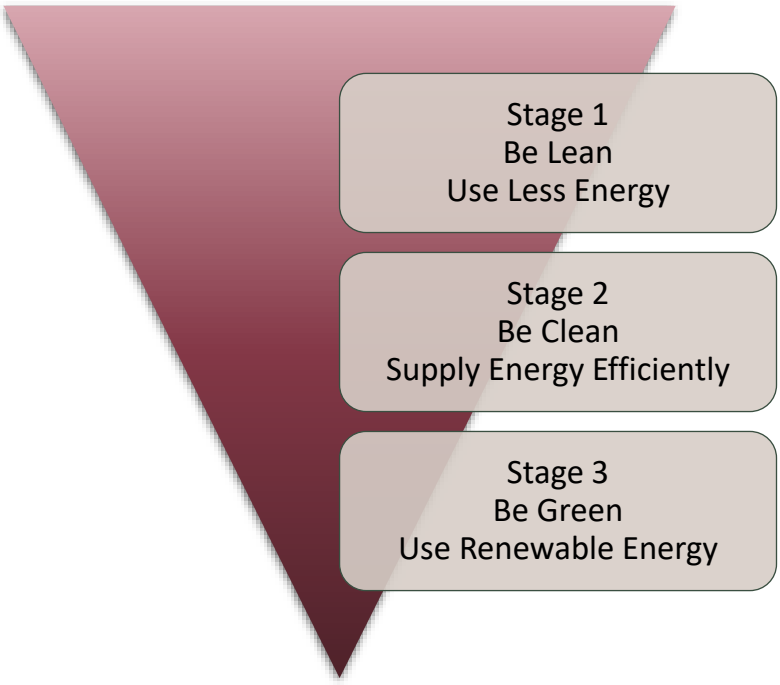


Figure 4: The Energy Hierarchy

5. BASELINE

5.1. This energy assessment will first establish the sites baseline energy demand and subsequent CO_2 emissions.

5.2. Baseline calculations will be carried out on the dwellings using the notional specification for existing building buildings contained within Energy Planning Guidance Appendix 3. As a community heating system is being specified this has been utilised in the baseline calculation with the Appendix R notional efficiency of 89.5%.

5.3. The calculated DER will be used as the TER and demonstrate the baseline energy demand and CO_2 Emissions.

5.4. The Target CO_2 emission rate (TER) sets a minimum allowable standard for the energy performance of a building to comply with Part L of the Building Regulations and is defined by the annual CO_2 emissions of a notional building of same type, size and shape to the proposed building. The TER is expressed in annual kg of CO_2 per m^2.

5.5. The Target summary for the dwellings CO_2 emissions and energy demand is shown in Tables 1 and 2 below.

Reference	Total Floor Area (m^2)	Target Emission Rate (TER) $kgCO_2/m^2$/Year	Total Emissions $kgCO_2$/Year
Plot 1	100.44	36.14	3,629.90
Plot 2	91.16	36.69	3,344.66
Total	191.60	-	6,974.56

Table 1: Summary of domestic emissions (regulated) Building Regulations Target assessment.

Reference	Space & Water Heating (kWh/Year)	Distribution losses (kWh/Year)	Lighting (kWh/Year)	Auxiliary (kWh/Year)	Total (kWh/Year)
Plot 1	17,001.48	107.31	252.87	0.00	17,361.66
Plot 2	15,666.72	96.22	231.10	0.00	15,994.04
Total	32,668.20	203.53	483.97	0.00	33,355.70

Table 2: Summary of domestic energy demand.

5.1. The baseline emissions are predicted to be 6,974.56 $kgCO_2$ per year.

5.2. The dwellings baseline energy demand is predicted to be 33,355.70 kWh/year.

6. BE LEAN (USE LESS ENERGY)

6.1. The dwellings have been designed to meet the Building Regulations requirements (Part L 2021) fabric targets and seeks to maximise the energy and CO_2 reduction through demand reduction measures. These typically include a combination of passive design measures (e.g. building design and efficient building fabric) and active design measures (e.g. Building services).

6.2. From the outset a high standard of sustainable design and construction has been incorporated into the design of the proposal. To reduce CO_2 emissions high levels and high-performance insulation will be specified. At this early design stage target U values will be used with the final specification to be confirmed at a later date. Through increased thickness and an improved thermal conductivity of the insulation the U-Values for the thermal elements will meet or exceed Building Regulations Part L standards. These high levels of insulation will help to contain heat within the dwelling therefore reducing demand on the heating and associated CO_2 emissions.

6.3. During construction, efforts will be taken to overlap all insulation and effectually seal joints where air leakage and thermal bridging could occur. Although not measured in SAP for existing buildings, attention will be paid to ensuring insulation is properly installed following the principles of the Recognised construction details. This will ensure continuity of insulation and minimise heat loss.

6.4. The orientation of the dwellings has been dictated by the existing structure and street scene. With the front of the building facing East, the highest concentration of glazing occurs on the lightwells to the West elevation.

6.5. The ventilation strategy consists of mechanical supply and extract with heat recovery. The system works by removing excess humidity from wet rooms, this warm air then passes over a heat exchanger which transfers a high proportion of the heat to the incoming (fresh) air which is then distributed to occupied rooms. The low specific fan power of the units specified means that the system requires reduced amounts of energy to run effectively.

6.6. In addition to the ventilation strategy, passive measures will be implemented to assist with cooling in the summer months, these include openable windows, low G values, cross ventilation and internal shading. Cooling has been specified to each dwelling; this will be provided through the MVHR utilising a hybrid system. The system specified is a Nuaire MR-ECO-COOL with an energy efficiency ratio (EER) of 2.6.

6.7. A separate in-depth overheating assessment has been untaken in line with Part O and CIBSE TM59 and the cooling hierarchy, this provides adequate justification for this cooling strategy.

6.8. The lighting used will be low energy through defined as having an efficiency greater than 75 Lumens/circuit Watt. The large area of windows & rooflights to the living rooms and bedrooms will also improve levels of natural daylighting reducing electrical demand from light fittings.

6.9. Due to the early stage of this assessment, the detailed design has not been finalised. Target U-Values have been used for the thermal elements and will be achieved on site upon completion.

6.10. Tables 3 overleaf contains a summary of the energy efficient and carbon reducing design characteristics incorporated within the proposal.

Thermal Element	Specification	U-Value
Basement Floor	Construction specification to be confirmed	0.25 W/m²k
Internal Floors	Concrete internal floors	N/A
Existing Walls	Construction specification to be confirmed	0.30 W/m²k
Retaining Walls	Construction specification to be confirmed	0.30 W/m²k
New External Walls	Construction specification to be confirmed	0.18 W/m²k
Internal Walls	Plasterboard on dabs, blockwork walls	N/A
Walls to Heated Corridors	Solid or fully filled (insulation) frame wall - treated as non-heat loss	0.00 W/m²k
Flat Roof	Construction specification to be confirmed	0.15 W/m²k
Internal Ceilings	Concrete internal ceilings	N/A
Doors to Heated Corridor	Treated as non-heat loss	0.00 W/m²k
Windows	Double glazed Argon filled - LowE coated glass, G value 0.40	1.40 W/m²k
Glazed Doors & Glazed Walls	Double glazed Argon filled - LowE coated glass, G value 0.40	1.40 W/m²k
Rooflights	Double glazed Argon filled - LowE coated glass, G value 0.40	1.30 W/m²k
Controlled Service	**Details**	
Air Permeability	Target air pressure test score of 6.0 m^3/hm^2	
Thermal Bridging	Not measured on existing structure, default Y value of 0.20	
Thermal Mass	Calculated	
Ventilation	MVHR – Nuaire MRXBOXAB-ECO2 with 3 extracts, installed within heated envelope with level 1 insulated rigid ductwork	
Heating System*	Mains gas community boiler linked to radiators. efficiency, SEDBUK (2009) = 89.5%	
Heating Controls	Charging system linked to use – Programmer and TRVs	
Hot Water (From community heating)	300L storage with cylinder loss factor no greater than 1.80 kWh/day. Cylinder in heated space with thermostat, fully insulated pipework & on separate timer to heating.	
Cooling	Cooling to living rooms, kitchens and bedrooms. Supplied from Nuaire MR-ECO-Cool-V EER 2.6	
Showers	Mixer showers supplied from unvented cylinder with flow rate of 9L/min	
Lighting	100% Low Energy LED lighting throughout Minimum 75 Lm/cW, 5W bulbs	

Table 3: Be Lean Specification

*Gas Boiler has been used at this stage as per the London Plan Energy Assessment Guidance

6.11. Incorporating the energy efficient design features results in the emissions and energy demand outlined in Table 3, the resulting CO_2 emissions and energy demand are shown in Tables 4 & 5.

Reference	Total Floor Area (m^2)	Target Emission Rate (TER)	Target Emissions $kgCO_2$/Year	Dwelling Emission Rate (DER)	Dwelling Emissions $kgCO_2$/Year	Percentage Improvement
Plot 1	100.44	36.14	3,629.90	30.55	3,068.44	16
Plot 2	91.16	36.69	3,344.66	32.07	2,923.50	13
Total	191.60	-	6,974.56	-	5,991.94	14

Table 4: Summary of regulated emissions at the Be Lean Stage

Reference	Space & Water Heating (kWh/Year)	Distribution losses (kWh/Year)	Lighting (kWh/Year)	Auxiliary (kWh/Year)	Cooling (kWh/Year)	Total (kWh/Year)
Plot 1	14,145.89	81.76	252.87	292.80	16.84	14,790.16
Plot 2	13,485.42	76.70	231.10	265.75	27.45	14,086.42
Total	27,631.31	158.46	483.97	558.55	44.29	28,876.58

Table 5: Summary of dwelling energy demand at the Be Lean Stage

6.12. The total dwelling emissions are summarised below:

Target CO_2 emissions (TER x Floor Area) 6,974.56 $KgCO_2$/Year

Be Lean CO_2 emissions (DER x Floor area) 5,991.94 $KgCO_2$/Year

6.13. The dwelling Be Lean emissions improve upon the Target Emission Rate by 14.09%. This satisfies the London Plan Policy SI2 as greater than 10% reduction has been achieved through energy efficiency measures alone.

6.14. The dwellings Be Lean energy demand is predicted to be 28,876.58 kWh/year.

6.15. Table 6 below outlines the averaged figure for both dwellings fabric energy efficiency (DFEE) against the target fabric energy efficiency (TFEE). This shows a 9% improvement, further showcasing that the designed dwelling has a highly efficient building fabric.

Target Fabric Energy Efficiency	Dwelling Fabric Energy Efficiency	Percentage Improvement
79.59	72.38	9%

Table 6: Summary of fabric efficiency at the Be Lean Stage

7. BE CLEAN STAGE (USE ENERGY EFFICIENTLY)

District Heating

7.1. Policy SI 3 of the London Plan encourage developments to move to decentralised generation of heat and power seeking to reduce the losses and inefficiencies of reliance upon a centralised system. The mayor has set a target of 25% to be generated through localised decentralised energy systems by 2025.

7.2. The London heat map has been consulted to establish if there are any existing or proposed heating networks in the vicinity of the development. With the results shown in Figure 5 below.

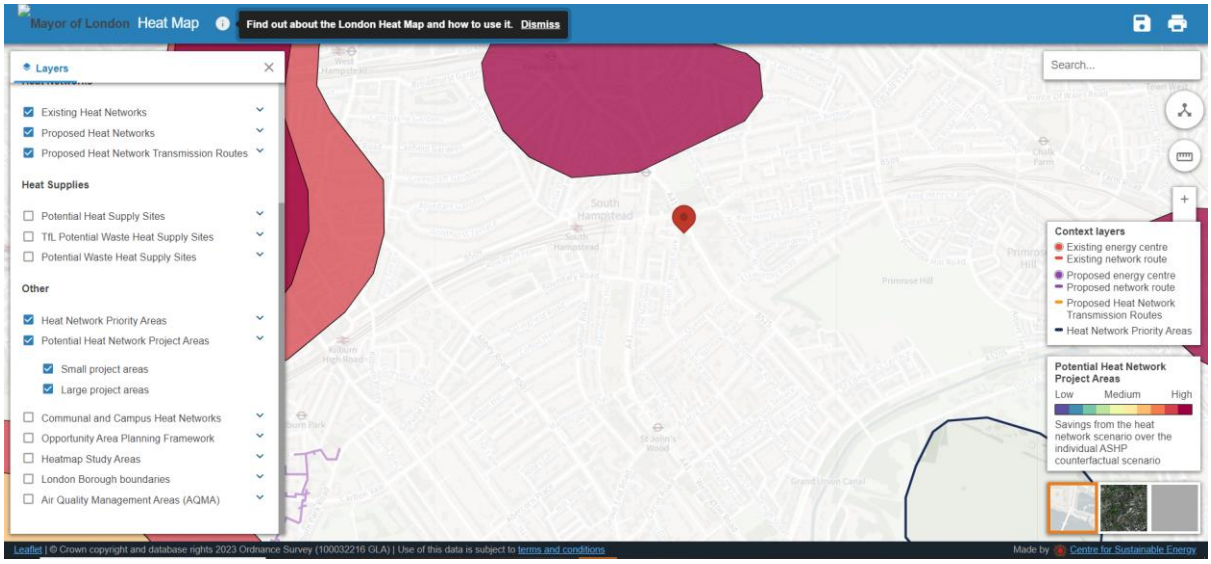


Figure 5: London Heat Map

7.3. After consulting the London heat map its evident that the proposal falls under scenario 2 In the GLA energy statement guidance. This is development in areas where an area wide heat network is not proposed, however is within a heat network priority area. The development is a significant distance from a proposed network.

Combined Heat and Power

7.4. Following the release of the new Carbon Emission Factors for SAP 10, in the new energy Statement guidance in June 2022, The Greater London Authority have made it clear there is a required shift away from gas fired CHP in favour of other low zero carbon technologies.

7.5. As the electricity grid decarbonises from increased local renewable energy generation the carbon savings achieved from gas-engine CHP will decrease which for future proofing provides opportunity for other low carbon technologies.

7.6. For small-medium residential developments it is generally not economic to install CHP, as the installed plant tends to have lower electrical efficiencies and therefore higher carbon emissions. In addition, due to the small landlord electricity demand, CHP installed to meet the base heat load would require the export of electricity to the grid.

7.7. There are also growing concerns about the air quality impacts of gas-engine CHP at this scale. The development falls within an air quality management area (AQMA). The installation of a gas fired CHP could exacerbate the problem.

7.8. Considering all the above CHP will not be proposed for this development.

Communal heating

7.9. Within the existing building at 95 Avenue Road there is a community heating system serving the existing residential apartments. This system has recently been upgraded and for the purposes of this assessment the efficiency has been recorded at 95% which is achievable for a gas boiler system of this nature.

7.10. Investigations have been undertaken to ensure there is enough capacity to serve the two additional apartments. This proposal will connect the new apartments to existing community system. The connection will made following the CIBSE Heat Networks Code of Practice. For this reason, a standing loss figure of 1.5 has been utilised in line with the SAP 10 methodology.

7.11. An update to the Be Lean Building services from Table 3, following the community heating connection is included below.

Reference	Controlled Service	Details
Plots 1 & 2	Heating System	Connected to existing community heating system – Gas boilers 95% efficient. Heat network to be constructed in line with CIBSE heat network code of practice
	Heating Controls	Charging system linked to use, programmer and TRV's
	Hot Water (from community system)	300L storage with cylinder loss factor no greater than 1.80 kWh/day. Cylinder in heated space with thermostat, fully insulated pipework & on separate timer to heating.
	Cooling	Cooling to living rooms, kitchens and bedrooms. Supplied from Nuaire MR-ECO-Cool-V EER 2.6

Table 7: Revised building services following renewable feasibility study

7.12. The resultant CO_2 emissions and energy demand after the incorporation of the improved community heating system is shown in Tables 8 & 9.

Reference	Total Floor Area (m^2)	Target Emission Rate (TER)	Target Emissions $kgCO_2$/Year	Dwelling Emission Rate (DER)	Proposed CO_2 Emissions $kgCO_2$/Year	Percentage improvement
Plot 1	100.44	36.14	3,629.90	28.84	2,896.69	20
Plot 2	91.16	36.69	3,344.66	30.27	2,759.41	18
Total	191.60	-	6,974.56	-	5,656.10	19

Table 8: Summary of regulated dwelling emissions at the Be Clean Stage

Reference	Space & Water Heating (kWh/Year)	Distribution losses (kWh/Year)	Lighting (kWh/Year)	Auxiliary (kWh/Year)	Cooling (kWh/Year)	Total (kWh/Year)
Plot 1	13,226.92	81.76	252.87	292.80	16.84	13,871.19
Plot 2	12,704.69	76.70	231.10	265.75	27.45	13,305.69
Total	25,931.61	158.46	483.97	558.55	44.29	27,176.88

Table 9: Summary of dwelling energy demand at the Be Clean Stage

7.13. The total emissions are summarised below:

Target CO_2 emissions (TER x Floor Area)	6,974.56 $KgCO_2$/Year
Be Green CO_2 emissions (DER x Floor area)	5,656.10 $KgCO_2$/Year

7.14. The Be Clean emissions improve upon the Be Lean stage by 5%. This has been achieved through the improved efficiency of the proposed community system over the SAP default efficiency.

7.15. When compared with the Target Emission Rate the dwellings have improved upon CO_2 emissions by a margin of 19%. This is adequate to satisfy policy CC1 of the Camden Local Plan (new build target). And the requirements of the London Plan for a minor development.

7.16. The site wide Be Clean energy demand is predicted to be 27,176.88 kWh/year.

8. BE GREEN (USING RENEWABLE ENERGY)

8.1. The following sections discuss the renewable energy generation measures that have been considered, and those which will be implemented at the development. Renewable technologies harness energy from the environment and convert this to a useful form. Many renewable technologies are available. However, not all of these are commercially viable and suitable for all proposals.

8.2. Technologies considered for the development include:

- Photovoltaics
- Solar Thermal
- Wind turbines
- Heat Pumps (ground-source / air-source)
- Biomass boilers

Photovoltaics
As the dwellings are located within the basement/lower ground floor of the existing apartment building there is no roof space available to accommodate solar PV panels. If attempting to utilise the flat roof of the main structure would lead to logistical problems in running the required cabling to the basement flats up to 9 storeys above. There would also be significant cable losses over a distance such as this. For these reasons solar PV is not suited to the proposal.
Recommended Technology: No

Solar Thermal
As the dwellings are located within the basement/lower ground floor of the existing apartment building there is no roof space available to accommodate solar PV thermal panels.
Recommended Technology: No

Wind turbines
For a wind turbine to be feasible the average wind speed needs to be at least 6m/s. According to Rensmart[1] Postcode NW8 6HY has a windspeed of 5.0 m/s at 10m above ground level, 5.8 m/s at 25m above ground level and 6.3 m/s at 45m above ground level. Based on this data, the wind turbine would need a hub height in excess of 45m above ground. A turbine of this size will require a substantial amount of consultation and planning as it will have a significant visual impact on the local environment. The costs associated with a 45m turbine would be disproportionate to the cost of the development. The risk of noise, light flicker to adjacent areas and threat to wildlife alongside cost, contribute to turbines not being feasible. [1] https://www.rensmart.com/Maps
Recommended Technology: No

Air Source Heat Pump
An ASHP would not suitable for the proposal as there is limited external space required for the outdoor units, and available internal space for associated plant. The only outside space available would be in within the lightwells. To work effectively the heat pumps, need free flowing air around the outdoor units which would not be possible in the enclosed courtyard or lightwell. Without free-flowing air the heat pumps do not run optimally and can freeze up. if the outdoor units were sited within the enclosed lightwells there also likely to generate noise issues.
Recommended Technology: No

Ground Source Heat Pump
The building is situated in a suburban, primarily residential area and there is inadequate space available to locate horizontal ground loop systems to serve the site. Vertical ground loops can be combined with foundation piling; however, this technique is not being used here. A borehole will typically need to reach depths of 100m for sufficient performance. For a heating system this would require very deep bore pipework, which will incur excessive infrastructure and excavation costs.
Recommended Technology: No

Biomass
Biomass boilers could be considered as an alternative to mains gas, but biomass heating has a number of significant disadvantages. The combustion in small scale biomass boilers and associated fuel transport are likely to have significant adverse impacts on air quality in an area which is exposed to elevated NOx and particulate emissions and already exceeds the current legislative targets. The need for a solid fuel store also increases the space requirements, further basement excavation would be required at a significant carbon and financial cost. Biomass pellets are also expensive compared to other fuels.
Recommended Technology: No

8.3. Based on the above, no appropriate renewable technologies have been identified as suitable for the proposal. This is primally due to the location of the dwellings beneath an existing apartment block.

8.4. Therefore, the Carbon emissions and energy demand remain the same as the Be Clean Stage.

9. SUSTAINABLE DESIGN

Water Conservation

9.1. Policy SI 5 Water Infrastructure requires new residential developments to meet the higher water efficiency standards within the 2015 Building Regulations Part G2 water consumption target of 110 litres per person per day (including five litres for external water consumption).

9.2. In order to minimise internal potable water consumption, consideration will be given to the flow rates of the fixtures and fittings. Water fittings will be specified to give a balance between low water consumption, performance, aesthetics and cost.

9.3. A full set of Part G water use calculations will be provided as part of the submission, demonstrating that the internal water consumption meets the targets of 110 litres per person per day. A summary below is included below with target fixtures and flow rates.

Installation Type	Unit of Measure	Capacity / Flow Rate
WC's Full Flush	Average flushing volume (Litres)	4
WC's Part Flush	Average flushing volume (Litres)	2.6
Bathroom Taps	Flow Rate (Litres/minute)	5
Kitchen Taps	Flow Rate (Litres/minute)	7
Bath	Capacity to overflow (Litres)	160
Shower	Flow Rate (Litres/minute)	9
Washing Machine*	Litres / kg dry load	8.17
Dishwasher*	Litres / place setting	1.25

Table 10: Target capacity/flow rates to meet 110 litres per person per day

*Default Value – Not specified

Waste and Recycling

9.4. The successful contractors will be encouraged to operate an environmental management policy and incorporate a Site Waste Management Plan (SWMP) detailing the strategy of avoiding the use of landfill and recycling by sorting waste streams.

9.5. Whilst on site contractors will be encouraged to manage recycling and waste efficiently. The principles of the waste hierarchy will be followed, by that, emphasis is placed on re-use followed by recycling and composting before energy recovery and disposal is considered. The aim is to reduce the waste arising from the start and encouraging waste to be diverted from landfill.

9.6. Waste minimisation targets should be set out and details of waste minimisation actions undertaken, with procedures followed for estimation, monitoring and measuring of any site waste arising.

Using recycled and recyclable materials and sourcing them responsibly

9.7. The contractor will be encouraged to operate an environmental materials policy for sourcing of construction products. Wherever possible all materials will be locally sourced, this will help minimise the environmental impact of transport to the site.

9.8. For all materials used in the scheme, consideration will be given in respect of the Green Guide rating and responsible sourcing certification level they achieve. An effort shall be made to ensure all timber used in the project is locally sourced. All timber specified will be sourced in line with the UK governments timber procurement policy and be specified from sustainable sources such as FSC- or PEFC-certified whenever possible.

9.9. The contractor will be encouraged to operate an environmental materials policy for sourcing of construction products.

9.10. Where feasible any existing materials will be reused. All new materials on site will be considered for re-use and future recycling. The level of new aggregates used shall be minimised through use of recycled aggregates and waste minimisation.

Embodied Carbon

9.11. Embodied Carbon includes the carbon emissions associated with the extraction and processing of materials, energy use in factories and transport as well as the construction of the building. As buildings decarbonise their energy use, embodied carbon becomes an increasingly significant source of emissions to tackle (LETI).

9.12. In order to reduce the quantity of embodied carbon associated with a dwelling the following considerations will be factored into the design.

- Using low Carbon concrete mixes, these can be designed to incorporate, fly ash, slag, calcined clays in order to reduce the carbon content of concrete mixes.
- Limiting the use of carbon intensive materials, these include aluminium, plastics and foam insulation.
- Choosing lower carbon alternatives such as supplementing steel for timber. Attention can be paid to the environmental project declarations to make informed decisions.
- Reusing materials, salvaged materials tend to have a much lower embodied carbon content as the carbon to produce them has already been spent. If materials are already on site this will reduce carbon associated with transport.
- Using high recycled content materials, this can be the case with concrete blocks, but also important with metals to where possible, to source with a high recycled content.
- Minimising waste, designing in line with common sizes of materials such as OSB or plasterboard.

Air Quality and Pollution

9.13. The presence of VOCs in paint is significant both in terms of environmental impact and to health. Volatile Organic Compounds, VOCs, are organic compounds that have high enough vapour pressures to enable them to vaporise into the atmosphere, solvents are of particular concern within buildings. To help create a healthy internal environment all internal finishes and fittings will be specified with low solvent and emissions of volatile organic compounds.

9.14. Good construction site practice will help to control and prevent pollution, all endeavours will be made to reduce any negative air quality impact of the construction activities. Those which can contribute to

air pollution include: land clearing, operation of diesel engines, demolition, toxic materials and creation of dust (typically from concrete, cement, wood, stone).

9.15. A number of measures will be encouraged on site to minimise pollution, these will include. Controlling dust on site through fine water sprays used to dampen down the site. Regular inspections for spillages and avoiding washing into waterways or drainage areas.

9.16. Skips with construction waste should be covered when leaving the site. No burning of materials will be carried out on site. Noise pollution can be reduced through careful handling of materials; using modern equipment and generators.

Be Seen Energy Monitoring

9.17. Next generation digital Smart Meters shall be used to provide accurate information to the users to identify patterns and trends of use and seasonal fluctuations, this will aid the user to make adjustments in order to reduce energy use.

9.18. Smart Meters will enable the network operators and energy suppliers to be ready for future Smart Grid.

9.19. As a minor development, ongoing energy monitoring under the Be Seen element of the London Plan is not required for this proposal.

10. CONCLUSIONS

10.1. E & S Bristol has explored the options for reducing the energy demands and CO_2 emissions for the proposed development at 95 Avenue Road. This Energy & Sustainability Statement has identified a set of deliverable energy strategy solutions that when adopted would ensure the development complied with relevant national planning policy, the London Plan and the London Borough of Camden policies relating to energy and climate change.

10.2. Energy strategy options were assessed according to the Mayor's Energy Hierarchy and the resulting savings calculated against a Building Regulations target assessment following the GLA guidelines. The strategy meets CO_2 emission savings targets and other related policies applicable to the site and enable each step of the Mayor of London's energy hierarchy to be addressed. This statement has shown the proposal is fully compliant with the Camden Local Plan Policy CC1 and the London Plan Chapter 9 Policy SI 2.

10.3. The energy hierarchy has been followed, improving upon the Baseline requirements at the Be Lean stage through high levels of insulation and energy efficient services and fixings. It has been demonstrated that the site has achieved a 14% reduction in CO_2 emissions.

10.4. At the Be Clean stage A community heating system has been deemed favourable resulting in a further 5% reduction in Co_2 emissions through the improved efficiency of the installed system.

10.5. For the third stage, Be Green, a feasibility study evaluating the suitability of various renewable technologies was undertaken. In this instance no renewable technologies were suited to this proposal due to the nature of the site.

10.6. To comply with policy CC1 of the Local Plan a site wide reduction in CO_2 emissions of 19% has been achieved against the Baseline/Target Emission Rate.

10.7. This sustainability statement concludes that the proposed development at 95 Avenue Road has met the requirements of Part L 2021 of the Building Regulations, the relevant parts of the London Plan and Policy CC1.

10.8. Further Details are shown in the summary tables and graph overleaf. Full copies of the SAP worksheets have been provided as a separate document and can be used to validate the figures used in this report.

11. SUMMARY TABLES

Carbon dioxide emissions

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	7.0	0.8
After energy demand reduction (be lean)	6.0	0.8
After heat network connection (be clean)	5.7	0.8
After renewable energy (be green)	5.7	0.8

Figure 6: Summary of domestic emissions

Regulated carbon dioxide savings

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	1.0	14%
Be clean: savings from heat network	0.3	5%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	**1.3**	**19%**
Annual savings from off-set payment	3.2	-
(Tonnes CO_2)		
Cumulative savings for off-set payment	**170**	-
Cash in-lieu contribution (£)	**16120***	

Figure 7: Summary of domestic emissions savings

*Please note in Line with Policy CC1 section 6.3.12 only major residential developments are required to pay the offset to achieve the zero carbon standards. As a minor proposal the development is required to meet the 19% reduction in CO_2 emissions.

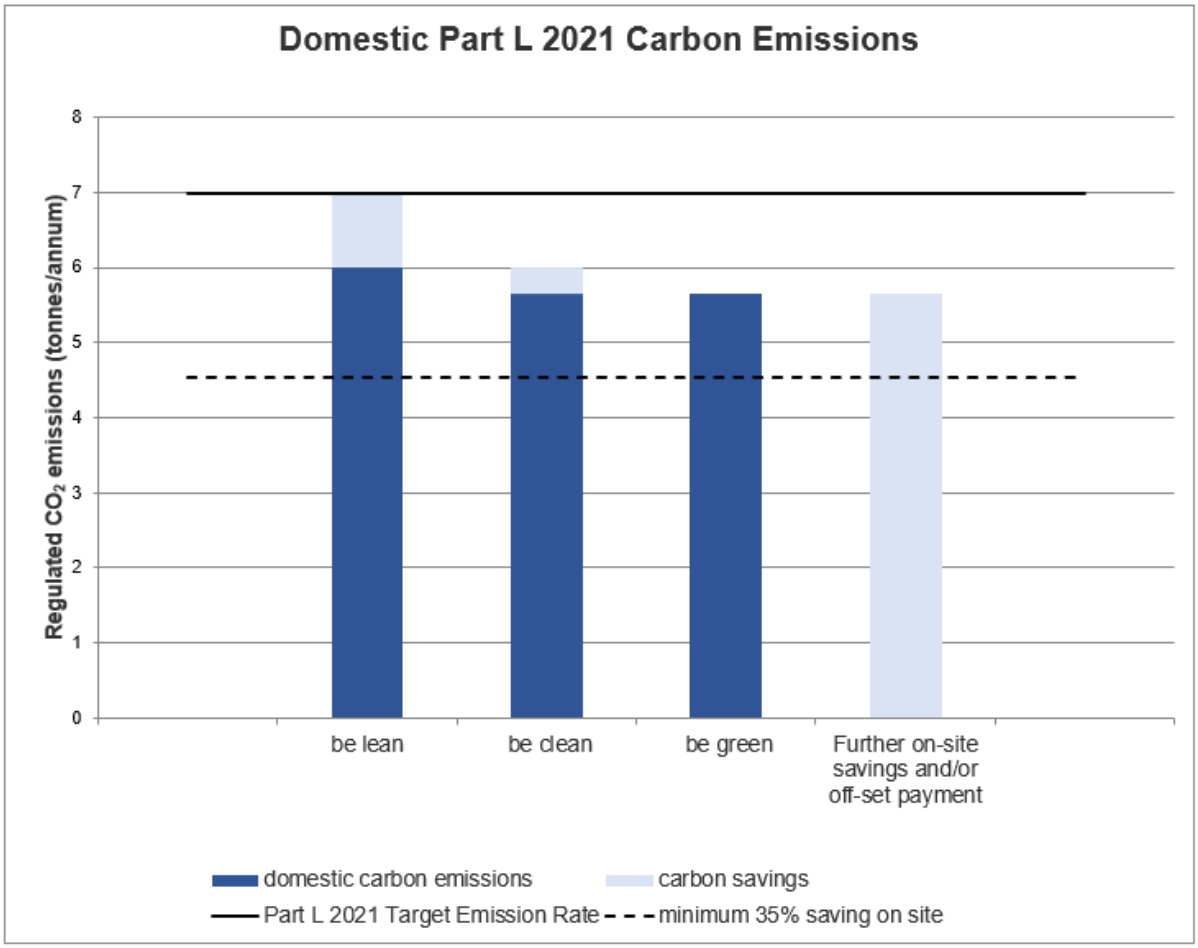


Figure 8: Summary of domestic emissions

APPENDIX A

BREDEM Calculator

BREDEM Calculation

BREDEM Method for Dwelling Unregulated Energy Consumption		
Dwelling Name/Number		Plot 1
Treated Floor Area (m2)		100.44
No. Occupants		2.7
User input (if no. occupants known)		0
No. Occupants		2.7
Appliance Energy Consumption		
Initial annual appliance energy, E_A' (kWh/yr)		2612
Month	Days Of Month	Energy Consumption (kWh)
1	31	254
2	28	232
3	31	250
4	30	228
5	31	218
6	30	195
7	31	190
8	31	187
9	30	188
10	31	208
11	30	219
12	31	243
Annual Energy Consumption (kWh/yr)		2610
Cooking Energy Consumption		
Type of cooker		Normal size cooker: electric
Cooker Type		No
E_C1A		275
E_C1B		55
E_C2A		0
E_C2B		0
E_C1		426
E_C2		0
Range power consumption (W)		
Month	Days Of Month	E_C,m (kWh)
1	31	36.2
2	28	32.7
3	31	36.2
4	30	35.0
5	31	36.2
6	30	35.0
7	31	36.2
8	31	36.2
9	30	35.0
10	31	36.2
11	30	35.0
12	31	36.2
Annual Energy Consumption (kWh/yr)		**426**
Total Cooking Energy (kWh/yr)		**426**
Total Unregulated Energy Electricty		3036
Total Unregulated Energy Gas		0
Total Unregulated Energy Consumption (kWh)		**3,036**
Total Carbon Emissions Electricty		**413**
Total Carbon Emissions Gas		**0**
Total Carbon Emissions - SAP 10		**413**
Total Carbon Emissions Tonnes		**0.413**
Total Unregulated Energy Consumption (Site)	**413**	**kWh**
Total Unregulated Energy Consumption (Tonnes)	**0.413**	**kWh**

BREDEM Calculation

BREDEM Method for Dwelling Unregulated Energy Consumption		
Dwelling Name/Number		Plot 2
Treated Floor Area (m2)		91.16
No. Occupants		2.6
User input (if no. occupants known)		0
No. Occupants		2.6
Appliance Energy Consumption		
Initial annual appliance energy, E_A' (kWh/yr)		2451
Month	Days Of Month	Energy Consumption (kWh)
1	31	238
2	28	217
3	31	234
4	30	214
5	31	204
6	30	183
7	31	178
8	31	176
9	30	176
10	31	195
11	30	205
12	31	228
Annual Energy Consumption (kWh/yr)		2449
Cooking Energy Consumption		
Type of cooker		Normal size cooker: electric
Cooker Type		No
E_C1A		275
E_C1B		55
E_C2A		0
E_C2B		0
E_C1		420
E_C2		0
Range power consumption (W)		
Month	Days Of Month	E_C,m (kWh)
1	31	35.7
2	28	32.2
3	31	35.7
4	30	34.5
5	31	35.7
6	30	34.5
7	31	35.7
8	31	35.7
9	30	34.5
10	31	35.7
11	30	34.5
12	31	35.7
Annual Energy Consumption (kWh/yr)		**420**
Total Cooking Energy (kWh/yr)		**420**
Total Unregulated Energy Electricty		2869
Total Unregulated Energy Gas		0
Total Unregulated Energy Consumption (kWh)		**2,869**
Total Carbon Emissions Electricty		**390**
Total Carbon Emissions Gas		**0**
Total Carbon Emissions - SAP 10		**390**
Total Carbon Emissions Tonnes		**0.390**
Total Unregulated Energy Consumption (Site)	**390**	**kWh**
Total Unregulated Energy Consumption (Tonnes)	**0.390**	**kWh**