LP ENERGY
ASSOCIATES

Energy
Sustainability
Carbon Profiling
Wellbeing
Certification

Planning Stage Energy Strategy

For

Dev Props

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Distribution and Revisions

Rev	Date	Comments	Issued by	Checked
D1	09.05.22	For Planning	L Pasifull	
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Contents

1. Executive Summary

This Energy Strategy has been prepared by LP Energy Associates Limited, in support of the planning application at Orchard Court, Clarence Road, Wood Green, London, N22 8PL

The proposal sees the "demolition of the existing bungalow and the construction of 5no, mews dwellings."

National, regional, and local planning policies have been identified and these proposals developed to meet or exceed their requirements. In accordance with the London Plan and requirements set out by the local authority, the development has been assessed in line with the energy hierarchy to determine the most appropriate strategy in delivering a substantial reduction in carbon dioxide emissions, from the Building Regulations Part L2013 and original building benchmark energy model.

The energy strategy follows and responds to the Be Lean, Be Clean, Be Green and Be Seen methodology and adopts various energy efficiency measures as well as low carbon renewable technologies where feasible, for a minor development. The following measures have been incorporated:

1.1 Be Lean, Be Green, Be Clean Design Scope

Be Lean Use less energy, minimise energy demand through efficient design and the incorporation of passive measures	**Building Fabric** • Deliver a high-performance building fabric • Achieve high levels of air tightness. • Reduce thermal bridging impacts using accredited/bespoke details on new elements. **Passive Design** • Improved daylighting. • Review of natural shading. **Energy Efficiency** • Energy efficient lighting controls • Energy efficient heating and controls • Appropriate energy metering and monitoring • Provision of energy efficient appliances
Be Clean Supply energy efficiently. reduce energy consumption through use of low-carbon technology	**Energy Efficient Energy Supply** • Upgraded LED Lighting throughout • Proposal to instal highly efficient exhaust air heat pumps into all houses.

Be Green Use renewable energy systems	**Renewable Technologies** • A study into the potential for installing renewable technology, further reducing energy demand and carbon emissions. This includes. ○ Solar Photovoltaics ○ Solar Thermal ○ Heat Pumps ○ Wind Turbines ○ CHP ○ Biomass Boilers
Be Seen	**Monitor, verify and report on energy performance**

Be Lean, Be Clean, Be Green, Be Seen Design scope

1.2 Design Strategy

When adopting '**Be Lean**' measures, applying excellent building fabric levels to the new elements, improving air tightness, and making a detailed study on overheating and natural daylighting, there was a 1.8% reduction in CO_2 emissions, when compared against the Part L 2013 benchmark figures. The figures have been upgraded, in line with the Building Regulations 2021 version, which is live from June 2022.

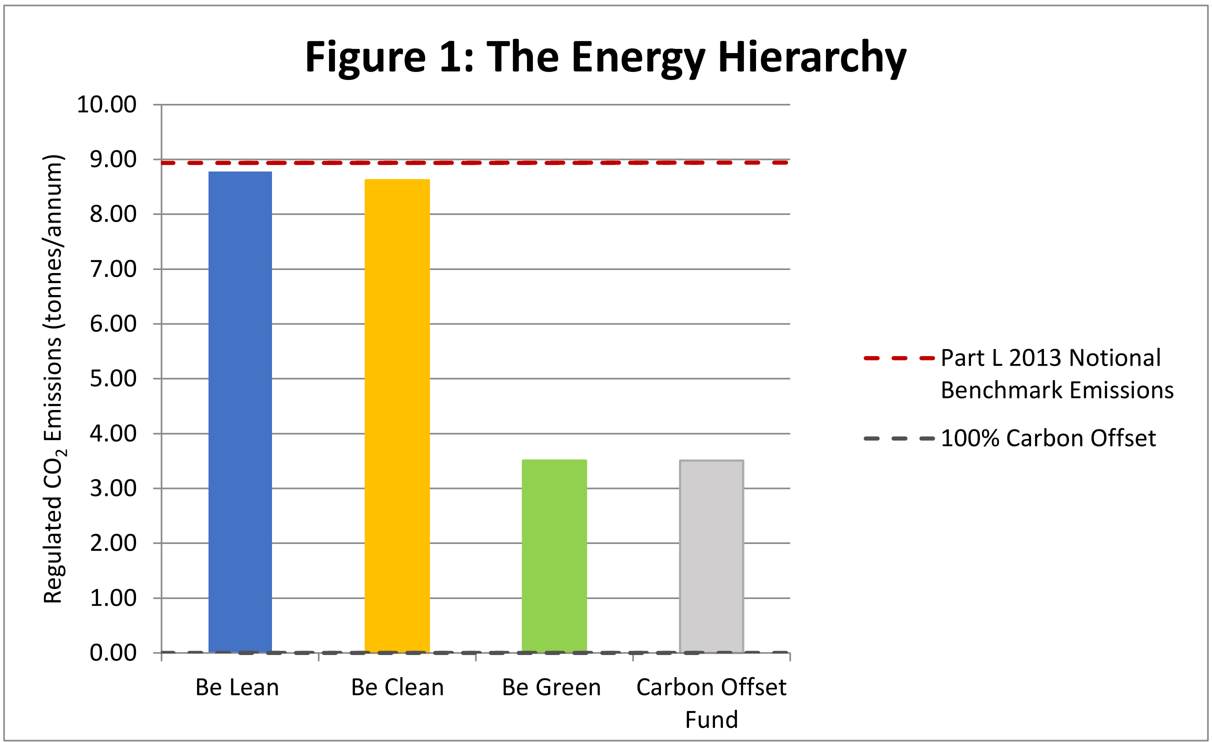
Once the base energy demand was reduced (from Be Lean assumptions), the strategy moved onto the possible installation of an on-site CHP system, or connection an existing network. There were no existing networks in the vicinity and when assessing an onsite CHP option, this system would be less effective under the new carbon fuel factors contained within SAP 10 and 10.1 and as a result, would not have an adequate benefit in carbon and energy reduction.

To ensure a future proofed solution, air source heat pumps, or exhaust air heat pumps were considered and have been incorporated into the design. When comparing the '**Be Clean**' measures against the Part L notional model, there was an additional 1.70% CO_2 reduction

An appraisal into viable renewable technologies was carried out to identify where green technologies could be installed, offering a displacement in energy and residual carbon emissions.

The most practical technology was electrical generating photovoltaics and there is ample space on each roof area to accommodate between 2.2 and 2.8kWp of power generation. This is subject to specialist design and could alter slightly based on space, shading and plant constraints. Additional options have been detailed within the appendices section. The photovoltaic array reduces carbon dioxide emissions by a further 57.2%, bringing the overall offset proposal to 61.00% beyond Part L 2013 figures. When assessing via SAP 10 carbon figures, the cumulative on-site CO_2 reduction was 81%. More information can be found in the following sections. In line with London Plan, GLA and local policies, the project target is to reduce overall CO2 emissions by 100%. Any remaining emissions will be offset via the Carbon Offset Fund. The Carbon Offset fee, based on SAP 10.1 figures, equates to £4,487.00.

1.3 The Energy Hierarchy



Energy Hierarchy Results

1.4 Carbon Dioxide Emissions After Each Stage of the Energy Hierarchy

	Carbon dioxide emissions (Tonnes CO2 per annum)		
	Regulated		Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	A	8.94	7.93
After Energy Demand Reduction (Be Lean)	B	8.77	7.93
After Energy Efficient Features (Be Clean)	C	8.62	7.93
After Renewable Energy (Be Green)	D	3.51	7.93

1.5 Regulated Carbon Savings After Each Stage of the Energy Hierarchy

	Regulated Carbon dioxide savings			
	(Tonnes CO2 per annum)		(%)	
Savings from Be Lean Measures	A-B	**0.16**	(A-B)/A*100	**1.8%**
Savings from Be Clean Measures	B-C	**0.15**	(B-C)/A*100	**1.7%**
Savings from Be Green Measures	C-D	**5.11**	(C-D)/A*100	**57.2%**
Total Cumulative Savings	A-D = E	**5.43**	(A-D)/A*100	**61%**

1.6 SAP 10 Carbon Savings and Payback Measures

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from Be Lean Measures	4.1	2%
Savings from Be Clean Measures	2.3	50%
Savings from Be Green Measures	6.5	81%
Cumulative on-site savings	6.5	81%
Annual savings from off-set payment	1.6	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**47**	-
Cash in-lieu contribution (£)	**£4,487.00**	100%

2. Introduction

This energy assessment provides details of the strategy proposed for the development. It also demonstrates how the development meets the requirements of the national planning policies, and Haringey London Borough Council core policy measures

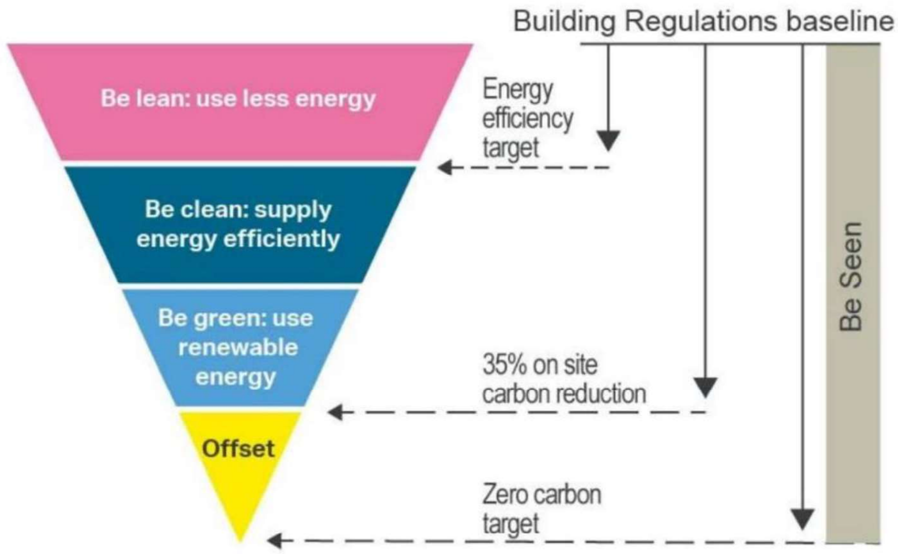
This energy assessment summarises the key measures proposed to meet the London Plan's carbon reduction targets and demonstrates that the development can meet and exceed the requirements of The London Plan to minimise carbon dioxide emissions.

The London Mayor expects all new developments to fully contribute towards the reduction of CO2 emissions. The targets are highlighted in Planning Policy SI2 Minimising greenhouse gas emissions of the London Plan 2021. The regulated carbon dioxide emissions reduction target for major development is zero carbon with 35 percent carbon reduction on site.

Following the issue of the Greater London Authority Energy Assessment Guidance (March 2021) applicants are encouraged to use the updated SAP10 carbon emission factors. This will be in place during the interim period before the adoption of the new Building Regulations expected in June 2022.

The SAP10 carbon emission factors have been used for this assessment and the report falls in line with the March 2020 guidance. The report follows the energy hierarchy to ensure a carbon reduction is achieved on site as follows.

Figure 1: *The London Plan energy hierarchy*



Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures (Be Lean). 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.

The residential parts of building will be assessed against Part L1a benchmark figures.

The energy report summarises how the proposed design strategy makes the best possible contribution to minimising carbon dioxide (CO2) emissions in accordance with the London Plan 2021 energy hierarchy:

A. Demand reduction (Be Lean)
B. Heating infrastructure including CHP (Be Clean)
C. Renewable energy (Be Green)
D. Monitoring (Be Seen)

3. Planning Policy Requirements

This section investigates the relevant policies that are to be adopted within the proposed development. This includes national, regional, and local policies and regulations and are summarised below.

4.1 National Planning Policy Framework (NPPF) [1]

The National Planning Policy Framework was published in February 2019 and outlines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate, and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities. The NPPF was designed to consolidate all policy statements and guidance into a single and simpler framework, making the planning stage more user friendly. There are three dimensions to sustainable development.

4.1.1 Economic Objective

To help build a strong, responsive, and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation, and improved productivity; and by identifying and coordinating the provision of infrastructure.

4.1.2 Social Objective

To support strong, vibrant, and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

4.1.3 Environmental Objective

To contribute 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, including moving to a low carbon economy.

In determining applications, great weight should be given to outstanding or innovative designs which promote high levels of sustainability or help raise the standard of design more generally in an area, so long as they fit in with the overall form and layout of their surroundings.

Local planning authorities should expect all developments to comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption.

4.2 The London Plan

The proposed development lies within Haringey London Borough Council; therefore, the

applicable Regional Strategy is the London Plan (March 2021). In its strategic priorities, the London Plan addresses issues of the environment quality raised by the urban heat island effect and realises the unique potential for district energy networks. The London Plan requires all London boroughs to follow the London Plan's energy efficiency guides.

The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years and requires all developments to actively tackle climate change, through sustainable development. For the purposes of energy and sustainable design, Chapter 9: Sustainable Infrastructure should be used when assessing the energy design of the scheme, namely the following sections:

- **Policy SI 1 Improving air quality.**
- **Policy SI 2 Minimising greenhouse gas emissions**
- **Policy SI 3 Energy infrastructure**
- **Policy SI 4 Managing heat risk**
- **Policy SI 5 Water infrastructure**
- **Policy SI 6 Digital connectivity infrastructure**
- **Policy SI 7 Reducing waste and supporting the circular economy.**
- **Policy SI 8 Waste capacity and net waste self-sufficiency**

The London Plan requires that a concise energy assessment be carried out, explaining the undertaken strategy for reducing carbon emissions, based on the energy hierarchy. The plan also requires that the energy assessment demonstrates how the reductions of carbon emission are to be met within the framework of the hierarchy.

Policy SI2 requires the reduction of CO2 emissions, in accordance with the Be Lean, Be Clean and Be Green methodology

- **Be Lean:** Use Less Energy
- **Be Clean:** Supply Energy Efficiently
- **Be Green:** Use Renewable Energy

Policy SI 2 requires that developments look to provide a reduction in proposed CO2 emissions, using on-site, renewable energy generation where feasible. All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment, and historical assets, and to avoid any adverse impacts on air quality.

4.3 The Building Regulations (2013)

The current version of the Building Regulations came into force in April 2014. Part L 2013 requires new homes to reduce their carbon emissions by a further 6% across the build mix when compared to its 2010 predecessor the first part of Part L1a looks at the overall carbon emissions and calculates a notional Target Emission Rate (TER), based on Part L benchmark figures. The proposed units will then need to produce less CO2 because of improving on these benchmark figures. A full breakdown of the assumed fabric values can be found in the 'Be Lean' section of this report.

4.4 Haringey London Borough Council Policy

- Minor Energy Statements should demonstrate a 100% reduction below Building regulations Part L 2013 following the Energy Hierarchy.
- SAP worksheets should be supplied to show the proposed reduction in emissions on site.
- Energy Hierarchy summary tables should be supplied, to show the reduction of emissions under Be Lean, Be Clean and Be Green methodology
- Set out how emissions are reduced on site, providing detail behind the inputs and outputs of the SAP Calculations.
- The Development fabric efficiencies, the proposed space heating/cooling and hot water strategy and proposed renewable energy technology. Further guidance on how to structure the Energy Statement can be found on the GLA website

4. Energy Strategy Principles

In line with the principles set out in section 4.0, the proposed energy strategy will focus on the three key driving principles:

Be Lean: Use less Energy – the incorporation of low energy design and passive measures to promise the reduction of energy use.

Be Clean: Supply Energy Efficiently – Use low-carbon technology to significantly reduce energy consumption.

Be Green: Use Renewable Energy – assess the feasibility of renewable energy systems.

5. Demand Reduction (Be Lean)

5.1 Fabric

In accordance with the London Plan Policy SI 2, the initial priority is to reduce the baseline emissions through efficient design measures. To ensure the proposed development complies with 2013 Building Regulations and improves upon the baseline compliance threshold, specific measures to make the building energy efficient must be incorporated within the scheme design and construction.

Element Description	U-Value Limit	U-Value Assumed in Model
Ground Floors	0.14 W/m^{2}K	0.10 W/m^{2}K
External Walls	0.20 W/m^{2}K	0.18 W/m^{2}K
Sheltered Walls	0.20 W/m^{2}K	0.18 W/m^{2}K
Party Walls	0.20 W/m^{2}K	0.00 W/m^{2}K
Main Roof Areas	0.14 W/m^{2}K	0.11 W/m^{2}K
Air Permeability	5.00m^3/ (h.m^2) at 50 Pa	3.00m^3/ (h.m^2) at 50 Pa
Glazing	1.40 W/m^{2}K	1.20 W/m^{2}K Gg: 0.4-0.65
Doors	1.40 W/m^{2}K	1.40 W/m^{2}K

Proposed Building Fabric Features

5.2 Cooling Load Reduction

In addition to the above, with specific consideration to minimising solar gains, the building has a medium thermal mass. The initial model shows that there were no significant overheating risks. This is due to the current building service strategy and high thermal mass elements of the existing build. As the design progresses, the overheating risk will be reviewed.

5.3 Lighting

100% of installed lighting will exceed the minimum performance criteria to be considered low energy, exceeding Part L 2013 minimum standards. In the commercial unit, lighting design is to be carried out with a design wattage of 8W/m2

5.4 Ventilation

Intermittent fans will be installed to applicable areas, with a low energy rating. This is to be designed in line with AD Part F

5.5 Pipework Insulation

Pipework insulation will be based on BS5422 standards for both hot and cold pipework and duct insulation, with high thermal properties.

5.6 Thermal Bridging

As legislation forces the use of ever improving U value, thermal bridging now represents a much greater proportion of heat loss of a building than it once did. As such it is becoming increasingly more critical to incorporate thermal bridging details to ensure a continuity of insulation at all junctions between fabric elements. The latest building regulations have also been developed in such a way that failure to address thermal bridging effectively carries significant penalty.

The dwellings within the scheme will be designed in line with the accredited construction details (ACD) and therefore it has been indicatively modelled with the accredited thermal bridge Psi-values for the following junctions:

- Lintels (E2)
- Sill (E3)
- Jambs (E4)
- Ground floor (E5)
- Party floor between dwellings (E7)
- Corners (E16)
- Corners inverted (E17)
- Party wall (E18)
- Staggered wall (E25)
- Eaves (E10)

5.7 Heating & Hot Water

For the 'Be Lean' scenario, the GLA requires that the scheme uses gas fire boilers, with an efficient of 89.5%. the proposed scheme will promote the use of air source heat pumps, to provide a future proofed and energy efficient solution. The hot water will be supplied via the mains gas boiler.

5.8 Summary

By adopting the above Be Lean measures, a carbon dioxide reduction of 1.8% is likely to be achieved, when compared against the notional benchmark figures.

5.8 Be Lean Results

	Carbon dioxide emissions (Tonnes CO2 per annum)		
	Regulated		Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	A	8.94	7.93
After Energy Demand Reduction (Be Lean)	B	8.77	7.93

	Regulated Carbon dioxide savings			
	(Tonnes CO2 per annum)		(%)	
Savings from Be Lean Measures	A-B	0.16	(A-B)/A*100	1.8%

6. Use Energy Efficiently (Be Clean)

The London Plan asks that the feasibility of Combined Heat and Power (CHP) systems are assessed, and where a new CHP system is appropriate, there should be encouragement to extend the system beyond the site boundary to adjacent sites. The scheme, however, is a minor development and while it is not required to connect to an existing network, this has still been reviewed.

Development proposals should select energy systems in accordance with the following hierarchy:

- **Connection to existing heating or cooling networks.**
- **Site wide CHP network.**
- **Communal heating and cooling**

6.1 Issues with CHP and SAP 10 Decarbonisation

With the upcoming Building Regulation Part L, London Plan and SAP10 decarbonisation impact, CHP units are going to significantly reduce in energy efficiency, due to the decarbonisation of electricity. This will cause less of a CO_2 emissions reduction, as the electricity generated as a surplus will have less of a carbon offset (0.519kWh vs 0.233kWh). As a CHP uses a larger proportion of mains gas to operate, the benefit will be further reduced and running costs will rise. It is uncertain of the impact and constraint of using CHP systems at present and this report therefore reviews this only as an option.

6.2 Air Source Heat Pumps

A direct electric approach will not have a positive impact on the scheme, on both the carbon intensity and primary energy intensity and it is recommended that any heating source has a renewable element. Air source heat pumps were noted as having the highest, positive impact on the overall energy efficiency and have therefore been proposed. The system will work excellently with the proposed building fabric measures.

Air source heat pumps (ASHPs) absorb heat from the outside air and uses this to heat radiators, underfloor heating systems, or warm air convectors. The air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can get heat from the air even when the temperature is as low as -15° C. Heat pumps have some impact on the environment as they need electricity to run, but the heat they extract from the ground, air, or water is constantly being renewed naturally.

The benefits on using this system include:

- Reduction in the cost of fuel bills.
- Reduction in the environmental impact of the apartments

- Contribution to compliance with building regulation requirements.
- Continuous ventilation which helps improve indoor air quality and prevent condensation.

6.3 Design Considerations

Since air source heat pumps work best when producing heat at a lower temperature than traditional boilers, it's essential that the buildings thermal build up is improved and draught-proofed for the heating system to be most efficient. Air source heat pumps can perform better with underfloor heating systems or warm air heating than with radiator-based systems because of the lower water temperatures required. A cylinder will be required to provide hot water. This in most cases, is supplied as an integrated unit with the heat pump system (indoor unit). The external fan location will be dependent on-air flow and noise restrictions

6.4 Be Clean Results

	Carbon dioxide emissions (Tonnes CO2 per annum)		
	Regulated		Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	A	**8.94**	**7.93**
After Energy Demand Reduction (Be Lean)	B	**8.77**	**7.93**
After Energy Efficient Features (Be Clean)	C	**8.62**	**7.93**

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from Be Lean Measures	0.16	1.8%
Savings from Be Clean Measures	0.15	1.7%

7. Use Renewable Energy (Be Green)

In line with Policy SI 2 of The London Plan, there is a requirement for a reduction in CO2 emissions, using on-site renewables. This section reviews each of the technologies that are to be considered on a new development in line with The London Renewable Toolkit, with the most feasible method being selected.

The following renewable technologies have been considered to assess their potential to meet the renewable targets for the development.

Technology	Included in report		Reasoning
	YES	NO	
Combined Heat and Power (CHP)		X	The fuel factors associated with a CHP system have been reviewed and provide a carbon offset benefit when assessing an electrical carbon factor of 0.519Kg/CO2 per kWh. With the emerging SAP 10 figures, that has an updated fuel factor of 0.136 Kg/CO2 per kWh, the CHP could potentially reverse the savings associated with the system and as such has been discounted from this scheme.
Solar Photovoltaics (Electric)	X		There is adequate space to install individual PV arrays to the main roof area. This equates to a total 36 panels; 13.68kWp and will offset approximately 11,805kWh and 6.12 tonnes of CO2 per year. Assumed Orientation: South; pitch: 10-15 degrees; shading: very little. The electrical generation is best used within the building either directly or via solar storage battery.
Solar Thermal (Hot Water)		X	While this would be feasible, it would be more beneficial to provide electrical generation solar PV to the roof space available.
Heat Pumps	X		Air Source Heat pumps have been considered on the scheme, subject to MEP design
Ground Source Heat Pump		X	The use of horizontal ground source heat pumps is inhibited because of the areas required for the horizontal ground loop system. The site would also be difficult to accommodate both a vertical borehole system or plateau setup, regarding safe working area and lack of open available space. Ground Source Heat Pumps have therefore been discounted based on these potential constraints.
Biomass		X	Biomass technology has been discounted as there is no space allocation for the pellets on site. There is also an increased fire risk where combustible materials are going to be stored. This system would also not work in a smoke control area and for future proofing purposes.

Wind Turbine		X	Due to noise, vibration, reflected light and shadow flicker it is not best practice to locate near built up areas. Wind turbines are therefore not practically feasible for this development.

The assessment of these technologies shows that Air Source Heat Pumps along with Photovoltaic arrays are the most feasible solution for this development. A detailed assessment of the other technologies can be found in the appendices section and the chosen option examined in more detail is reviewed below.

7.1 Photovoltaics (PV)

Photovoltaic (PV) panels provide clean silent electricity. They generate electricity during most daylight conditions, although they are most efficient when exposed to direct sunlight or are orientated to face within 30 degrees from south. PV panels can be integrated into many different aspects of a development including roofs, walls, shading devices, or architectural panels. The panels typically have an electrical warranty of 20-25 years and an expected system lifespan of 25-40 years.

PV systems convert energy from the sun into electricity through semi-conductor cells. A cell consists of a junction between two thin layers of dissimilar semiconducting materials, usually based on silicon. When light shines on the junction, a difference in energy is created – otherwise known as ‘voltage’ or ‘potential difference’. This voltage is used to produce an electrical current or direct current (DC), which can be used directly or converted into alternating current (AC) depending upon the application. AC is most appropriate for household use or for exporting to the local electricity network/national grid. Individual PV cells only produce a small amount of power, so are usually connected to form a module. Modules can then be linked to form an array and sized to meet a particular load.

7.1.1 Design Considerations

- Optimise the PV array by designing with the best inclination and orientation.
- Ensure that the panels receive minimal over-shading.
- Ensure that the wiring from arrays is kept to a minimum, to reduce electrical losses.
- Provide safe and secure access for maintenance purposes.
- Ensure regular monitoring of performance.

Following an assessment of the possible renewable technologies available, a photovoltaic array is identified as being most effective in providing a CO_2 reduction, when assessed in line with the energy hierarchy.

7.1.2 PV Strategy

Within the energy model, the following design has been considered:

	House 1	House 2	House 3	House 4	House 5
Number of Panels	8	8	6	6	8
Approximate Area per Panel	1.640m^2				
Approximate Surface Area Required	13.12 m^2	13.12 m^2	9.84 m^2	9.84 m^2	13.12 m^2
Panel Output (Kwh)	0.360				
Total Output (kWp)	2.88	2.88	2.16	2.16	2.88
Total Output (kWh/year)	2,485.44	2,485.44	1,864.08	1,864.08	2,485.44
SAP 2012 Carbon Factor (kg.CO2 /kWh)	0.519				
CO2 Offset (Tonnes.CO2 /year)	1.29	1.29	0.97	0.97	1.29
Yearly Cost Saving (Block) – Unit cost @ £0.26	£646.21	£646.21	484.66	484.66	£646.21
25-year life payback	£16,155.25	£16,155.25	£12,116.50	£12,116.50	£16,155.25

Required Photovoltaic Array

An initial study of the roof plan indicates that there is sufficient area available for the Photovoltaic array above. The assumptions are based on the panels having little or no shading and connection the landlord's supply, subject to specialist design. An indicative layout has been supplied

7.3 Be Green Results

		Carbon dioxide emissions (Tonnes CO2 per annum)	
		Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	**A**	**8.94**	**7.93**
After Energy Demand Reduction (Be Lean)	**B**	**8.77**	**7.93**
After Energy Efficient Features (Be Clean)	**C**	**8.62**	**7.93**
After Renewable Energy (Be Green)	**D**	**3.51**	**7.93**

	Regulated Carbon dioxide savings			
	(Tonnes CO2 per annum)		(%)	
Savings from Be Lean Measures	**A-B**	**0.16**	**(A-B)/A*100**	**1.8%**
Savings from Be Clean Measures	**B-C**	**0.15**	**(B-C)/A*100**	**1.7%**
Savings from Be Green Measures	**C-D**	**5.11**	**(C-D)/A*100**	**57.2%**
Total Cumulative Savings	**A-D = E**	**5.43**	**(A-D)/A*100**	**61%**

8. Be Seen

To truly achieve net-zero buildings we need to have a better understanding of their actual operational performance. The 'Be Seen' calculations have been completed in line with the guidance and the results will be uploaded to the mayor's post construction monitoring platform. The applicant has committed to providing the actual performance of the development for at least five years post occupation.

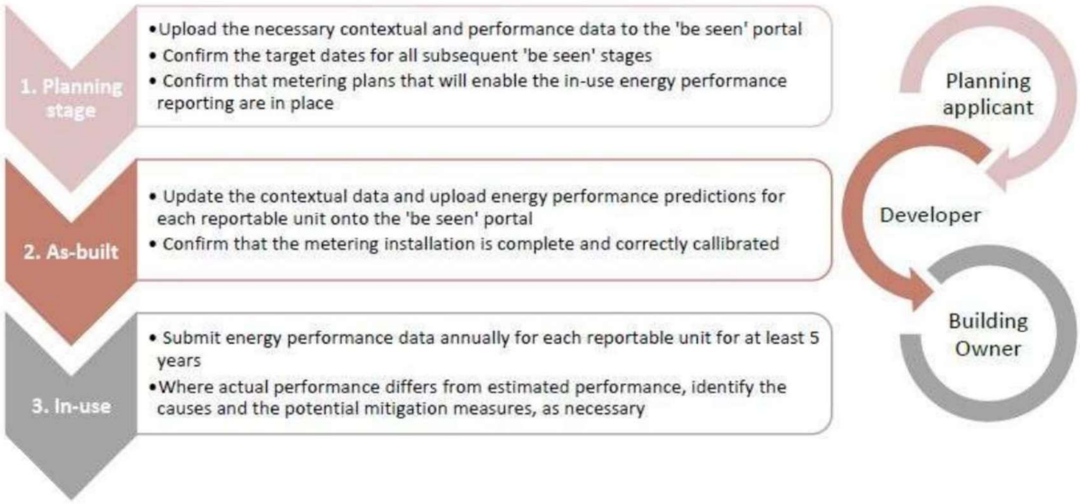


Image from 'Be Seen' consultation draft October 2020

9. Conclusion

The proposed development has been assessed in line with the London Plan energy hierarchy, with a view of demonstrating how best to achieve a sustainable, future proofed scheme, when compared against Part L 2013 and existing building model benchmark figures, as required to meet local and regional planning policies.

The purpose of the strategy is to reduce the overall energy demand as far as possible with regards to the practicality and economic factors, by implementing energy efficiency measures and introducing low carbon and renewable technologies. The strategy follows the Be Lean, Be Clean, Be Green energy hierarchy principles, set out in The London Plan 2021

9.1 Be Lean.

The proposed passive design and energy features achieve a 1.80% reduction in CO2 emissions overall compared to the baseline model. This has been met with the adoption of excellent building fabric values, low air permeability, advanced and innovative building monitoring equipment, and the use of thermal accredited construction details, to lower the fabric energy efficiency on new elements of the project. Any potential upgrades of existing fabric should be reviewed at a later stage.

9.2 Be Clean.

The feasibility of connecting to an existing heat network was investigated, in line with the energy hierarchy requirements. However, there are no local networks that would be sufficient in supplying the project with this service. The next step was to review the possibility of installing an on-site CHP. This is subject to specialist review; however, the building fabric, solar gains and thermal mass quality drastically reduces the need for a constant heating. The electrical generation because of the low profiles would prove minimal.

It is therefore proposed that highly efficient, Air Source Heat Pumps are installed. This system will provide heating and cooling, with smart controls, to serve the building. The proposed energy efficient features achieve a further 1.70% reduction in CO2 emissions overall compared to the baseline model.

9.3 Be Green.

Renewable technologies have been investigated and the most appropriate incorporated into the development which further increases the CO_2 emissions of the development meeting the objective of the London Plan Policy SI 2. PV Panels located on the available un-shaded roof space have been proposed. The renewable technological features achieve a further 57.20% reduction in CO_2 emissions overall compared to the baseline model. Figure 3 and 4 below shows a summary of the total annual emissions and respective savings when assessed though the London Plan energy hierarchy.

The tables above demonstrate the overall, site wide CO_2 reduction, when compared to the benchmark model. It is noted that there is a 61.00% CO_2 reduction, equating to an approximate offset figure of 35.69 Tonnes of CO_2 per annum.

This energy statement outlines the key features and strategies adopted by the design team to reduce energy use and carbon emissions for the scheme. It demonstrates compliance with the London Plan 2021, as well as the Haringey Borough Council local plan.

The strategy for reducing energy and associated carbon emission follows the energy hierarchy:

- **Be Lean** – improved building fabric specification to exceed that of the notional building, low air permeability target, thermal bridging details and selection of energy efficient services
- **Be Clean** – connection to a district heat network and installation of Combined Heat and Power
- (CHP) have been investigated for the site and not been deemed appropriate at this time, future connection to district heat network (DHN) has been accommodated
- **Be Green** – air source heat pumps to be installed and the roof area available has been maximised for photovoltaic (PV) panels.
- Offset – remaining carbon to meet zero carbon will be paid to the offset fund – total cost **£4,487.00.** this uses SAP 10.1 figures.
- Be Seen – onsite monitoring of energy usage 5 years post construction

This report concludes that the proposed development will achieve a 61.00% improvement over Part L1A 2013 of the Building Regulations and an 81% reduction in when compared against SAP 10 carbon factors.

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10. Appendices

10.1 Assessment of Renewable Options

10.2 Sample Photovoltaic Roof Layout

10.3 Sample SAP Results

10.4 GLA Spreadsheet confirming SAP 10 figures

10.1 Assessment of Renewable Options

This section reviews each of the technologies that are to be considered on a new development, in line with The London Renewable Toolkit, with the most feasible method being selected. The technologies below have been investigated, with justification provided for those discounted due to technical and economic viability reasons.

10.1.1 Wind Turbines

Wind energy can be a cost-effective form of renewable energy generation, producing zero CO2 emissions and available in a wide range of sizes and outputs. There are two main types of wind turbine; the most common type is the horizontal axis type, which allows the turbine to rotate according to wind direction on top of a large tower. Vertical axis turbines are also available and are better suited to urban locations. Both types drive a generator, either directly or indirectly via a gearbox, energy can either be stored in batteries or converted from direct current (DC) to alternating current (AC) which can then be fed to the grid.

The national wind speed database indicates an average wind speed for the site ranging from 4.7-6.1m/s at 10-45m above ground level. Typically, large wind turbines are considered viable where wind speed exceeds 7m/s, however turbines will operate from wind speeds of 4m/s and still produce useful amounts of energy, but due to the location the uneven and turbulent wind patterns that can be expected to occur near buildings, the effective operational time is likely to be limited.

Additionally, due to noise, vibration, reflected light and shadow flicker it is not best practice to locate near residential areas.

Wind turbines are therefore not practically feasible for this development.

10.1.2 Biomass

Biomass can be burnt directly to provide heat using wood from forests, urban tree pruning and farmed coppices, or as a liquid biofuel (biodiesel). Biomass systems are becoming more common in the UK market, although they are used widely throughout Europe, where there is plentiful supply of potential fuel.

Biomass systems are technically carbon neutral; however, the fuel can only be called renewable energy if it has been sourced from a sustainable location. To avoid secondary CO2 emissions, the fuel should be sourced locally.

There are three types of wood burning boiler - logs, woodchips, and wood pellets. Wood logs are the most readily available, generally produced as a by-product from forestry and woodland from tree surgery and wind damage. However, wood log boilers tend to be used to serve domestic systems. Wood chips have high moisture content and are generally made from almost any spare wood. However, wood chip boilers are only 50% efficient and tend to suffer from blockages to the feed to the boiler, and hence we would be cautious about their use on this site. Storage space requirement is also high due to the irregularity of the chips.

Wood pellets are made from dry waste wood, such as used pallets and off-cuts/sawdust from furniture manufacturers. The waste wood is compressed into uniform, high density pellets that are easier to transport, handle and store than other forms of wood fuel.

Biomass combustion systems are generally more mechanically complex than conventional boiler heating systems, especially when it comes to delivery, fuel storage, handling, and combustion. The complexity is necessary because of the different combustion characteristics of biomass, compared to conventional fossil fuel systems. This increased complexity would yield a higher capital cost, compared to a conventional system.

These systems would require a more frequent maintenance plan than a conventional system, and more attention to fire insurance premiums, air quality standards, disposal options and general safety issues.

To minimise NOx emissions, the boilers must have individual flues designed to take the emissions above the surrounding buildings and ensure the dilution of particulates and NOx.

Biomass technology could potentially offer a solution to satisfying heating and hot water loads to the project. However, it has been discounted as there is no space allocation for the pellets on site. There is also an increased fire risk where combustible materials are going to be stored.

10.1.3 Solar Thermal

Solar thermal water heating is an efficient energy source, which can cater for a large portion of the hot water load, subject to the type of development, location, and the heating and hot water strategy. A south facing highly efficient evacuated tube solar array will provide approximately 520kWh/year of hot water. Although benefit is limited by the amount of energy demand, any heat generated that goes unused is simply wasted.

The hot water demand is high for this project, and it would therefore be beneficial to supply a low energy or renewable technology to assist in the buildings hot water demand. However, the solar thermal panels would discount the available roof area for photovoltaic panels. Displacing electricity is more beneficial as it has a higher carbon factor than mains gas.

10.1.4 Ground Source Heat Pumps

In the UK, the ground keeps a constant temperature of approximately 11-12 degrees centigrade through the year. Because of the grounds high thermal mass, it stores radiant heat from the sun during the summer. Ground source heat pumps can transfer this heat from the ground to the building using a glycol solution, to provide space heating and domestic hot water. Although these systems will be 100% electrically loaded, they produce approximately 3-4 times more energy than they consume.