ATSPACE

DELIVERING BEYOND COMPLIANCE

Industry leaders in compliance from design through to completion

ENERGY STATEMENT

Plot 1, 31 Beech Hill Avenue
Barnet
Hertfordshire
EN4 0LU

Date: **30/10/2023**

Report Reference: **Q-02404**

Head Office

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REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
1	30/10/2023	Atspace Ltd	Joe Dillon	For Comment

This statement outlines the opportunities for reducing carbon output/energy demand through optimizing fabric fit-out and using renewable energy.

It is not intended as detailed design advice, and is purely for the demonstration of the relevant reduction requirement.

As such data and information should only be treated as INDICATIVE at this stage of the process. Further investigation can be undertaken when more accurate and detailed information is required on specific measures.

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1.0 Introduction

1.1 Introduction to Developments

Atspace Ltd has been instructed to prepare an Energy Statement for the residential new build project at 31 Beech Hill Avenue.

This project is the construction of one detached two-storey dwelling houses with rear balconies, accommodation in roof space together with associated parking

The site is located in a residential area of Barnet.

The plans of the proposed development can be seen in Figures 1 – 4 below.

Figure 1: *Plot 1 Ground floor & First Floor Plan*

***Figure 2** – Plot 1 Second Floor & Roof Plan*

***Figure 3** – Plot 1 Front & Left Side Elevation*

Figure 4 – Plot 1 Rear & Right Side Elevation

This statement will demonstrate how the CO_2 emissions of each plot have been reduced by 35% over the baseline value derived for their respective SAP Calculations.

1.2 Planning Policy

The following Energy/ CO_2 related planning policies apply to this development:

DMD 50

Environmental Assessment Methods

The Council will require developers to demonstrate compliance with targets relating to the relevant adopted environmental assessment methods

1. ***New build residential development***

a. *Major Development*

Proposals must achieve the following standards under the Code for Sustainable Homes, or equivalent scheme or rating if this is updated:

- *2013 to 2015 – Seek to exceed Code Level 4*
- *2016 onwards – Code Level 5 and moving towards zero carbon (Code Level 6 often expressed as net zero carbon for regulated and unregulated energy).*

b. *Minor Development*

Proposals must achieve Code Level 4 (or equivalent rating if this scheme is updated) where it is technically feasible and economically viable to do so.

2. Residential refurbishments and conversions

a. Major Development

Proposals must achieve the following standards under the BREEAM Domestic Refurbishments standard, or equivalent rating/scheme if this is replaced or updated:

- *2013 to 2015 – Seek to exceed an "Excellent" rating*
- *2016 onwards – Moving towards an "Outstanding" rating (often expressed as net-zero carbon development).*

b. Minor Development

Proposals must exceed a 'Very Good' rating under the BREEAM Domestic Refurbishments standard or their equivalent rating/scheme.

DMD 51

Energy Efficiency Standards

All developments will be required to demonstrate how the proposal minimises energy-related CO_2 emissions following the following energy hierarchy:

a. Maximising fabric energy efficiency and the benefits of passive design;

b. Utilising the potential for connection to an existing or proposed decentralised energy network following DMD 52 'Decentralised Energy Networks';

c. Demonstrating the feasibility and use of low or zero-carbon technology following lDMD 53 'Low and Zero Carbon Technology'; and, where applicable;

d. Financial contributions to on, near or off-site carbon reduction strategies following DMD 54 'Allowable Solutions'.

Measures to secure energy efficiencies and reduce the emissions of CO_2 must adhere strictly to the principles of the energy hierarchy with each tier utilised fully before a lower tier is employed. Developers must submit detailed Energy Statements following DMD 49 'Sustainable Design and Construction Statements' to demonstrate how they have engaged with the energy hierarchy to maximise the energy efficiency of the proposal.

Specific targets for energy efficiency will apply to the following types of development:

Residential Development

The Council will require all major residential developments to achieve as a minimum:

a. 25% reduction in carbon dioxide emissions over Part L1A of Building Regulations (2010) in line with best practice to 2013;

b. 40% improvement from 2013 to 2016; and *c. Moving towards zero carbon from 2016.*

Non-residential proposals

The Council will require major non-residential development involving the replacement or creation of new non-residential floorspace or a combination thereof to achieve as a minimum:

a. 25% reduction in Carbon Dioxide emissions over Part L2A of Building Regulation (2010) in line with best practice to 2013;

b. 40% improvement from 2013 to 2016;

c. As per Building Regulations; and

d. Moving towards zero carbon from 2019.

All of the reductions specified for residential and non-residential development above should be provided on-site. Where site constraints preclude attainment of the required reductions and/or the reductions are not technically feasible and this has been evidenced through the Energy Statement, following DMD 49 'Sustainable Design and Construction Statements' provisions for providing near-site or off-site reductions through a set of agreed allowable solutions or financial the contribution will be required to fully offset the shortfall.

For minor development, the Council will seek to encourage all residential or non-residential developments to achieve the above targets where it is demonstrated that this is technically feasible and economically viable.

Developers will be required to take account of unregulated CO_2 emissions within their energy statements and will be required to reduce energy consumption for these uses so far as practicable.

This Policy should be read in conjunction with Core Strategy Policy 20

1.3 Methodology

The methodology that has been applied in this report is as follows:

1) Prepare baseline energy calculations for the site based on a Part L 2013 compliant construction specification designed for the development.

2) From the baseline energy calculations, the energy demand for the development(s) in kWh/year and the actual CO_2 emissions in kg CO_2 year can be established.

3) CO_2 reduction requirements can then be assembled which are drawn from the baseline values.

4) Applying energy-efficient design principles (improved fabric spec) has reduced the energy demand and CO_2 emissions of the site. Energy calculations have been prepared using the improved fabric specification.

5) Carry out a renewable energy feasibility study to ascertain which LZC technologies would be suitable for the development.

6) The sizing of suitable renewable technologies has been established to ensure the zero-carbon CO_2 emission reduction target has been met.

2.0 Predicted Annual Carbon Emissions

Baseline SAP 2012 calculations were prepared based on the construction specification shown in **Table 1** below:

Aspect	Baseline Result
External Wall	0.23 W/m^2 K
Dormer Cheeks	0.30 W/m^2 K
Slope Roof	0.18 W/m^2 K
Flat Roof	0.16 W/m^2 K
Dormer Roof	0.20 W/m^2 K
Ground Floor	0.15 W/m^2 K
Windows	1.4 W/m^2 K (G-value 0.55) (BFRC Rated)
Rooflights	1.4 W/m^2 K (G-value 0.63)
Doors	1.8 W/m^2 K
Thermal Bridging	Accredited Construction Details Fully Adopted
Air Tightness	5 m^3.h^{-1}.m^2
Ventilation	Ventilation provided by intermittent extracts
Space Heating	Gas Fired Boiler (90% efficient SEDBUK 2009)
Heating Controls	Time and temperature zone control
Hot Water	300l cylinder (2.86 kWh/day heat loss)
Secondary Heating	N/A
Renewable technologies:	N/A

The conducted baseline SAP calculations have shown that the proposed development will generate **6,636.92 kg CO_2/yr**. To satisfy the planning policies on CO_2 reduction, the developer has committed to reducing predicted CO_2 emissions to obtain a 35% reduction on each dwelling.

Therefore, since the developments predicted CO_2 emissions is **6,636.92 kg CO_2/yr**. Once building compliance has been reached, this would equate to a reduction target of **2,322.922 kg CO_2/yr**.

In other words, providing the total site emissions comes to equal to or less than **4,313.998 kg CO_2/yr**, the 35% reduction will be achieved for each dwelling. See **Table 2** below for a breakdown of emissions generated per plot:

	CO_2 Emission Rate Breakdown (kg CO_2/yr)				
Plot No.	**Baseline**	**Target**	**Reduction**	**Floor Area (m^2)**	**kg CO_2/yr/m^2**
Plot 1	6,636.92	4,313.998	2,322.922	525.90	12.62

3.0 Predicted Baseline Annual Energy Demand

Based on using the specification outlined in **table 1** above, this would create a total predicted energy demand for the development of **25,238.4 kWh/year**. The breakdown of this predicted energy demand can be seen in **Table 3** below. The figures quoted have been derived from the Design Stage SAP 2012 Calculations for the development.

Table 3: Baseline Predicated Annual Energy Demand

Total Predicted Energy Requirement (kWh/yr)					
Plot No.	Units	Space Heating	Water Heating	Lighting, Pumps, Fans	Total Predicted Energy Requirement (kWh/yr)
1	kWh/yr	25,238.40	3,053.66	1,013.17	29,305.23

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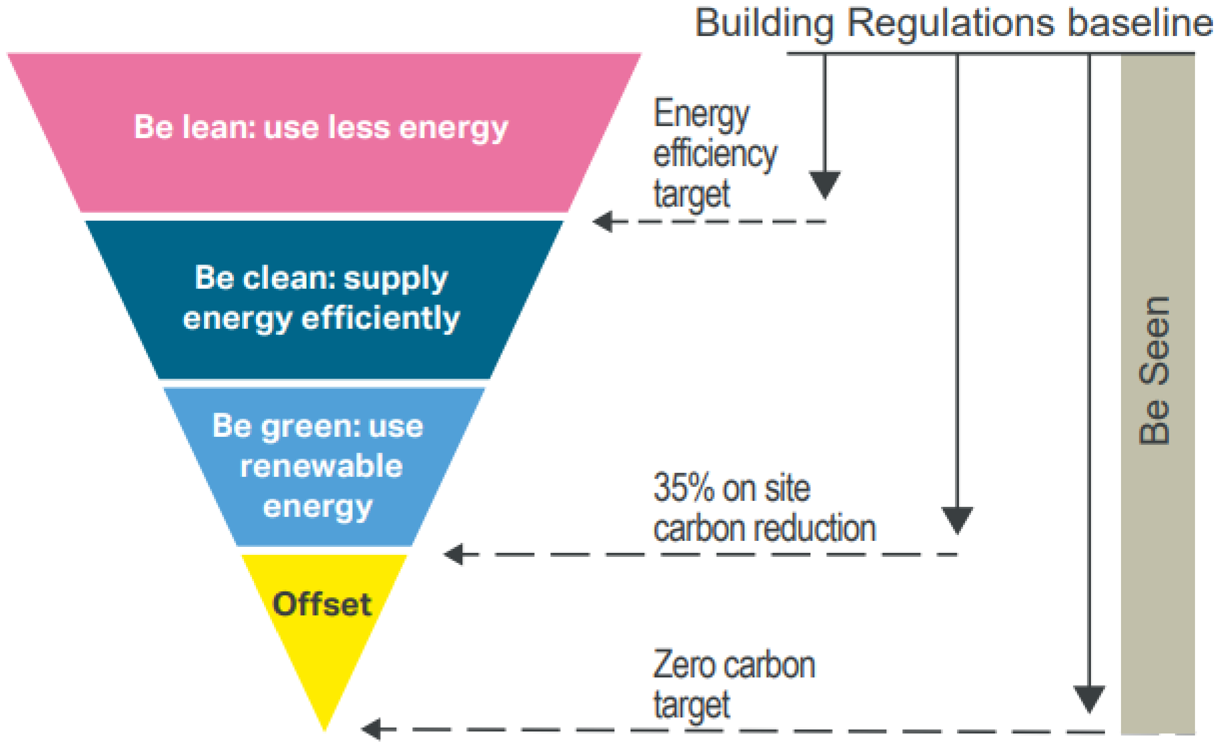
4.0 Reducing Carbon Emissions through Energy Reduction

The Energy Hierarchy sets out the most effective way to reduce a dwelling's CO_2 emissions. Firstly, by reducing energy demand, then by using energy efficiently and lastly by incorporating LZC/Renewable technologies.

Figure 9.2: The Energy Hierarchy and Associated Targets



Reducing the need for energy usage in the dwelling's design:

The first and most cost-beneficial action is to reduce the amount of energy needed by the occupants of the dwelling whilst still maintaining or even improving the comfort conditions. A lot can be achieved through passive design, improving the dwelling's external fabric and following principles to reduce air infiltration.

The developer is attempting to reduce the energy demand and CO2 emissions of the development by making the following fabric and energy efficiency improvements to their standard Part L 2013 building specification:

Energy reduction strategies include:

- Adopting enhanced fabric specifications
- Installing a high-efficiency gas boiler
- Incorporating energy-efficient lighting: 100% of all new lighting to be energy efficient
- Adopting principles of airtight construction
- All new windows will be double-glazed with a Low-e soft coating
- Passive Solar Design – Solar gain, solar shading, thermal mass
- Using construction details

The client is proposing to construct the building with materials that align with construction details provided by LABC (Local Authority Building Control).

Bridge Type	Psi Values for ACD's	Psi Values for LABC Details
E2 (Lintel)	0.300	0.021
E3 (Sill	0.040	0.015
E4 (Jamb)	0.050	0.011
E5 (Ground Floor)	0.160	0.059
E6 (Intermediate Floor)	0.070	0.000
E10 (Eaves)	0.060	0.107
E12 (Gable)	0.240	0.055
E16 (corner)	0.090	0.054
E17 (inverted corner)	-0.090	-0.100

Improvements From Using Construction Details				
Plot No.	Units	Revised Energy Requirement	Revised CO_2 Emission Rate (kg CO_2/yr)	Percentage reduction from Fabric Improvements
1	kWh/yr	27,346.81	6,213.90	6.37%

These construction details are based on the following wall build-up being used:

- 100mm Dritherm 32 (0.032 W/m.K)
- 100mm Inner Leaf Blockwork (≤ 0.28 W/m.K)

5.0 Feasibility Study of Renewable Technologies

This section will assess the technical viability of the following renewable energy technologies for the site to rule out unfeasible options:

- Mast mounted wind turbines
- Roof-mounted wind turbines
- Solar PV (Photovoltaic) Panels
- Solar Thermal Panels
- ASHP (Air Source Heat Pump)
- GSHP (Ground Source Heat Pump)
- Biomass
- CHP

The following observations have been made concerning the technical feasibility of integrating renewable energy technologies into this development.

Table 4: Feasibility Study of Low Carbon Technologies

Renewable Technology	Feasible	Reasons
Mast Mounted Wind Turbine	No	There is no sufficient open land for a mast-mounted wind turbine to be installed on-site. The site is situated in a densely populated area. Surrounding properties aren't far enough away to be unaffected by turbine noise, reflected light and shadow flicker. The site area is surrounded by buildings and other obstructions that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce the lifespan of components. Currently, the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database, the average wind speeds for the site is: 5.2 m/s at 10m, 6.0 m/s at 25m and 6.4 m/s at 45m height for the property postcode (EN4 0LU). Therefore, the wind speeds are not sufficient for a mast-mounted wind turbine to be viable.
Roof Mounted Wind Turbine	No	The site area is surrounded by buildings and other structures that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce the lifespan of components. Roof-mounted wind turbines are not yet a proven technology and several technical problems have been identified by manufacturers which are being investigated to rectify these issues. A vibration that can be transmitted to the building structure. Noise from a turbine may irritate occupants of the dwelling and adjacent buildings. Noise may also adversely affect ventilation strategy. Currently, the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database, the average wind speeds for the site is: 5.2 m/s at 10m, 6.0 m/s at 25m and 6.4 m/s at 45m height for the property postcode (EN4 0LU). Therefore, the wind speeds are not sufficient for a mast-mounted wind turbine to be viable.

Solar PV (Photovoltaic) Panels/Tiles	Yes	The proposed development has sufficient flat and pitched roof area for solar panels accommodation. Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees. The site is located in a region with a high level of global horizontal irradiation (1,000-1,020 kWh/m2/year)
Solar Thermal Collectors	No	The proposed development has sufficient flat & pitched roof area that can accommodate solar thermal panels. Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees. The site is located in a region with a high level of global horizontal irradiation (1,000-1,020 kWh/m2/year) Solar thermal collectors would be compatible with the planned heating system. There will be a year-round hot water demand. In practical domestic solar hot water systems, the solar hot water system is usually run in conjunction with, rather than instead of, a backup conventional boiler and as a result, the carbon intensity of the combined system is high relative to other renewables. Moreover, the high efficiency of modern condensing boilers, which can convert over 90% of means that the carbon intensity of these heat sources is relatively low at 200-300 gCO2/kWh. As a result, domestic solar water heating systems are a relatively expensive way of mitigating carbon emissions when they replace heat from efficient modern boilers. For this reason, they are not recommended.
ASHP (Air Source Heat Pump)	Yes	The proposed development has been designed to accommodate the space for a hot water cylinder. The buildings are suitable for a low-grade heat distribution system (e.g. underfloor water system, oversized radiators). Condenser units can be noisy and also blow out colder air to the immediate environment causing a nuisance to the residents. There are reported performance issues with this technology. During the heating season, the outside air temperature is often less than the ground temperature. This lower temperature has the effect of reducing the COP. For an air-to-water heat pump, the standard specifies test conditions of 7oC outdoor air temperature (source temperature). At external air temperatures lower than this, the COP will fall, as will the heating output of the heat pump. Depending on the application this reduction may be significant, such as during a cold winter morning when building pre-heat is needed.

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GSHP (Ground Source Heat Pump)	No	It may be possible to drill a limited number of vertical or horizontal boreholes for GSHP on the site. Developments can accommodate a low-grade heat distribution system (e.g. underfloor water system, oversized radiators). The site and neighbourhood contain mature trees. Drilling boreholes on the site creates the risk of damaging their roots. There is sufficient space inside each of the proposed dwellings for heat pump equipment.
Biomass Boiler	No	There is not an established fuel supply chain for the area. There is sufficient space for a delivery vehicle (vehicular access to fuel storage, turning circle etc) There is sufficient space in the proposed buildings for a wood-fuel boiler and associated auxiliary equipment. There isn't sufficient space for fuel storage to allow a reasonable number of deliveries. Biomass systems are management intensive (fuel sourcing, transport, storage) and require adequate expertise from users.
CHP	No	Given the proposed building use there won't be a high demand for heat for most of the year, therefore CHP won't be suitable. A CHP unit only generates economic and environmental savings when it is running at least 4,500 hours per year. This equates to an average heat demand of about 17 hours a day for five days a week throughout the year. The proposed development energy and heat demand profile do not match this requirement. CHP is typically utilized on buildings with high electricity and heating demand for most of the year such as local authority buildings, leisure centres, universities, hotels, and district heating schemes where CHP is used to provide electricity, space and water heating. CHP should be considered wherever there is demand for electricity and an appropriate demand for heat in the near vicinity.

Based on the feasibility study in **Table 4** above, the following technologies have been identified as being feasible for the proposed development.

- Photovoltaic panels
- ASHP

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6.0 System Size Options to Provide 35% CO2 Reduction

The developer is proposing to install solar photovoltaic panels onto the roof of the building:

- A Combined 4.5 kWp PV installation to ensure that the 35% target is exceeded.

	P.V. kWp Array per plot	Associated CO_2 Reduction
Plot 1	4.5	1,922.93

The above improvements ensure the development achieves a 35% Reduction over Part L1A Building Regulations 2013, this achievement, therefore, satisfies the requirements of the London Plan.

Table 5 below shows the percentage reduction in CO2 emissions following the proposed Installation and improvements.

Aspect	Associated Total CO_2
Baseline (2) (kg CO_2/year)	6,636.92
Fabric Improvements (kg CO_2/year)	-423.02
Reduction Over Baseline	6.37%
Renewable Improvements (kg CO_2/year)	-1,922.93
Total Reduction in CO_2 (1) (2) (kg CO_2/year)	4,290.97
% Reduction (1) / (2) x 100	**35.73%**

For any further questions regarding the Energy Statement please contact Joe Dillon on:

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