Energy Statement

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Job number: 10325

Date: 22.03.24

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Revision	Issue Date	Author	Checked	Description
1	01.02.23	LR	AJ	Second Issue
2	22.03.24	MT	PK	Third issue

This document and any calculations herein have been produced based on information supplied by the client and their agents and design team. Any amendments to the technical specification on which this report is based may invalidate the results.

Contents

1 Executive Summary

This report has been produced by Base Energy on behalf of Atelier Ochre in support of the planning application for the construction of a new detached dwelling at 56a Church Hill, London, N21 1JA. The development falls under the requirements of The London Borough of Enfield & The London Plan.

The below policies set out design approach with regards to energy, carbon dioxide emissions, and sustainability in order to ensure the development complies with:

- National Planning Policy
- The London Plan
- The London Borough of Enfield Local Planning Policy

The above policies require:

- A 35% reduction in CO_2 over Part L 2013
- Compliance with Part L1 2021

The report will demonstrate how to meet the above policy and furthermore demonstrate how to meet the current Part L 2021 building regulations. The design of the development will incorporate energy efficient building fabric and services in addition to low carbon technology:

- Thermal specification in line with Part L notional U-values
- A design which limits air permeability, targeting 4.00
- Energy saving building services including low energy lighting and advanced heating controls
- ASHP

This results in a 72% CO_2 reduction using the GLA spreadsheet and SAP 10 carbon factors and is also designed to comply with Part L1 2021 Building Regulations.

2 Existing and Proposed Development

The development site is located at 56a Church Hill, London, N21 1JA.

The development proposals are for the construction of a new detached dwelling.

The development proposals constitute a minor development.

Aspects of the site location, shape, and surroundings (in particular the adjacent buildings), along with any other requirements of planning, use type, and scale will naturally constrain the development proposals in terms of the layout, positioning, and orientation of the proposed development. Subsequently, these constraints will impact on the feasibility of certain renewable technologies (as discussed in Section 4 of this report).

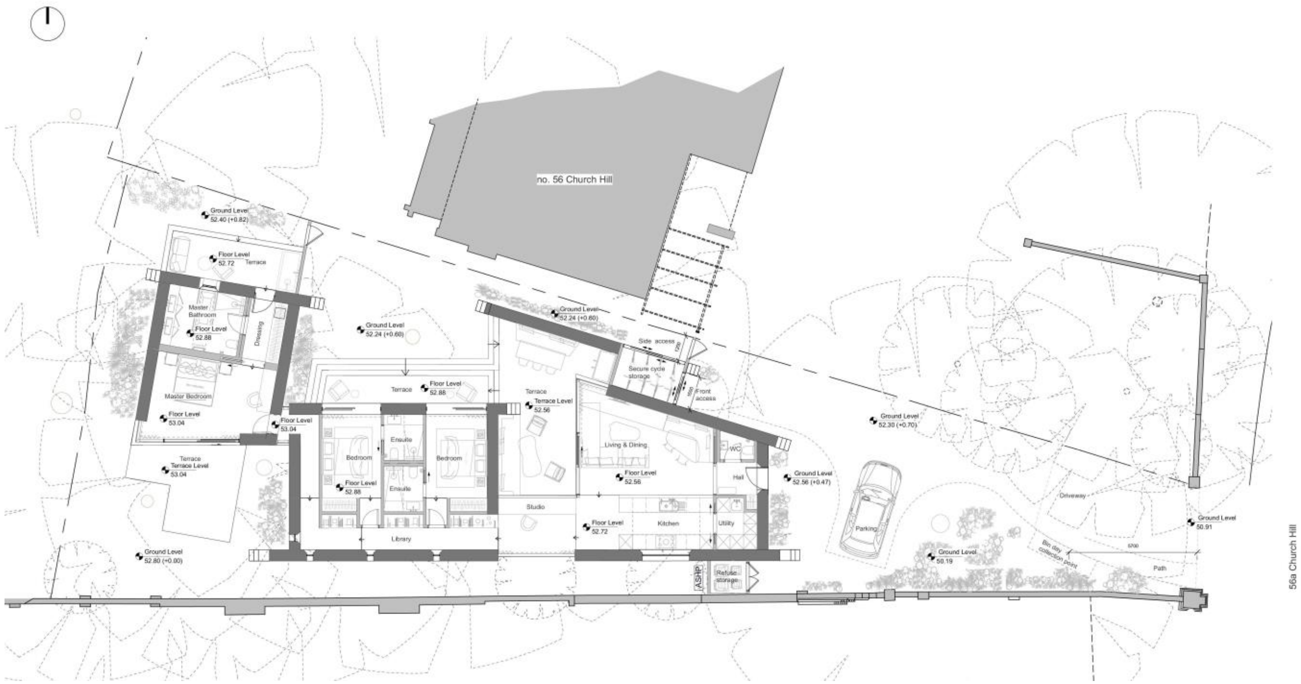

Figure 2.1: Site Location and proposals

3 Planning Policy

National Planning Policy Framework 2021

The NPPF was updated in July 2021 to place greater emphasis on beauty, place-making, the environment, and sustainable development. The strengthened environmental objectives aim to protect and enhance the natural, built, and historic environment, and encourage effective land use, greater biodiversity, prudent use of natural resources, minimisation of waste and pollution, and adaptation to climate change alongside a move to a low carbon economy.

Local Planning Policy

Enfield Energy Efficiency Standards Development Management Document (DMD 51) states:

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 in accordance with DMD 52 'Decentralised Energy Networks'.
c) Demonstrating the feasibility and use of low or zero carbon technology in accordance with DMD 53 'Low and Zero Carbon Technology'; and, where applicable,
d) Financial contributions to on, near or off-site carbon reduction strategies in accordance with DMD 54 'Allowable Solutions'.

London Plan 2021 Policy SI 2 Minimising greenhouse gas emissions

London Plan energy assessment guidance 2020 now requires all major developments to achieve Zero carbon, and where carbon emissions fall short of this a carbon offset payment is to be made. Developments should make best efforts to be designed to meet zero carbon, and a minimum 35% reduction in CO2 emissions is required over current Part L building regulations and the remaining carbon emissions are to be offset by a cash in lieu payment.

Based on the above, and due to the proposals being a minor development, the proposed dwelling will aim to achieve a 35% saving in CO2 emissions through the provision of energy efficient measures and if needed, renewable technologies. This report demonstrates how the development will meet current Building Regulation requirements for energy efficiency (baseline scenario) and, through an assessment of energy efficiency measures and renewable technologies, demonstrates how the dwelling can achieve a minimum 35% saving in CO2 emissions.

Part L Building regulations has recently been updated and now falls under Part L 2021 and SAP 10. The proposed dwelling will aim to achieve a 35% saving in CO2 over Part L 2013 as per the planning requirement and also aim to meet current building regulations.

4 Methodology

The Standard Assessment Procedure (SAP) is the UK Government methodology for assessing and calculating the energy performance of dwellings.

The Simplified Building Energy Model (SBEM) is the UK Government methodology for assessing and calculating the energy performance of non-domestic buildings.

SAP and SBEM calculations take into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of the building fabric (u-values[1] and thermal mass)
- Air permeability
- Efficiency, fuel source, and control of heating and cooling systems
- Ventilation system energy use and heat recovery
- Lighting energy
- Low carbon and energy saving or generating technologies

Approved Document Part L of current Building Regulations addresses the conservation of fuel and power. Part L is divided into two separate documents:

- Part L1 Newly constructed and extended or renovated existing dwellings
- Part L2 Newly constructed and extended or renovated existing non-domestic buildings

To comply with Part L, the calculations should demonstrate how the building will either meet or achieve a percentage reduction in the Dwelling or Building or Emission Rate (DER or BER) under the required Target Emission Rate (TER).

The calculation software has been used to calculate a baseline of energy demand and carbon dioxide emissions as appropriate from which any reductions or contributions have been measured.

[1] U-values (Thermal Transmittance) - the measure of the overall rate of heat transfer by all mechanisms under standard conditions, through a particular section of a construction. Lower u-values mean better thermal insulation

5 Baseline Energy & CO_2

Energy modelling software has been used to calculate a baseline for the development. This forms the basis from which compliance with planning policy has been measured.

Table 5.1: Baseline CO2

SAP 2012	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)
Baseline	22.4	141.2	3,158

Using the **SAP 2012** carbon factors, the **Total Baseline CO2 Emissions** for the development are shown to be 3,158 kg/year.

Table 5.2: Baseline Results using Sap 10 Carbon Factors for GLA Spreadsheet

SAP 10	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)
Baseline	20.4	141.2	2,887

The **Total Baseline CO2 Emissions** when calculated in **SAP 10** are shown to be 2,887 kg/year.

6 Low Carbon Design – Fabric First – Be Lean

Before considering low carbon energy generating technology the development has been designed to reduce energy demand through the first step of the energy hierarchy by considering 'fabric first'. A thermally efficient building envelope will follow the design with standards as set out below.

Table 6.1: Building Fabric Standards (including u-values W/m²K)

	Part L 2013 Limiting Parameters	Part L 2021 Limiting Parameters	Part L 2021 Notional Targets	Proposed Development
Walls	0.30	0.26	0.18	0.13
Ground Floor	0.25	0.18	0.13	0.10
Roof	0.20	0.16	0.11	0.09
Windows	2.00	1.6	1.2	1.0
Doors	2.00	1.6	1.0	1.0
Air permeability	10.00	8.00	5.00	4.00

- Insulation: The specified building envelope is designed in line with the notional Part L targets and will help to limit the energy demand of the dwelling for space heating
- Thermal bridging: The design will seek to limit heat loss through thermal bridging using the default and approved details targeting a global 'y-value' of 0.05

Once heat retention has been addressed the next step is to ensure energy consuming building services are efficient.

- Lighting: the design of the development allows for natural daylight which will reduce the energy use from internal lighting. All of internal lighting will be low energy with a minimum efficacy of 80 lumens per watt.
- Space & Water Heating: 89% mains gas system boiler with a 170L Hot Water Cylinder with a measured heat loss of 1.2kwh/day
- Heating Controls: Comprising time & temperature zone control with delayed start thermostat
- Ventilation: Natural ventilation with extract fans to wet rooms

The specifications outlined above, and with the heating provided by a gas system as required by the GLA guidance, have been incorporated into the calculation to generate a dwelling emission rate to be measured against the baseline data.

Table 6.2: Baseline vs Be Lean CO2

SAP 2012	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	22.4	141.2	3,158	N/A
Be Lean	18.3	141.2	2,581	**18%**

Table 6.3: Baseline vs Be Lean using SAP 10 Carbon Factors for GLA Spreadsheet

SAP 10	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)	Reduction in CO2 Using SAP 10 Factors
Baseline	20.4	141.2	2,887	N/A
Be Lean	16.7	141.2	2,356	**18%**

The **CO2 Emissions** when calculated in **SAP 10** is shown to be 2,356 kg/year.

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 531 kg/year.

Based on the Be Lean approach as above, an 18% reduction in CO2 emissions can feasibly be achieved solely through improving the fabric elements.

7 Low Carbon Technology Review & Recommendations

Having set out an energy efficient design, the nest step is to incorporate low carbon technology for energy generation. A number of technologies exist and should be specified where they:

- compliance with planning policy
- are feasible for the site
- are cost efficient
- are appropriate for proposed development form and function
- protect against fuel poverty
- promote fuel security
- reduce reliance on fossil fuels
- reduce carbon emissions
- reduce resource depletion
- reduce pollution

Site location and development form and function will influence the suitability of different technologies through:

- Orientation
- Space (inside and outside of the buildings)
- Surrounding topography, structures, and natural features
- Wind speed
- Overshading
- Geology and ground conditions
- Building form, function, and density

In determining the most feasible renewable technologies for the dwelling, the following have been reviewed:

- Wind turbines
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Biomass
- Combined Heat and Power
- Photovoltaic Panels
- Solar water heating

WIND TURBINES

Wind turbines are used to produce electricity. They can be either pole mounted (in a suitably exposed position) or building mounted; building mounted systems need a sufficient wind speed at the structural height and both a structural survey and planning permission.

- Wind speed can be too low on low rise buildings
- Taller systems need sufficient space
- Wind resources very variable and unpredictable
- May need planning permission

Wind turbines technology is **not recommended** for this development

GROUND SOURCE HEAT PUMP (GSHP)

GSHPs use naturally occurring underground low-level heat in areas with appropriate geological features. Heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water through pipes buried within the ground, (closed loop). The water is passed through a heat pump to transfer the heat from this water into a higher temperature water circuit to provide heating. The loop can be fitted horizontally (laid in a shallow trench) or vertically (in a borehole).

- Feasibility analysis is costly
- Suitable ground conditions required
- More capital intensive than air source heat pumps
- Can be more efficient and lower running costs than ASHPs
- Well suited to highly insulated buildings

Ground source heat pump technology is **not recommended** for this development, however there are other more cost effective systems available.

AIR SOURCE HEAT PUMP (ASHP)

ASHP systems absorb heat from outside air at a low temperature into a fluid which is then passed through an electrically driven compressor where its temperature is increased. There are two main types of ASHP systems: Air to Water systems distribute heat through wet central heating; Air to air produce warm air which is circulated by fans For an ASHP system to be installed, there needs to be ample outdoor space for the external condensing unit; these units can also be noisy and blow out colder air to the neighbouring environment.

- Requires space for external plant and internal hot water tank for wet systems supplying DHW
- Can generate noise though quieter systems have been developed
- Least efficient when most needed
- Longer life than fossil fuel boilers
- High capital costs vs gas systems but lower than GSHPs
- Well suited to highly insulated buildings

Air source heat pump technology **is recommended** for this development and it is understood that this is the preference for the client

BIOMASS

Biomass systems burn wood pellets, chips, or logs to provide heat in a single room, or to power central heating and hot water boilers. There needs to be ample space available for both the boiler and the storage of fuel. There will also be regular deliveries of fuel and therefore adequate site access is required.

- Carbon emissions are cyclical unlike fossil fuel
- Requires fuel storage space and bulk delivery
- Carbon 'neutral' fuel in isolation but supply side emissions are still present so not neutral overall
- Harmful particulate emissions impact air quality and health

Biomass technology **is not recommended** for this development

COMBINED HEAT AND POWER (CHP)

CHP is effectively an on-site small power plant providing both electrical power and thermal heat energy. It is an energy efficiency and low carbon measure rather than a renewable energy technology. A CHP system operates by burning a primary fuel (normally natural gas) by use of either a reciprocating engine or turbine, which in turn drives an alternator to generate electrical power. The heat emitted by the engine and exhaust gases is recovered and used to heat the building or to provide hot water.

- Reduces consumption of and reliance on grid electricity
- Works best with high and consistent heat and hot water demand
- Recovers waste energy
- Can export to the grid
- Uses fossil fuel
- Emissions on site rather than upstream
- Efficiency is sensitive to sizing

CHP **is not recommended** for this development

DISTRICT HEATING

District Heating systems provide multiple buildings or dwellings with heat and hot water from a central boiler house, or 'energy centre'. The system can provide heating or cooling which is transferred from the energy centre through a network of highly insulated pipes carrying the heated water to each dwelling.

- Economies of scale
- Frees up space in habitable areas of development
- Variety of systems
- Can make use of waste heat from industry
- Can be fossil fuel based and dependent

With reference to the Local Heat Map it has been determined that there are no existing or proposed heat networks or energy centres within a suitable radius from the development and there are no existing networks local to the site (See Appendix A)

District heating **is not recommended** for this development

SOLAR PHOTOVOLTAIC (PV)

Solar PV cells (which are mounted together in panels or tiles on the roof) convert sunlight into electricity. The cells are made from layers of semi-conducting material; when the light shines on the cell, an electric field is created across the layers. Although PV cells are most effective in bright sunlight, they can still generate electricity on a cloudy day. The power of a PV cell is measured in kilowatts peak (kWp). Each PV panel produces 0.25Watts to 0.35Watts depending on the manufacture.

- Passive technology, requires no energy input from grid
- Does not require sunny days to generate power
- Capital costs can be high although payback is effective
- Needs sufficient roof space and orientation
- Zero site or upstream emissions
- Can export to the grid

Solar PV technology **is not recommended** for this development

SOLAR HOT WATER

Solar hot water systems absorb energy from the sun and transfer this energy using heat exchangers to heat water which can then be stored. Systems should be roof mounted and oriented to face between a south-east and south-west direction.

- Mostly passive technology but requires pump energy
- Not suitable for combi boilers and developments without roof space
- Lower CO_2 reductions than other technologies

Solar hot water technology **is not recommended** for this development

Low Carbon Technology Summary

The low carbon technology review indicates that ASHPs is feasible for this development. The following low carbon technology is recommended:

ASHP

This technology is deemed optimal for meeting the needs of the client and achieving policy compliance. ASHP has been incorporated into the energy model along with the fabric outlined in section 6 of the report and the results are presented in the next section.

8 Low Carbon Technology – Renewable Energy Generation - Be Green

The selected Low Carbon Technology has been incorporated into the calculation and the results are set out below.

Table 8.1: Baseline vs Be Lean CO2

SAP 2012	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	22.4	141.2	3,158	N/A
Be Green	12.8	141.2	1,812	**43%**

Table 8.2: Baseline Results – SAP 10 for carbon reporting spreadsheet

SAP 10	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)	Reduction in CO2 Using SAP 10 Factors
Baseline	20.4	141.2	2,887	N/A
Be Green	5.8	141.2	814	**72%**

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 1,812 kg/year.

The **Total Baseline CO2 Emissions** when calculated in **SAP 10** are shown to be 814 kg/year.

9 Part L1 2021 Compliance – SAP 10 Assessment

To show compliance with current Building Regulations Part L 2021, the Be Green development has been assessed using SAP 10 software. As the final construction has not been finalised the thermal bridging notional Y-value 0.050 has been used within the calculations. Due to this, when a full SAP assessment and the thermal junctions are assessed, results may vary.

The below tables show the compliance results on the Primary Energy, CO2 emissions and Fabric Efficiency for the dwelling.

Table 9.1 SAP 10 Developments Compliance - DER/TER Variance

	SAP 10 Calculation
Dwelling Emission Rate (DER) (kg CO2/m²/year)	4.42
Target Emission Rate (TER) (kg CO2/m²/year)	10.4
DER/TER Variance	-57.50%

Table 9.2 SAP 10 Developments Compliance – DFEE/TFEE variance

	SAP 10 Calculation
Dwelling Fabric Energy Efficiency (DFEE) ($kgCO_2/m^2$)	53.46
Target Fabric Energy Efficiency (TFEE) ($kgCO_2/m^2$)	57.88
DFEE/TFEE Variance	-7.64%

Table 9.3 SAP 10 Developments Compliance – DPER/TPER Variance

	SAP 10 Calculation
Dwelling Primary Energy Rate (DPER) ($kgCO_2/m^2$)	45.97
Target Primary Energy Rate (DPER) ($kgCO_2/m^2$)	57.37
DPER/TFER Variance	-19.88%

10 Conclusion

Proposals are for the construction of a new detached dwelling at 56a Church Hill, London, N21 1JA falling under the requirements of The London Borough of Enfield Council & The London Plan.

Under the local planning policy, the proposed development is required to achieve at least a 35% reduction in regulated CO2 emissions over Building Regulations Part L 2013.

Energy modelling software has been used to calculate a baseline against which compliance with the above can be measured.

The proposed development will be designed to limit energy demand through the inclusion of a thermally efficient building fabric and energy efficient services.

Low carbon technology will be incorporated through an ASHP.

This results in a saving of 2,073 kg/year which equates to **72% reduction in CO2 emissions** over Building Regulations Part L 2013 using the SAP 10 carbon factors in the applicable GLA Carbon Reporting Spreadsheet. As such, the development can therefore exceed the council's requirement for a 35% reduction in CO2 emissions.

When compared on the SAP 10 software, this results in a **57.50% reduction in CO2 emissions** over Building Regulations Part L 2021.

We have also assessed the dwelling under Part L1 2021 building regulations and in the SAP 10 software to check the design meets with current building regulations (See Appendix D).

This Energy Statement and the calculations on which it is based demonstrate that the proposed development complies with the local planning policy and Part L 2021 requirements.

11 Appendices

Appendix A: London Heat Map

Appendix B TER Worksheet - Baseline Scenario

Appendix C: DER Worksheet – Low Carbon Technology Scenario