ENERGY STATEMENT

35 BROOKDENE DRIVE, NORTHWOOD, HA6 3NS

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1	First Issue	ZA	17.03.2025

All information provided here is based on plans and information available at the time of writing. Prior to implementation of the options discussed, further detailed study, design, and costing, based on ground surveys, structural analysis, over shading studies, etc., as relevant to each renewable/low carbon source, is necessary.

CONTENTS

1. EXECUTIVE SUMMARY

This report describes the development of the climate change and energy strategy for the proposed development 35 Brookdene Drive, Northwood, HA6 3NS.

The scope of this project encompasses the construction of new residential unit. This energy statement was investigated to test compliance with Part L Volume 1 (2021) of the Building Regulations and Royal Borough of Hillingdon local planning requirements. The SAP calculations have demonstrated the proposed construction is an efficient building that fully complies with the regulations.

Additionally, the statement has been prepared to satisfy the planning requirements to grant a permission for the development.

The following three-step energy hierarchy has been adopted:

- Be Lean: High specification of building fabric and energy efficient services to minimise energy demand, including natural ventilation through openable windows.
- Be Clean: The site is not currently suitable for a local CHP system or connection to a district network. Therefore, no carbon savings are possible using this measure.
- Be Green: The heating and hot water for dwelling will be provided by Air Source Heat Pumps (ASHPs) with additional carbon offset from photovoltaics (PV Panels).

In summary, the strategy detailed in this statement demonstrates a carbon emission reduction of 78.74% against SAP 10 baseline for the new residential dwelling.

- Part L 2021 Building Regulations: The proposed design for the new dwelling is intended to minimise carbon emissions; thus, with the incorporation of efficient systems and on-site renewables in the form of PV and Heat Pump, we achieve an improvement of 78.74% in carbon emissions over the 2021 Building Regulations.

Carbon Emission Reduction

Residential Emissions	Regulated Emissions (tonnes CO_2/annum)	Regulated tonnes CO_2/annum savings per stage	Regulated (%) CO_2 emission saving per stage
Baseline	2.2	-	
Be Lean	2.15	0.04	2%
Be Clean	2.15	0.0	0%
Be Green	0.5	1.7	77%
Cumulative on-site savings		1.74	**79%**

Table 1: Carbon Reduction

Building Regulations Requirements

For the proposed design, the Dwelling Emission Rate, Fabric Energy Efficiency and Primary Energy Rate comply with the domestic Part L1 Volume 1 2021 targets for each dwelling has been demonstrated as compliant.

The calculated carbon emission rate for the proposed development is lower than the Part L Volume 1 (2021) target.

The full results from the SAP calculations showing compliance against TER (Target Emission Rate), TFEE (Target Fabric Energy Efficiency) and TPER (Target Primary Energy Rate) has been shown below:

Fabric Energy Efficiency ($kWh/m^2.annum$)			Carbon emissions ($kgCO_2/m^2.annum$)			Primary Energy ($kWh_{PE}/m^2.annum$)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
48.85	43.99	9.95%	9.36	1.99	78.74%	49.67	24.91	49.85%

Table 2: SAP Block Compliance

2. INTRODUCTION

This energy statement has been prepared by Wires & Wireless Consultants on behalf of client in support of its planning application for the proposed development.

Description of the project

The site is located at 35 Brookdene Drive, Northwood, HA6 3NS.

The proposal is to design a dwelling that is high quality, to provide a good enviroment to its occupants and make the best use of the site.

The proposed number of dwelling is 1.

Figure 1: Proposed Building elevation by the Architect.

3. PLANNING POLICIES

This Climate change and energy statement addresses local and National planning policies which relate to sustainable design and construction mainly contained within the Royal borough of Hillingdon Local plan.

3.1 National Planning Policy Framework (NPPF) 2023

The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. Planning law requires that applications for planning permission be determined in accordance with the development plan unless material considerations indicate otherwise. The National Planning Policy Framework must be considered in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements. The purpose of the planning system is to contribute to the achievement of sustainable development. In summary the framework advises:

"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

New development should be planned for in ways that:

- *Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and*
- *Can help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the government's policy for national technical standards.*

To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- *Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);*

- *Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and*
- *Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."*

"Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

- *an 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*
- *a 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 well-designed beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and*
- *an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy*

3.2 Local Planning Policy

3.2.1 Policy DMEI 1: Reducing Carbon Emissions

A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.

B) All major development7 proposals must be accompanied by an energy assessment showing how these reductions will be achieved.

C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.

3.2.1 Policy EM 1:

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.

2. Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.

3. Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.

4. Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.

5. Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.

6. Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.

7. Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation(39) as part of their proposals.

8. Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of

electricity generation including anaerobic digestion, hydroelectricity and a greater use of waste as a resource.

9. Promoting new development to contribute to the upgrading of existing housing stock where appropriate. The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

10. Locating and designing development to minimise the probability and impacts of flooding.

11. Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.

12. Giving preference to development of previously developed land to avoid the loss of further green areas.

13. Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks(40) .

14. Promoting the inclusion of passive design(41) measures to reduce the impacts of urban heat effects

3.2.4 London Plan 2021

The London Plan (2021) published 2nd March 2021 sets out the mayor's overarching strategic spatial development strategy for greater London and underpins the planning framework from 2019 up to 2041. This document replaced the London Plan 2016.

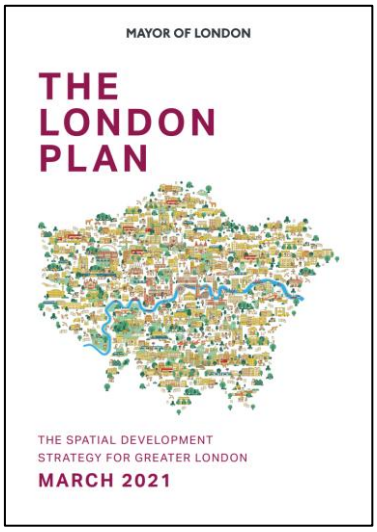

Figure 2 London Plan 2021

The new Plan has a strong sustainability focus with many new policies addressing the concern to deliver a sustainable and zero carbon London.

Policy GG6 Increasing Efficiency and Resilience

This is an overarching policy references London's target to become zero carbon by 2050 and the need to design buildings and infrastructure for a changing climate, addressing water, flood and urban heat island.

Policy SI1 Improving air quality

This requires development proposals to be at least air quality neutral and submit an Air Quality Assessment.

"*Development plans, through relevant strategic, site specific and area-based policies should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.*"

Any mitigation required to meet the Air Quality Neutral target should be done on site preferably.

Policy SI2 Minimising greenhouse gas emissions

Sets the requirements for all major developments to follow the energy hierarchy and achieve net-zero-carbon for both residential and non-residential schemes (via onsite carbon reductions and offset payments) and introduces new targets at Lean stage:

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.

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.

Policy SI 3 Energy Infrastructure requires:

All major developments within Heat Network Priority Areas will need to utilise a communal low-temperature heating system. Where developments are utilising CHP this policy also requires them to demonstrate that 'the emissions relating to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler'. Any combustion on site should meet the requirements of part B of Policy SI1.

Policy SI 4 Managing heat risk requires:

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

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

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure

2) minimise internal heat generation through energy efficient design

3) manage the heat within the building through exposed internal thermal mass and high ceilings

4) provide passive ventilation

5) provide mechanical ventilation

6) provide active cooling systems.

4. PART L COMPLIANCE

Part L Volume 1 2021 Criteria

As a new build dwelling, the project will need to comply with Part L Volume 1 of the Building Regulations. This document highlights the minimum energy performance requirements for new buildings:

Criterion 1:

"Where a building is erected, it shall not exceed the target CO_2 emission rate for the building that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24."

Criterion 2:

"Where a dwelling is erected, it shall not exceed the target fabric energy efficiency rate for the dwelling that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24"

Criterion 3:

"Where a building is erected, it must not exceed the target primary energy rate for the building which has been approved pursuant to regulation 25(c), applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24."

Part L Compliance Results

The full results summary can be found as below in:

- SAP Input **(Appendix A)**
- Regulation Compliance Report **(Appendix B)**

Part L 2021 Compliance Conclusion

Results show that the percentage improvement in carbon emissions achieved through the proposed passive and active measures and introduction of renewables in the form of PV panels. The below results are taken from the Block Compliance for each building.

Fabric Energy Efficiency ($kWh/m^2.annum$)			Carbon emissions ($kgCO_2/m^2.annum$)			Primary Energy ($kWh_{PE}/m^2.annum$)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
48.85	43.99	9.95%	9.36	1.99	78.74%	49.67	24.91	49.85%

Table 2: SAP Block Compliance

5. ENERGY STRATEGY

The following hierarchy has been followed with regards to optimising energy use:

- Be Lean – Use Less Energy
- Be Clean – Efficient Energy Supply
- Be Green – Renewable Energy

Following the energy hierarchy, the approach focuses on managing the energy demand of the development through a 'fabric first' method. This is the most effective way to reduce energy consumption and CO_2 emissions. Additional energy reductions will be achieved by specifying high efficiency building services to minimise energy losses in supply, storage, and distribution.

After reducing demand, further CO_2 emission reductions will be attained by utilising clean energy sources where possible and integrating appropriate renewable and low-carbon technologies. The feasibility of these renewable and low-carbon technologies is discussed in the following section.

Baseline

The baseline CO_2 emissions are calculated from the 'notional' building using the Part L software tools. The 'notional' building consists of standard set of fabric and services parameters which deliver the Target Emissions Rate. This is then used as the Baseline emissions from which savings from 'Be Lean, Be Clean, Be Green' measures are calculated.

Table 3 below shows the regulated and unregulated baseline figures.

	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	2.20	-

Table 3: Baseline Carbon Emissions

6. DEMAND REDUCTION (BE LEAN)

Passive Measures

In this section, a number of passive measures are proposed prior to the implementation of LZC technologies. In general, the "fabric first" approach is being followed so as to lower the energy demand as much as possible, followed the proposal of efficient systems and finally the application of low-carbon and renewable energy systems.

New Build Fabric

A key component for Part L Volume 1 2021 is the Fabric Energy Efficiency Standard (FEES), which sets a target figure in kWh/m^2 for energy demand in new dwelling. FEES is assessed using Dwelling Fabric Energy Efficiency (DFEE) and Target Fabric Energy Efficiency (TFEE) values and can only be improved through the building fabric.

Table 4 shows how the U-values and airtightness of the development has been improved from the standards set out in Part L. The proposal also meets the LETI standards for Small scale housing.

Element	Targeted value	Part L minimum value	Improvement over Notional value
Exposed Wall U-value (W/m^2.K)	0.14	0.26	46.15%
Ground Floor/ Exposed Floor U-value (W/m^2.K)	0.11-0.13	0.18	38.88%-27.77%
Roof U-value (W/m^2.K)	0.11	0.16	31.25%
Window U-value (W/m^2.K)	1.20	1.60	25.00%
Solid Door U-value (W/m^2.K)	1.00	1.60	37.50%
Skylight U-value (W/m^2.K)	1.30	2.20	40.90%
Airtightness (m^3/m^2.h)	3.5	8	56.25%

Table 4: Targeted values compared with Part L minimum values

Thermal bridging

Part L1A 2021 places an increased importance on addressing thermal bridging. Thermal bridging can be minimised through careful detailing or the use of Recogonised Construction Details (RCDs) or suppliers calculated value. For the assessment, RCD details have been used which is 0.05 (y value).

Natural Ventilation

Dwelling ventilation will be provided via openanle windows, trickle vents will be provided for background ventilation.

Summary of passive measures

- High levels of insulation- keep heat in
- Low energy glazing- keep heat in
- Airtight construction- keep warm air inside
- Good daylight- reduce artificial lighting
- Low flow taps- reduce hot water use

Active measures

The following active measures have been used:

Space heating

Heating for the Dwelling is provided by Gas Boiler with time and temperature zone control to control the temperature. In accordance with GLA energy guideline to match Notional dwelling specification.

Domestic Hot Water

Domestic hot water for Dwelling is provided via hot water cylinder from main heating system. All primary pipework will be insulated in accordance with GLA energy guideline to match Notional dwelling specification.

Ventilation

Natural ventilation via openable windows with intermittent extract fan to all wet areas.

Lighting

The following measures will be considered in the detailed lighting design:

- Use of energy efficient light fittings to achieve improved lumens per circuit watt beyond the minimum requirements of the Building Regulations Part L 2021.

Summary of active measures

- Natural ventilation through openable windows to reduce energy use
- LED lighting and controls
- High efficiency Natural Gas Boiler
- Time and temperature zone control

Carbon Emissions Reduction

Table 5 shows the resulting carbon emissions of the development before and after applying the "Be Lean" measures outlined above.

As shown, the carbon emissions are predicted to be lower than the base case. This is due to the high performance of building fabric and services. Through the "Be Lean" measures, an improvement of **2.0%** can be achieved.

	Regulated Carbon Dioxide Emissions	
	Tonnes CO_2 per annum	Savings (%)
Baseline	2.20	-
Be Lean	2.15	**2.0%**

Table 5: Be Lean Reduction in Carbon Emissions

7. SYSTEM EFFICIENCY (BE CLEAN)

Local Site CHP

Residential sites typically provide only small electrical baseloads making this technology unsuitable and economically unfeasible to operate. In order for the use of CHP to be viable it is essential that the demand for heat and electricity are simultaneous. This is often a problem in the summer months are the need for heating is reduced, whilst the electricity demand remains fairly constant. Additionally, the installation of a CHP requires large up-front capital investment.

Connection to District Heating Network

The map below shows the opportunity for district heat networks nearby. The site is not in proximity to any existing or potential heat network. The nearest existing network is approx 10.9KM away and potetial proposed network is approx 8.4KM.

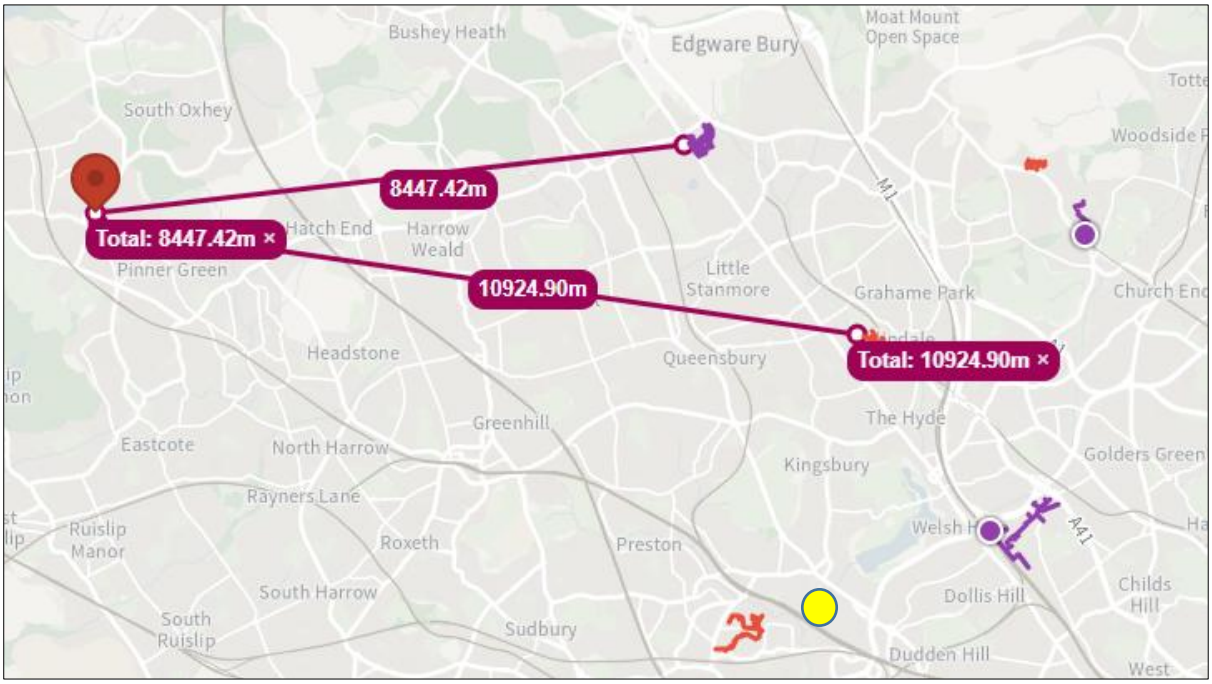

Figure 2: Heat Map London (Downloaded – 18/03/25)

For the above reason connection to a district heating network has been ruled out as an option.

Carbon Emissions Reduction

Since a district heating connection, or on-site CHP is unviable, no carbon emissions reductions are available using these measures.

8. RENEWABLE ENERGY (BE GREEN)

An initial review was conducted to eliminate any technologies which from the outset have been identified as unviable. This can be found in Appendix 3: Preliminary Appraisal of Renewable Energy Options.

From this study, ASHP and Solar PV has been identified as the most effective technology for the development.

8.1 Air Source Heat Pump (ASHP)

The proposed design uses ASHP serving heating and hot water requirements. At this stage, we have used Mitsubishi ECODAN 14.0 KW system to perform the calculations.

8.2 Solar Photovoltaic

Solar photovoltaic panels provide renewable electricity to a building. To maximise efficiency, panels should be South oriented with an elevation of 10-45°. There must be minimal shading of the panels as shading will reduce performance.

The panels require little maintenance although the inverters (which convert the generated DC power to AC for use in the building) are likely to require replacement every 10-15 years.

For new build dwelling, PV panels can be placed on the SW and SE facing pitched roof without any significant overshading problems (Figure 3).

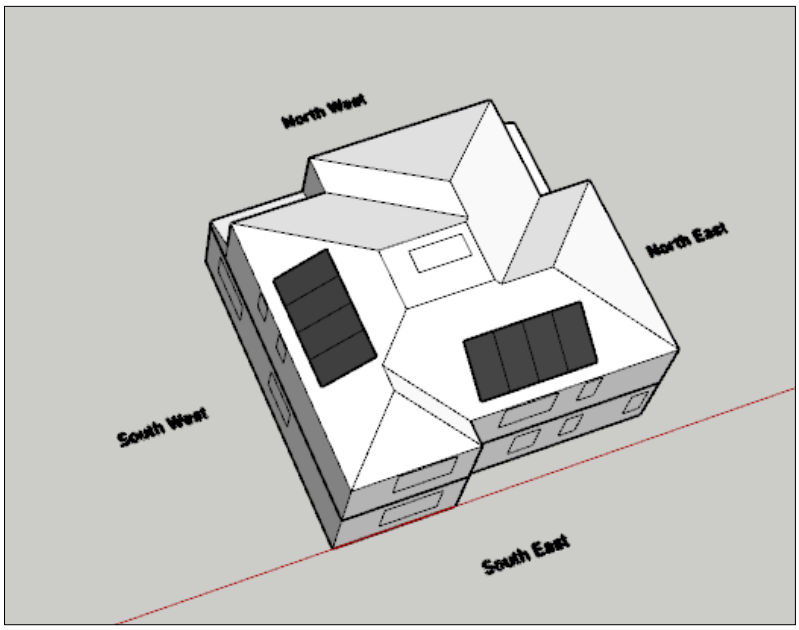

Figure 3: PV Sol PV Estimation

8.3 Carbon Emissions Reduction

Following the energy hierarchy, reductions in regulated energy requirements and associated CO_2 emissions have been made at each stage as demonstrated in Table 6. The strategy detailed in Be Green stage demonstrates a further carbon emission reduction of **77%** against SAP 10 baseline for the new built dwelling. In total, the new built dwelling achieves **79%** CO_2 emission reduction against SAP 10 baseline which is zero carbon emissions on the regulated energy use.

	Regulated Carbon Dioxide Emissions	
	Tonnes CO_2 per annum	Savings (%)
Baseline	2.2	-
Be Lean	2.15	2%
Be Clean	2.15	0
Be Green	0.50	77%
Total Savings	**1.74**	**79%**

Table 6: Be Lean, Be Clean, Be Green Reductions in Carbon Emissions

Table 7 below outlines the anticipated CO_2 emissions reductions and carbon offset payment. The combined on-site savings and zero carbon target shortfall is used to calculate a total carbon offset payment. As the development achieves zero carbon on regulated energy uses, there will not be any offset payment requirement.

	Regulated Carbon Dioxide Emissions	
	Tonnes CO_2 per annum	Savings (%)
Cumulative on-site savings	1.74	79%
Annual savings from off-set payment	14	-
Offset Payment Rate (£/tCO_2)	95	
Total Offset Payment	**£1,336**	

9. APPENDIX 1: KEY MODELLING INPUTS – NEW BUILD DWELLING

SAP Specification for new build dwelling

The following input were used in creating the FSAP 10.2 model:

Construction details		
Floor	Ground floor U-value (W/m^2.k)	0.11-0.13
Wall	Exposed wall U-value (W/m^2.k)	0.14
Roof	roof U-value (W/m^2.k)	0.11
Doors & Glazing	Door U-value (W/m^2.k)	1.0
	Window U-value (W/m^2.k)	1.20
	Glazing g-value	0.63 (Windows), 0.50 (Skylight)
	Glazing frame factor	0.8 (Aluminium)
Thermal Mass Capacity		Calculated
Thermal Bridging		RCD Y value 0.050
Ventilation		
Ventilation type		Natural Vent via Openable Windows
Air permeability (m^3/h.m^2)		3.50
Number of chimneys (secondary heating)		None
Primary heating details		
Heating system		Air Source Heat Pump
Heating emitter		Under floor and radiator
Heating fuel		Electricity
Heat Pump model		Mitsubishi Electric Ecodan 14.0 kW PUZ-WM140YHA or similar
Heat Pump annual seasonal efficiency		294%
Heating controls		Time and temp zone control
Water Heating		
Hot water system		From ASHP
Cylinder volume (litre)		150
Cylinder heat loss factor (kWh/day)		2.09
Cylinder in heated space		Yes
Primary pipework insulated		Yes
Water heating timed separately		Yes
Lighting		
Percentage of low energy lights		100%
PV Panel Parameters		
Collector Power (kWp)		1.74 kWp SE & 1.74 kWp SW

Table 14: SAP Specification

10. APPENDIX 2: SAP BREL REPORTS

Building Regulations England Part L (BREL) Compliance Report

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

Date: Tue 18 Mar 2025 11:57:08

Project Information			
Assessed By	Zahid Ashraf	Building Type	House, Detached
OCDEA Registration	EES/027335	Assessment Date	2025-03-18

Dwelling Details			
Assessment Type	As designed	Total Floor Area	235 m^2
Site Reference	35 BrookDene Drive	Plot Reference	35 BrookDene Drive
Address	35 BrookDene Drive, Northwood, HA6 3NS		

Client Details	
Name	DS SQUARED architects
Company	DS SQUARED architects
Address	116a High ZStreet , Edgware, HA8 7EL

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

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*9.36 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	1.99 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*49.67 kWh_{PE}/m^2*	
Dwelling primary energy	24.91 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*48.8 kWh/m^2*	
Dwelling fabric energy efficiency	44.0 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.14	Walls (1) (0.14)	OK
Party walls	*0.2*	N/A	N/A	**N/A**
Curtain walls	*1.6*	N/A	N/A	**N/A**
Floors	*0.18*	0.11	Exposed Floor (0.13)	OK
Roofs	*0.16*	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	*1.6*	1.19	GF NE Window (1.2)	OK
Rooflights	*2.2*	1.3	Roof Light, West (1.3)	OK

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	83.58	0.14 **(!)**
Exposed wall: Walls (2)	96.07	0.14 **(!)**
Ground floor: Floor, Floor	121.92	0.11
Upper floor: Exposed Floor, Exposed Floor	1.33	0.13
Exposed roof: Roof (1)	5.05	0.11
Exposed roof: Roof (2)	9.7	0.11
Exposed roof: Roof (3)	123.63	0.11

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
GF NE Door, Solid Door	2.12	North East	N/A	1 **(!)**
GF NE Window, Windows	4.97	North East	0.8	1.2
FF NE Window, Windows	3.63	North East	0.8	1.2
GF NW Window, Windows	18.97	North West	0.8	1.2
FF NW Window, Windows	8.39	North West	0.8	1.2
GF SW Window, Windows	3.84	South West	0.8	1.2
FF SW Window, Windows	1.2	South West	0.8	1.2
GF SE Window, Windows	5.76	South East	0.8	1.2
FF SE Window, Windows	5.96	South East	0.8	1.2
Roof Light, Roof Lights	1.44	West	0.7	1.3

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Name	Area [m²]	Orientation	Frame factor	U-Value [W/m²K]

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

Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.026 (!)	
External wall	E3: Sill	Not government-approved scheme	0.023 (!)	
External wall	E4: Jamb	Not government-approved scheme	0.018 (!)	
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.051	
External wall	E6: Intermediate floor within a dwelling	Not government-approved scheme	0 (!)	
External wall	E10: Eaves (insulation at ceiling level)	Not government-approved scheme	0.062	
External wall	E11: Eaves (insulation at rafter level)	SAP table default	0.15	
External wall	E12: Gable (insulation at ceiling level)	Not government-approved scheme	0.033 (!)	
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	
External wall	E16: Corner (normal)	Not government-approved scheme	0.031 (!)	
External wall	E17: Corner (inverted - internal area greater than external area)	Not government-approved scheme	-0.059	
Roof	R1: Head of roof window	SAP table default	0.24	
Roof	R2: Sill of roof window	SAP table default	0.24	
Roof	R3: Jamb of roof window	SAP table default	0.24	
Roof	R4: Ridge (vaulted ceiling)	SAP table default	0.12	
Roof	R5: Ridge (inverted)	SAP table default	0.12	
Roof	R6: Flat ceiling	SAP table default	0.12	
External wall	E20: Exposed floor (normal)	SAP table default	0.32	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	

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

Maximum permitted air permeability at 50Pa	*8 m³/hm²*	
Dwelling air permeability at 50Pa	3.5 m³/hm², Design value (!)	OK
Air permeability test certificate reference		

4 Space heating

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

Efficiency	294.6%
Emitter type	Both radiators and underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	Mitsubishi Electric Europe B.V.
Model	Ecodan 14.0 kW
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	150 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

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Name	Area [m²]	Orientation	Frame factor	U-Value [W/m²K]

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

Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.026 (!)	
External wall	E3: Sill	Not government-approved scheme	0.023 (!)	
External wall	E4: Jamb	Not government-approved scheme	0.018 (!)	
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.051	
External wall	E6: Intermediate floor within a dwelling	Not government-approved scheme	0 (!)	
External wall	E10: Eaves (insulation at ceiling level)	Not government-approved scheme	0.062	
External wall	E11: Eaves (insulation at rafter level)	SAP table default	0.15	
External wall	E12: Gable (insulation at ceiling level)	Not government-approved scheme	0.033 (!)	
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	
External wall	E16: Corner (normal)	Not government-approved scheme	0.031 (!)	
External wall	E17: Corner (inverted - internal area greater than external area)	Not government-approved scheme	-0.059	
Roof	R1: Head of roof window	SAP table default	0.24	
Roof	R2: Sill of roof window	SAP table default	0.24	
Roof	R3: Jamb of roof window	SAP table default	0.24	
Roof	R4: Ridge (vaulted ceiling)	SAP table default	0.12	
Roof	R5: Ridge (inverted)	SAP table default	0.12	
Roof	R6: Flat ceiling	SAP table default	0.12	
External wall	E20: Exposed floor (normal)	SAP table default	0.32	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	

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

Maximum permitted air permeability at 50Pa	*8 m³/hm²*	
Dwelling air permeability at 50Pa	3.5 m³/hm², Design value (!)	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	294.6%
Emitter type	Both radiators and underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	Mitsubishi Electric Europe B.V.
Model	Ecodan 14.0 kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder	
Capacity	150 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

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

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	100 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	*N/A*	
Specific fan power	N/A	**N/A**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model		
Commissioning		

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	1.74 kWp
Orientation	South West
Pitch	30°
Overshading	None or very little
Manufacturer	4×.435
MCS certificate	
Technology type: **Photovoltaic system (2)**	
Peak power	1.74 kWp
Orientation	South East
Pitch	30°
Overshading	None or very little
Manufacturer	4×.435
MCS certificate	

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	yes

Signed:	zahid ashraf	Assessor ID:	EES/027335
Name:	Zahid Ashraf	Date:	18.03.2025

11. APPENDIX 3: PRELIMINARY APPRAISAL OF RENEWABLE ENERGY OPTIONS

This appendix summarises the preliminary analysis of renewable energy options, and identifies which should be assessed in further detail, and which should be discounted because of clear technical reasons or other obstacles.

LZC Technology	Basic Technical Information	Technical, Environmental & Economic implications / Considerations	Suited Application	Site Specific Comment	Detailed Analysis?
Solar thermal	Solar collectors (flat plate or tube) transfer energy into transfer liquid to a closed loop twin coil hot water cylinder	+ Government grants available (RHIs) +/- Can meet a significant proportion of the DHW demand - Efficiency effected by site factors – shading, orientation and roof/ground space -Requires considerable hot water demand all year round to be finically beneficial	Domestic and commercial applications with high annual hot water load; leisure centres, canteens, washrooms	Due to the individual heating system and low hot water demand for each dwelling it is not considered feasible.	No
Wind turbine	Turbine/generator converts wind energy to electrical power.	+ Government grants available (FITs) + Allows on site generation of renewable electricity - Can create structural, vibrations and noise implications - Not suited for urban environments - Costs can be high in relation to the actual amount of electricity generated - Potential for additional planning issues	Large sized turbines in non-urban or offshore locations will be more effective	Significant planning uses for free standing turbine. Roof mounted turbines generally ineffective. Detailed study of site wind conditions would be required.	No
Solar Photo-voltaic	Converts sunlight to DC electrical power which then using an inverter to convert to DC.	+ Government grants available (FITs) + Allows on site generation of renewable electricity + Generally payback between 7-12 years + Low maintenance requirements - Efficiency effected by site factors – shading, orientation and roof/ground space	Wide range of building types particularly buildings with limited solar shading and south facing roof	This technology is appropriate for the dwelling on the basis that: There is a demand for electricity. Maintenance requirements are very low. No complex plant to accommodate.	Yes
Air source heat pump	Air Source Heat Pumps (ASHP) capture heat from the outside air and transfer the heat directly to the air inside the building or transferring the heat to a liquid medium that can be pumped around the building	+Lower installation cost that ground source heat pump + Can provide heating and cooling + Government grants available (RHIs) -COP is not as good during the heating season when the outside air temperature is often less than the ground temperature -Can restrict distribution strategies -Carbon saving are less clear cut	Wide range of building types particularly building designed to have low temperature heat emitters.	ASHP has been proposed for the dwelling. High Efficiency system providing carbon emission savings.	Yes
Ground Source Heat Pump	Ground Source Heat Pumps(GSHP) capture heat from the ground and transfer the heat to a liquid medium that can be pumped around the building	+ COP is much better than air source heat pumps + Government grants available (RHIs) -Requires area for ground collector or borehole -High initial capital cost -Can restrict distribution strategies -Carbon saving are less clear cut	Suits building designed to have low temperature heat emitters with sufficient space for necessary ground works	High capital cost.	No
Biomass	Uses biomass as a fuel source for space heating and hot water	+ Government grants available (RHIs) + Renewable source of heating - Requires large fuel storage capacity - Generally a large capital cost	Building/site with sufficient access and storage facilities and a capable maintenance team	There is insufficient storage space and very limited access for regular deliveries to warrant further investigation.	No


Wires &
Wiresless