

Land adjacent to Windhover Roundabout, Bursledon

BREEAM ENE04 Low and Zero Carbon Feasibility Study Stage 2



Land adjacent to Windhover Roundabout, Bursledon



BREEAM ENE 04 – Low and Zero Carbon Feasibility Study

Project name	Land adjacent to Windhover Roundabout, Bursledon
Project number	1620011691-024
Client	Wates Developments Ltd
Document Number	RUK2021N00014-RAM-RP-00246
Version	02 – re-issue for planning
Date	24/03/26
Prepared by	Mohammad Ahsan Khan / Ronak Sharma
Checked by	Gisele Braga
Technically Approved by	Ian van Duivenbode
Approved by	Tom Smith

This report is produced by Ramboll at the request of the client for the purposes detailed herein. This report and accompanying documents are intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party and shall not be liable for any loss, damage or expense of whatsoever nature which is caused by their reliance on the information contained in this report.

Contents

Executive Summary

1.0 Introduction

1.1 General

1.2 Site Description

2.0 Appraisal of LZO Technologies

2.1 Air/water source heat pumps - Adopted

2.2 Photovoltaics (PVs) – Adopted

2.3 Solar Thermal Hot Water – Not Adopted

2.4 Wind turbines – Not Adopted

2.5 Ground source heat pumps – Not Adopted

2.6 District Heating – Not Adopted

2.7 Energy Storage and Export

3.0 Planning Policies and Regulations

3.1 National Planning Policy Framework

3.2 Climate Change Act 2008

3.3 UK Building Regulations Part L 2022

3.3 UK Building Regulations Part L 2022

3.4 BREEAM New Construction 2018

3.5 South Cambridgeshire Local Plan (2018)

3.6 Noise

3.7 Available grants

4.0 LZO Technology Modelling

4.1 Inputs

4.2 Results

4.3 PV Simple Payback

4.4 ASHP/WSHP

5.0 Conclusion

Appendix 01 – BRUKL Reports

Appendix 02 – Modelling Inputs

Executive Summary



This Low and Zero Carbon (LZC) Feasibility Study report has been prepared by Ramboll on behalf of Wates to support the outline planning application (all matters reserved except for access) for employment development (Use Class B2/B8) of up to 18,580 square metres together with ancillary offices (Use Class E(g)(iii)) and other ancillary buildings, structures, parking, servicing and manoeuvring areas, landscaping and sustainable urban drainage features, following demolition of existing buildings. Hereafter referred as the ‘Proposed Development’.

The feasibility study will consider all LZC technologies appropriate to the Site and building use, and appraise each one on an individual basis. Once all technologies have been considered, the most suitable has been taken forward and analysed in more detail with consideration for life cycle cost and simple payback.

The Proposed Development site address is Land adjacent to Windhover Roundabout and between Bursledon Road (A3024) and West End Road (A27), Bursledon, Hants, SO31 8BN.

In accordance with this description of development, an illustrative masterplan has been prepared which shows the following elements:

- (Unit 1) Warehousing unit totalling 9,586 SqM (103,188 SqFt) comprising Use Class B2/B8 space and ancillary Use Class E office space;
- (Unit 2) Warehousing unit totalling 7,209 SqM (77,599 SqFt) comprising Use Class B2/B8 space and ancillary Use Class E office space;
- Provision of up to circa 175 car parking spaces and up to circa 41 HGV spaces, together with service yards and HGV loading spaces;
- Provision of ancillary external structures such as sprinkler tanks;
- Creation of site access from A3024 Bursledon Road and A27 West End Road, together with provision of signals and other works to the existing highway; and
- Provision of site landscaping, including new planting and provision of swales and other sustainable urban drainage features.

Overall, the Proposed Development has incorporated a sustainable design and construction philosophy that meets best practice levels for a warehouse development (B2/B8 use), by developing a strategy of passive design features, consideration of energy efficient building services, and low carbon technologies that have been demonstrated via IES Virtual Environment (IES-VE) energy modelling. The latest illustrative proposed architectural drawings provided by TOR were used for this study.

The assessment has shown how the deployment of air source heat pumps (ASHP) reduces CO2 emissions of the Proposed Development by 4.94 kgCO2/m2 per annum. This corresponds to 56.00% savings for Unit 1 and 55.69% savings for Unit 2 over the baseline case (as per BREEAM Ene 04 LZC Methodology – gas boiler, without ASHP and PV). The ASHP system does not have an achievable simple payback figure, although it will aid in achieving Building Regulations compliance and contributes towards the climate response where an electrically fuelled strategy is most desired.

The use of Photovoltaic (PV) panels reduces the CO2 emissions by a further 1.91 kgCO2/m2 per annum for Unit 1, and a further 1.17 kgCO2/m2 per annum for Unit 2.

This equates to an overall 77.66% emission saving over the base case for Unit 1 and, 70.34% emission saving over the base case for Unit 2.

Please refer to Table 1 for Unit 1 carbon savings by LZC technologies, and Table 2 for Unit 2 results.

Table 1 – Unit 1 carbon savings by LZC technologies

Unit 1	Building Emission Rate (kgCO ₂ /m ² /yr) Part L 2021	% Carbon Savings
Baseline case (Gas Boiler) Part L 2021 TER	8.82	-
Actual case (ASHP)	3.88	56.00%
Actual case (ASHP + PV)	1.97	77.66%

Table 2 – Unit 2 carbon savings by LZC technologies

Unit 2	Building Emission Rate (kgCO ₂ /m ² /yr) Part L 2021	% Carbon Savings
Baseline case (Gas Boiler) Part L 2021 TER	7.99	-
Actual case (ASHP)	3.54	55.69%
Actual case (ASHP + PV)	2.37	70.34%

This report covers the criteria required to satisfy the third credit of Ene 04 Low Carbon Design of the BREEAM UK NC V6.1. Table 3 details the criteria for achieving this credit.

Table 3 – Ene 04 LZC Feasibility Study credit criteria

One credit - Low and zero carbon feasibility study	Completed?
An energy specialist completes a feasibility study by the end of Concept Design.	✓
Establish the most appropriate recognised local (on-site or near-site) low and zero carbon (LZC) energy sources for the building or development based on the feasibility study.	✓
Specify local LZC technologies for the building or development in line with the feasibility study recommendations.	✓
Quantify the reduced regulated carbon dioxide (CO ₂ -eq) emissions resulting from the feasibility study.	✓

1.0 Introduction

Site location and description of the Proposed Development

1.1 Site location and description

The Site is located north of Windhover roundabout (Cranbury Site) and between Bursledon Road and West End Road, Bursledon, Hants (SO31 8BN), close to Junction 8 of the M27 motorway as seen in Figure 1.1.

The Site is circa 4.63 ha (11.4 acres) and comprises predominantly undeveloped agricultural pastureland, but with potential for some Made Ground to be present in limited areas of the Site. The Site takes the form of two connected grassland fields with a patch of tall ruderals and a wet flush along its eastern edge. The Site also includes a small collection of agricultural-type buildings sited on an area of hard standing within its southeastern part. Topographically the Site falls to its south-west towards Bursledon Road and rises north-east towards West End Road.

The surrounding context is a mixture of agricultural fields, woodland, residential and commercial development.

The Site is adjacent to new residential development and a Tesco Extra store to the south. To the north and north-east of the Site is deciduous woodland as well as open grassland. To the east is a row of detached and semi-detached houses interspersed with fields and woodland.

The Site does not form part of any Conversation Area, and no Listed Buildings are located on Site. The nearest designated heritage assets are the Grade II* Bursledon Windmill and Grade II Granary, which form part of the Bursledon Windmill Conservation Area, located approximately 300 m south-east of the Site.

1.2 Proposed Development

In accordance with this description of development, an illustrative masterplan has been prepared which shows the following elements:

- (Unit 1) Warehousing unit totalling 9,586 SqM (103,188 SqFt) comprising Use Class B2/B8 space and ancillary Use Class E office space;
- (Unit 2) Warehousing unit totalling 7,209 SqM (77,599 SqFt) comprising Use Class B2/B8 space and ancillary Use Class E office space;
- Provision of up to circa 175 car parking spaces and up to circa 41 HGV spaces, together with service yards and HGV loading spaces;
- Provision of ancillary external structures such as sprinkler tanks;
- Creation of site access from A3024 Bursledon Road and A27 West End Road, together with provision of signals and other works to the existing highway; and
- Provision of site landscaping, including new planting and provision of swales and other sustainable urban drainage features.

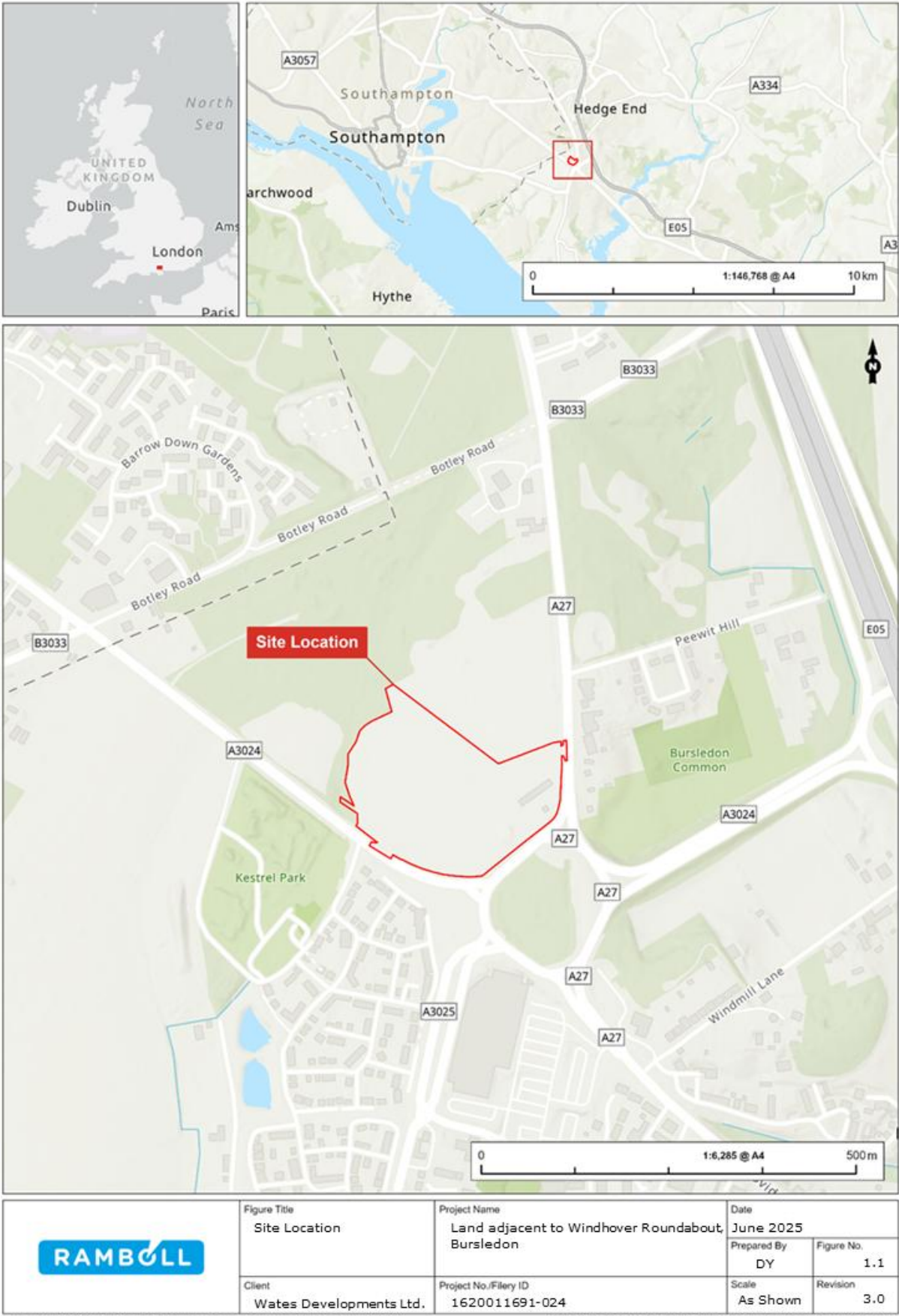


Figure 1.1 – Site Location

2.0 Appraisal of LZC Technologies



A high-level options appraisal has been undertaken to consider the application of LZC and renewable technologies for the Proposed Development, as detailed in Table 2.1.

All technologies highlighted in red have been discounted as unfeasible. All technologies highlighted in green and amber have been investigated further.

In addition, energy storage and export has also been considered in case the PV array generates more electricity than is required by the building, the excess energy could either be stored on-site or be exported to the grid.

2.1 Air source heat pumps - Adopted

Air/water source heat pump systems use a refrigeration cycle in reverse to extract low-grade heat from the outside air (or water) and transfer it into useful heat at a higher temperature, for use with space heating systems and/or to generate hot water.

Air source heat pumps are a proven, robust and low maintenance technology which is practical for low temperature heating systems. Required external equipment can be screened or incorporated on the roof, limiting visual impact and, as the technology is electrically driven, there is no impact on onsite air quality.

The efficiency of an air source heat pump (ASHP) correlates to the external temperature. In heating mode, when delivering a heating water temperature of 45°C at external temperatures of -4°C to 12°C, a typical heat pump would have a COP in the range of 2.0-4.0. The Part L assessment assumes an annual performance SCOP of 2.64 for space heating and 2.86 for Domestic Hot Water (DHW). In reality these values should be exceeded through design optimisation.

ASHPs will not achieve a simple payback when considered within this report scope. The drive towards electrically fuelled buildings is significant and forms a large part of the climate change agenda to decarbonise buildings. In this respect, ASHPs are one of the most accessible and affordable low and zero carbon technologies.

This system is regarded as technically suited to the Proposed Development.

Table 2.1 – Feasibility of different LZC Technologies

TECHNOLOGY	Solar access	Access to river/stream	Coastal access	Wind access	Access to biomass	Access to solar warmed air	Access to solar warmed water	Access to solar warmed ground	Local heat network	Constant base load	Notes
Air Source Heat Pump (ASHP)						✓					A centralised ASHP system can provide significant carbon reductions over a natural gas fuelled scheme. ASHP technology is deemed viable for this site.
Photovoltaics (PVs)	✓										A PV network is a very economically and technically feasible technology incorporating a low capital cost and achieves a simple payback. PV systems are a significantly developed technology and are used worldwide as one of the most versatile technologies.
Solar thermal water heating	✓										Use of solar thermal would be limited to hot water demand only, use of solar thermal for space heating not feasible as it is not required when solar thermal is most effective.
Wind				✓							Not considered an efficient option due to low wind profiles and turbulence, leading to low energy yields. Also, the environmental plus visual impact and noise generated would cause issues to residents and businesses.
Ground Source Heat Pump (GSHP)								✓			A detailed ground survey would be required to assess the viability of use. Significant costs associated with the necessary ground works.
District Heating									X		No proximity to any district heating network (DHN). However, it is recommended to future proof the Proposed Development to allow connectivity to an area wide heating/cooling network if one become available in the future.
Hydro power		X									No river / stream with suitable flow / head to generate power.
Tidal / Wave power			X								No suitable tidal flow near site
Water Source Heat Pump (WSHP)							X				No water body nearby to the site, therefore this technology is not viable.
Combined Heat and Power										X	CHP shown to increase carbon emissions when new SAP10 carbon factors applied. Generally being phased out due to being gas-fired and grid electricity being less carbon intensive.
Biomass										X	Would require solid fuel deliveries to site and dedicated space for storage of the biomass fuel. Requires additional duties and is not considered a long-term solution.

2.0 Appraisal of LZC Technologies

2.2 Photovoltaics (PVs) – Adopted

PV systems convert energy from the sun into electricity through semi-conductor cells. PVs can supply electricity to the building they are installed on, or to any other load connected to the electricity grid. PVs operate most efficiently in direct sunlight; however, energy can still be produced in overcast or cloudy conditions meaning that PVs can be used successfully in all parts of the UK, especially in South England.

PV electricity generation is complementary to the heat generating solution and does not replace or reduce the capacity of the other technologies. The only competing technology is solar thermal due to the conflict for space on the roof of a development.

Four types of solar cells are available at present; these are mono-crystalline, poly-crystalline, thin film and hybrid panels. Although mono-crystalline and hybrid cells are the most expensive, they are also the most efficient with an efficiency rate of 12-20%. Poly-crystalline cells are cheaper, but they are less efficient (9-15%). Thin film cells are only 5-8% efficient but can be produced as thin and flexible sheets.

PVs are deemed a suitable technology for the Proposed Development for the following reasons:

- The development provides sufficient roof space for the installation of PV panels.
- PV arrays are relatively easy to install when compared to other renewable systems,
- PV panels provide significant CO2 savings.
- PVs are a very economically and technically feasible technology incorporating a low capital cost and achieves a simple payback.
- PVs are a key part of the future energy roadmap where the decarbonisation of the National Grid will be the main source of carbon savings.

This system is regarded as technically suited to the Proposed Development.



Figure 2.1 – Photovoltaic Panel Array

2.3 Solar Thermal Hot Water – Not Adopted

Solar Thermal Hot Water systems are a well-established renewable energy source to provide hot water on building with higher and more constant regulated domestic hot water (DHW) demand, which is unlikely to be the case on Use Classes B2 and B8 applied flexibly building type. Solar thermal systems in the UK normally operate with a backup source of heat, such as gas or electricity. Due to the variable, limited and unpredictable demand for hot water there would need to be significant thermal storage to collect heat when it is available in readiness for its use when the demand arises. Without this storage, use of solar thermal would be limited to DHW.

Additionally, as the buildings DHW demand is proposed to be fully met by a highly efficient ASHP system, this additional technology provision would make little sense and add significant additional complexity/cost for little energy/CO₂ emissions benefit. This system is not regarded as technically suited to the Proposed Development.



Figure 2.2 – Solar Collector Array

2.4 Wind Turbines – Not Adopted

Wind turbines harness the power of the wind to produce electricity through circular motion. They can produce clean electricity with no associated carbon emissions, and range in outputs from watts to megawatts. Recorded data identifies the UK as the windiest country in Europe, and as such wind power is one of the UK's most promising renewable energy technologies and already provides electricity for nearly a quarter of million homes.

Wind turbines are a technically proven technology using aerodynamic forces ('lift' and 'drag') to produce mechanical power that can then be converted to electricity.

Stand-alone turbines would be most suited to the development, as opposed to building-integrated turbines, considering there is potential space on site. However, stand-alone wind turbine would have significant environmental and visual impact, besides noise impact which would cause issues to residents and businesses.

This system is not regarded as technically suited to the Proposed Development.



Figure 2.3 – Wind Turbine

2.0 Appraisal of LZC Technologies

2.5 Ground Source Heat Pumps – Not Adopted

Ground Source Heat Pump (GSHP) technologies involve the use of underground water sources (aquifers) which retain a near constant temperature all year round, hence in winter the underground water is warmer than the surface air temperatures, and in summer it is cooler. This temperature difference can be used in combination with a heat pump to provide heating and cooling energy.

For the technology to work effectively, the ground conditions are required to provide adequate thermal transfer. Whilst a viable and proven technology, the seasonal heating performance gains associated with a suitably designed GSHP system are regarded as not sufficient to justify the significant additional cost and complexity associated with its adoption/ground installation.

Although the Site has a large extension to incorporate GSHP, this technology is normally appropriate when there is a balance between heating and cooling demand to balance its system efficiency. As the Proposed Development is a warehouse (B2/B8 use) with very little cooling demand to the auxiliary office spaces, the demand for heating and cooling are not balanced. Therefore, this solution has been rejected in favour of a more practical, cost effective and still highly efficient air source heat pump and PV solution.

This system is not regarded as technically suited to the Proposed Development.

2.6 District Heating – Not Adopted

Consideration was given to the possible connection to an existing or proposed area wide decentralised energy network. The UK CHP Development Map (<https://chptools.decc.gov.uk/developmentmap>) is an interactive tool, using an interactive GIS system, which allows users to identify opportunities for decentralised energy projects in the UK. This tool details the existing major heat loads and supplies within the UK as well as existing heat distribution networks.

As shown in Figure 2.4, there is no heat network in the vicinity of the development. However, it is recommended to future proof the Mechanical and Electrical (M&E) design to allow connectivity to an area wide heating/cooling network if one become available in the future.

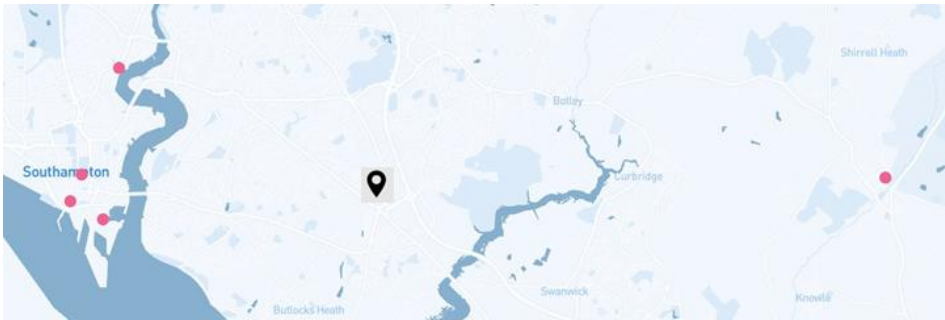


Figure 2.4 – District Heat Network. Existing networks shown by the red dots (Credit: UK CHP Development Map)

2.7 Energy Storage and Export

If the proposed PV array generates more electricity than is required by the building, the excess energy could either be stored on-site or be exported to the grid. It should be noted that the modelling exercise undertaken suggests that this scenario will be unlikely, and that the building will consume all electricity generated by the PV array during normal operation.

Electricity storage is a potential option. However, it is unlikely that the amount of electricity generated by the PV array would offset the cost of battery storage at present. If deemed required, input from the local district network operator (DNO) should be sought to ensure that an export agreement is in place if the building owner intends to sell electricity back to the grid.

3.0 Planning Policies and Regulations

This section summarises the drivers for sustainable and low carbon design, and reviews both current and future legislation that may affect the scheme. The development needs to consider carbon issues from the outset of the design, as the solution may have an impact on the operation and management of the site, the delivered quality of the development, and its ability to adapt to changing energy solutions over its lifecycle.

There are several national policies and regulations related to energy; those most relevant to the energy assessment of new developments are detailed below:

- National Planning Policy Framework – NPPF (Feb 2025)
- Climate Change Act 2008
- Building Regulations Part L 2021

In addition, the Proposed Development is designed to target compliance with the following planning strategies and policies, detailed in Table 3.1.

Table 3.1 - Applicable Policies and Regulations

Policies/Regulations	
Building Regulations Part L 2022	✓
BREEAM Ene01 Reduction of Energy Use and Carbon	✓
BREEAM Ene04 Low Carbon Design - Passive Design Analysis (1 credit) - Low Zero Carbon Feasibility Study (1 credit)	✓

3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) sets out the Government’s planning policies for England and how these should be applied. The NPPF is designed to make the planning system less complex and more accessible; to protect the environment and promote sustainable growth. It provides a framework within which locally prepared plans for housing and other development can be produced, alongside local planning policies.

The framework itself does not have prescriptive energy related policies but identifies the following:

- Great weight should be given to *“outstanding or innovative designs which promote high levels of sustainability”*.
- New developments should *“avoid increased vulnerability to the range of impacts arising from climate change”*.
- New developments *“can help to reduce greenhouse gas emissions, such as through its location, orientation and design”*.
- Proposals should *“help increase the use and supply of renewable and low carbon energy and heat”*, either by on-site low carbon generation or connection to decentralised sources.
- Consideration should be given to *“landform, layout, building orientation, massing and landscaping to minimise energy consumption”*.

3.2 Climate Change Act 2008

The Government has introduced legislation and several policies during recent years focusing on the reduction of CO2 emissions. The Climate Change Act (2008) sets a legally binding target for the reduction in UK carbon dioxide emissions. Upon ratification of the Kyoto Protocol, the UK committed to a reduction in its CO2 emissions by 80% compared to 1990 levels (by 2050). In addition, under the Climate Change Act an interim target of a 34% reduction by 2020 was set.

To enforce these targets, the Government is using the Building Regulations Part L 2021 (Conservation of fuel and power) which set the standards to which all new and existing buildings must comply.

3.3 UK Building Regulations Part L 2021

Building Regulations are statutory instruments that seek to ensure that the policies set out within any relevant UK legislation are carried out.

Building regulations approval is required for most of the building work carried out in the UK. Part L of these regulations covers the requirements with respect to the conservation of fuel and power in all building types. It controls the insulation values of building fabric elements and openings, the air permeability of the structure, the heating efficiency of heating, ventilation, and air conditioning systems together with hot water storage and lighting efficiency. It also sets out the requirements for calculating the carbon dioxide emissions and the Carbon Emission Targets for each building type.

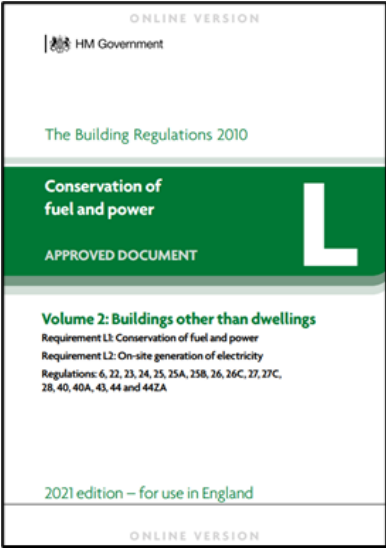


Figure 3.2 – Part L 2022 – Conservation of Fuel and Power

3.4 BREEAM New Construction v6.1

The BREEAM (Building Research Establishment's Environmental Assessment Method) is an environmental performance standard against which new, non-domestic buildings in the UK can be assessed.

The relevant criteria addressed in this document are as follows:

- ENE 01 Reduction of energy use and carbon emissions. To minimise operational energy demand, primary energy consumption and CO₂ emissions.
- ENE 04 Low Carbon Design - To encourage the adoption of passive design measures and LZC technologies, which reduce building energy consumption and associated carbon emissions and minimise reliance on active building services systems.

3.0 Planning Policies and Regulations



3.5 Noise

The two LZC technologies considered technically appropriate for the Proposed Development are ASHPs and PVs. PVs are silent in operation, therefore heat pumps are the only technology which may have specific noise constraints.

An environmental noise impact assessment has been undertaken for the Proposed Development considering the impact on operational noise on relevant receptors. This is provided under a separate cover ref Ramboll Land adjacent to Windhover Roundabout, Bursledon Noise Impact Assessment RUK2021N00014-RAM-RP-00225.

3.6 Available grants

Ramboll are not aware of any grants currently available from sources to assist with funding of renewable energy installations.

4.0 L&ZC Technologies, Modelling

The impact of the L&ZC technologies identified has been modelled using the Building Regulations Part L 2021 compliance model for the Proposed Development. This has been undertaken using the IES VE 2024 software.

Two models have been set up for the purpose of the L&ZC technology study, which are as follows:

- Baseline Building: This model represents the as-designed buildings. However, it does not include any L&ZC technologies (ASHPs nor PV) and gas boilers as per Ene 04 L&ZC methodology.
- Actual Building (Be Green): This represents the as-designed buildings including the adopted L&ZC technologies (ASHP and PV).

Image of the IESVE model for Unit 1 can be seen in Figure 4.1, while image of Unit 2 is illustrated in Figure 4.2.

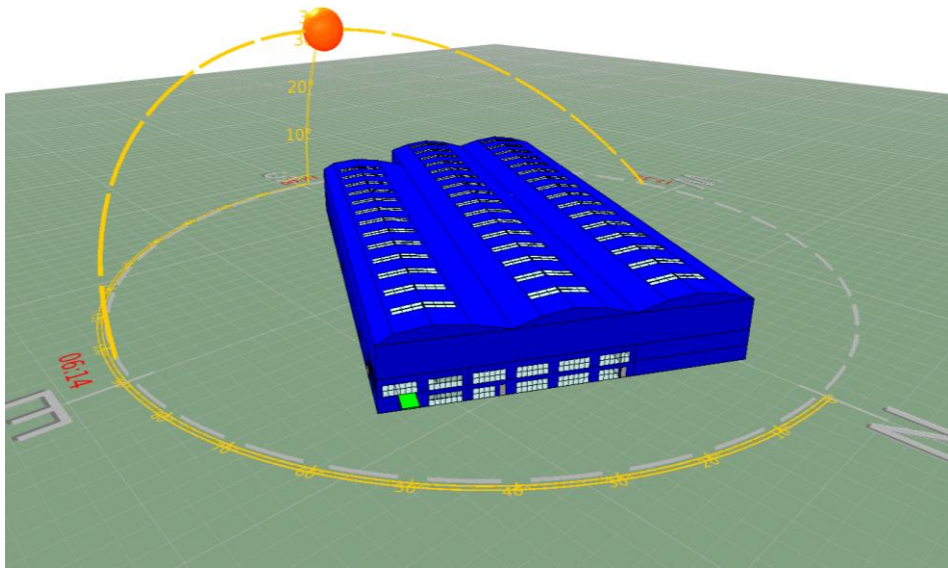


Figure 4.1 - Image of the IESVE model for Unit 1.

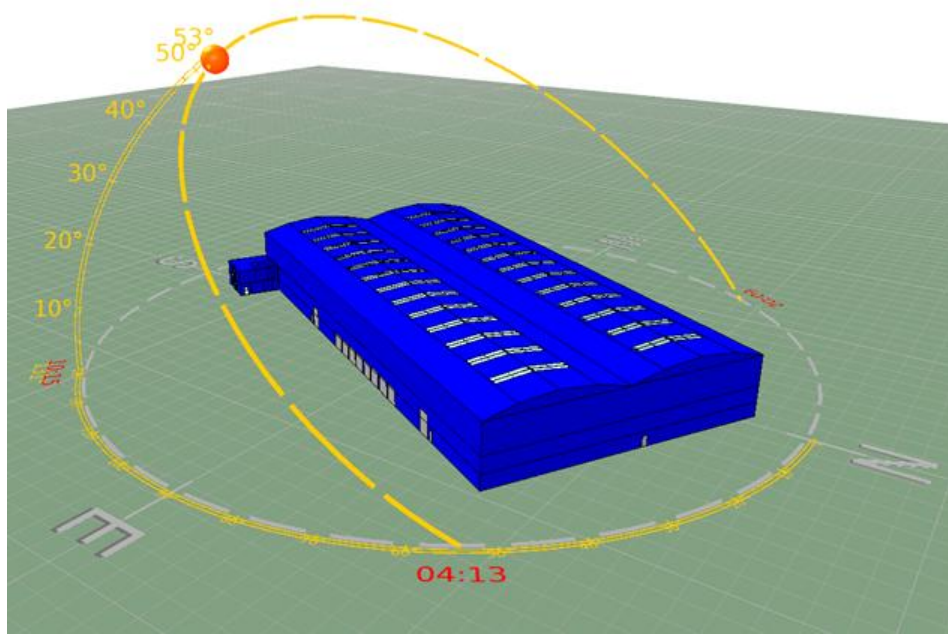


Figure 4.2 - Image of the IESVE model for Unit 2.

4.1 Inputs

For the baseline, the modelling inputs were based on the ‘as designed’ buildings for all parameters excluding the proposed L&ZC technologies (ASHP and PV). The baseline was modelled with its heat demand provided by a gas boilers at 91% efficiency, as per Ene 04 L&ZC methodology.

For the actual models, ASHPs were introduced for its heat demand. In addition to ASHP, 700sqm of PV array in Unit 01 and 320sqm of PV array in Unit 02 were also included as proposed.

BREEAM KBCN0297 states that base case modelling should ‘assume the worst acceptable efficiency permitted by the relevant Building Regulation’. Therefore, heating efficiencies for the base case were assigned according to the notional building efficiencies set out in Part L 2021 regulations.

The parameters used to set up the models are summarised in Table 4.5. Additionally, a detailed tabular summary of heating and cooling parameters in both the Baseline and Actual building models can be found in Appendix 02.

4.0 LZC Technology Modelling



4.2 Results

The regulated carbon dioxide emissions for both the ‘Baseline Building’ and the ‘Actual Building’ can respectively be seen in Table 4.1 and 4.2.

It should be noted that the regulated emissions comparison is made to the Part L 2021 Target Emissions Rate, rather than the Building Emission Rate of the LZC Baseline building model. The LZC Baseline building model, equipped with gas-fired boilers for heating, did not achieve compliance with Building Regulations. Therefore, as per BREEAM KBCN0297, no additional saving is claimed for improvements required to bring the building in line with Building Regulations.

The results show that the implementation of ASHPs results in 56.00% savings for Unit 1 and 55.69% savings for Unit 2 over the baseline buildings.

The use of PV panels further reduces the CO2 emissions by a further 1.91 kgCO2/m2 per annum for Unit 1, and a further 1.17 kgCO2/m2 per annum for Unit 2.

Overall, both adopted LZC technologies (ASHP and PV) equates to 77.66% emission saving over the baseline building for Unit 1 and, 70.34% emission saving over the baseline building for Unit 2.

Table 4.3 - Modelled output for the specified LZC technologies Unit 1

Unit 1 LZC Technology Output	Value	Unit
PV electricity generated per year	142,633.7	kWh
Annual CO2 savings from PV generation	29.5	tCO ₂ e
Annual Electricity consumed by ASHP/WSHP	103,524.5	kWh
Annual CO ₂ savings from ASHP/WSHP operation (see Table 4.7 for further details)	45.9	tCO ₂ e

Table 4.4 - Modelled output for the specified LZC technologies Unit 2

Unit 2 LZC Technology Output	Value	Unit
PV electricity generated per year	65,196.2	kWh
Annual CO2 savings from PV generation	13.5	tCO ₂ e
Electricity consumed by ASHP/WSHP	58,023.9	kWh
Annual CO ₂ savings from ASHP/WSHP operation (see Table 4.7 for further details)	26.29	tCO ₂ e

Table 4.1 – Unit 1 Regulated CO2 emissions for the Baseline and Actual Buildings

Unit 1	Building Emission Rate (kgCO ₂ /m ² /yr) Part L 2021	% Carbon Savings
Base case (Gas Boiler) Part L 2022 TER	8.82	-
Updated (ASHP)	3.88	56.00%
Updated (ASHP + PV)	1.97	77.66%

Table 4.2 – Unit 2 Regulated CO2 emissions for the Baseline and Actual Buildings

Unit 2	Building Emission Rate (kgCO ₂ /m ² /yr) Part L 2021	% Carbon Savings
Base case (Gas Boiler) Part L 2022 TER	7.99	-
Updated (ASHP)	3.54	55.69%
Updated (ASHP + PV)	2.37	70.34%

Table 4.5 - Parameters used to set up the IES models for analysis Unit 1 and 2

Model Parameter	Baseline case	Updated (ASHP)	Updated (ASHP & PV)
Building form and usage	As designed ⁽¹⁾	As designed ⁽¹⁾	As designed ⁽¹⁾
Glazing and fabric proportions	As designed ⁽¹⁾	As designed ⁽¹⁾	As designed ⁽¹⁾
Glazing and fabric performance	As designed ⁽¹⁾	As designed ⁽¹⁾	As designed ⁽¹⁾
Thermal mass	As designed ⁽¹⁾	As designed ⁽¹⁾	As designed ⁽¹⁾
Daylighting and controls	As designed ⁽¹⁾	As designed ⁽¹⁾	As designed ⁽¹⁾
Ventilation	As designed ⁽¹⁾	As designed ⁽¹⁾	As designed ⁽¹⁾
Heating and cooling	Heating provided by gas boilers at 91% efficiency. Cooling provided by electric chillers with an EER of 5.	As designed ASHP Heating COP = 3.1. Cooling provided by electric chillers with an EER of 5.	As designed ASHP Heating COP = 3.1. Cooling provided by electric chillers with an EER of 5.
Installed PV	None	None	As designed ⁽¹⁾ , 700 m ² PV array in Unit 01 and 320 m ² PV array in Unit 02

⁽¹⁾ Illustrative proposed Unit 1 and Unit 2 drawings by TOR, dated 23/05/2025 and illustrative Masterplan dated 10/06/2025.

4.0 LZC Technology Modelling



4.3 PV Simple Payback

A simple payback calculation has been undertaken for the proposed PV array, which is shown in Table 4.6.

The calculations presented here indicate that the PV array could pay back in 9.3 years. This is based on the following assumptions:

- IES-VE prediction of PV generation is assumed to be representative of in-use performance.
- Cost of electricity is assumed to be £0.29/kWh.
- Cost of PV array is assumed to be £2500/kW (154kW PV array in Unit 01, and 70.4kW PV array in Unit 02).
- Due to outline planning design status, the PV cost has been assumed based on another project quote. The PV array included is as per illustrative Proposed Roof Plans for Unit 1 and Unit 2.

4.4 ASHP / WSHP

A comparison of operating costs between the proposed ASHP and baseline gas-fired boiler systems can be seen in Table 4.7. These calculations demonstrate that the ASHP system is more expensive to operate than an equivalent gas-fired boiler system and as such there is no payback period. However, there is a substantial saving in terms of CO₂ emissions, which would lead to an effective operating cost of CO₂ abatement of £165.4/tCO₂e for Unit 1 and £154.7/tCO₂e for Unit 2.

This is based on the following assumptions:

- IES-VE prediction of heat demand is assumed to be representative of in-use performance,
- Modelled equipment efficiencies are assumed to be representative of in-use performance,
- Cost of electricity is assumed to be £0.29/kWh,
- Cost of gas is assumed to be £0.06/kWh,
- Electricity and gas carbon factors are taken with reference to the UK Government GHG Conversion Factors for Company Reporting (1). The carbon factor for electricity is inclusive of transmission and distribution,
- Operating costs are comprised of fuel consumption costs. Maintenance and other associated running costs are assumed to be negligible and are not accounted for within this comparison.

(1) <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024> (accessed 02 December 2024)

Table 4.6 - Simple payback calculation for the proposed PV array

Solar PV Payback	Value (Unit 1)	Value (Unit 2)	Unit
Electricity generated per year	14.88	9.09	kWh/m2NIA
Building area	9585.6	7,172.3	M2
Electricity generated per year	142,633.7	65,196.2	kWh
Cost of electricity	0.29	0.29	£/kWh
Annual savings from PV electricity	41,363.7	18,906.9	£
Cost of PV array	385,000	176,000	£
PV array simple payback period	9.3	9.3	Years

Table 4.7 - Operating cost comparison of the proposed ASHP and baseline gas-fired boiler systems

Heating System Comparison	Value (Unit 1)	Value (Unit 2)	Unit
Electricity carbon factor	0.207	0.207	kgCO ₂ e/kWh
Gas carbon factor	0.18	0.18	kgCO ₂ e/kWh
Cost of electricity	0.29	0.29	£/kW
Cost of gas	0.06	0.06	£/kW
Gas-fire boiler efficiency	91%	91%	%
Annual gas consumption	373,838.4	212,658.7	kWh
ASHP electricity consumption	103,524.5	58,023.9	kWh
Annual ASHP cost of fuel	30,022.1	16,826.9	£
Annual ASHP CO ₂ emissions	21.4	12.01	tCO ₂ e
Annual gas-fired boiler cost of fuel	22,430.3	12,759.5	£
Annual gas-fired boiler CO ₂ emissions	67.3	38.3	tCO ₂ e
Relative cost uplift for ASHP operation	7591.8	4067.4	£
Relative CO ₂ emissions reduction for ASHP operation	45.9	26.29	tCO ₂ e
Effective operating cost of CO ₂ abatement	165.4	154.7	£/tCO ₂ e

5.0 Conclusion



The deployment of ASHP has proven to reduce the CO2 emissions by 4.94 kgCO2/m2 per annum for Unit 1, and 4.45 kgCO2/m2 per annum for Unit 2. This corresponds to 56.00% savings for Unit 1 and 55.69% savings for Unit 2 over the baseline case building. The ASHP system does not have an achievable simple payback figure, although it would aid in achieving Building Regulations compliance and contributes towards the climate response where an electrically fuelled strategy is most desired.

The use of PV panels reduces the CO2 emissions by a further 1.91 kgCO2/m2 per annum for Unit 1, and a further 1.17 kgCO2/m2 per annum for Unit 2. The PV panels will achieve simple payback in 9.3 years.

This equates to an overall 77.66% emission saving over the base case for Unit 1 and, 70.34% emission saving over the base case for Unit 2. Please refer to Table 5.1 for Unit 1 carbon savings by LZC technologies, and Table 5.2 for Unit 2 results.

Table 5.1 – Unit 1 carbon savings by LZC technologies

Unit 1	Building Emission Rate (kgCO2/m2/yr) Part L 2021	% Carbon Savings
Baseline case (Gas Boiler) Part L 2021 TER	8.82	-
Actual case (ASHP)	3.88	56.00%
Actual case (ASHP + PV)	1.97	77.66%

Table 5.2 – Unit 2 carbon savings by LZC technologies

Unit 2	Building Emission Rate (kgCO2/m2/yr) Part L 2021	% Carbon Savings
Baseline case (Gas Boiler) Part L 2021 TER	7.99	-
Actual case (ASHP)	3.54	55.69%
Actual case (ASHP + PV)	2.37	70.34%

Appendix 01



BRUKL Reports Unit 1

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Burlesdon Unit 1 Option 3 Gas Boiler

As designed

Date: Thu Jun 05 14:25:39 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 4761.71

The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² ·annum	4.84
Building CO ₂ emission rate (BER), kgCO ₂ /m ² ·annum	8.82
Target primary energy rate (TPER), kWh _u /m ² ·annum	28.3
Building primary energy rate (BPER), kWh _u /m ² ·annum	76.15
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{g-Limit}	U _{g-Calc}	U _{g-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	NT000000:Surf[3]
Floors	0.18	0.15	0.15	NT000000:Surf[0]
Pitched roofs	0.16	0.15	0.15	NT00002E:Surf[81]
Flat roofs	0.18	0.15	0.15	NT00002E:Surf[80]
Windows** and roof windows	1.6	1.4	1.4	NT00000E:Surf[0]
Rooflights***	2.2	2.01	2.01	NT00002E:Surf[2]
Personnel doors [^]	1.6	1.4	1.4	NT000000:Surf[1]
Vehicle access & similar large doors	1.3	1.3	1.3	NT000000:Surf[10]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{g-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{g-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{g-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

[^] For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Figure A01.1 – Unit 1 Part L 2022 BRUKL Report – Baseline case building

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Burlesdon Unit 1 Option 3 ASHP

As designed

Date: Thu Jun 05 13:56:52 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 4761.71

The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² ·annum	3.75
Building CO ₂ emission rate (BER), kgCO ₂ /m ² ·annum	3.88
Target primary energy rate (TPER), kWh _u /m ² ·annum	40.26
Building primary energy rate (BPER), kWh _u /m ² ·annum	41.78
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{g-Limit}	U _{g-Calc}	U _{g-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	NT000000:Surf[3]
Floors	0.18	0.15	0.15	NT000000:Surf[0]
Pitched roofs	0.16	0.15	0.15	NT00002E:Surf[81]
Flat roofs	0.18	0.15	0.15	NT00002E:Surf[80]
Windows** and roof windows	1.6	1.4	1.4	NT00000E:Surf[0]
Rooflights***	2.2	2.01	2.01	NT00002E:Surf[2]
Personnel doors [^]	1.6	1.4	1.4	NT000000:Surf[1]
Vehicle access & similar large doors	1.3	1.3	1.3	NT000000:Surf[10]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{g-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{g-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{g-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

[^] For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Figure A01.2 – Unit 1 Part L 2021 BRUKL Report – Actual building (ASHP)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Burlesdon Unit 1 Option 3 (Be Green)

As designed

Date: Thu Jun 05 01:15:12 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 4761.71

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² ·annum	3.75
Building CO ₂ emission rate (BER), kgCO ₂ /m ² ·annum	1.97
Target primary energy rate (TPER), kWh _u /m ² ·annum	40.26
Building primary energy rate (BPER), kWh _u /m ² ·annum	19.88
Do the building's emission and primary energy rates exceed the targets?	BER <= TER BPER <= TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{g-Limit}	U _{g-Calc}	U _{g-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	NT000000:Surf[3]
Floors	0.18	0.15	0.15	NT000000:Surf[0]
Pitched roofs	0.16	0.15	0.15	NT00002E:Surf[81]
Flat roofs	0.18	0.15	0.15	NT00002E:Surf[80]
Windows** and roof windows	1.6	1.4	1.4	NT00000E:Surf[0]
Rooflights***	2.2	2.01	2.01	NT00002E:Surf[2]
Personnel doors [^]	1.6	1.4	1.4	NT000000:Surf[1]
Vehicle access & similar large doors	1.3	1.3	1.3	NT000000:Surf[10]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{g-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{g-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{g-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

[^] For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Figure A01.3 – Unit 1 Part L 2021 BRUKL Report – Updated (ASHP and PV)

Please note that a combination of ASHP plus PV panels are expected to be necessary to demonstrate compliance with Part L of the Building Regulations, thus achieve the Policy DM2 of the Eastleigh Borough Local Plan (≥15% carbon emissions reductions target through onsite LZC technologies). Please refer to the Be Green BRUKL document (image on the right) for the proposed strategy including both ASHP and PV panels.

Appendix 01



BRUKL Reports Unit 2

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Burlesdon Unit 2 Option 3 Gas Boiler

As designed

Date: Thu Jun 05 14:18:56 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 3556.95

The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m²·annum	3.14
Building CO ₂ emission rate (BER), kgCO ₂ /m²·annum	7.99
Target primary energy rate (TPER), kWh _e /m²·annum	3.43
Building primary energy rate (BPER), kWh _e /m²·annum	59.32
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{e-Limit}	U _{e-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	NT000006:Surf[1]
Floors	0.18	0.15	0.15	NT000006:Surf[0]
Pitched roofs	0.16	0.15	0.15	NT000052:Surf[55]
Flat roofs	0.18	0.15	0.15	NT00001C:Surf[0]
Windows** and roof windows	1.6	1.4	1.4	NT000004:Surf[1]
Rooflights***	2.2	2.01	2.01	NT000052:Surf[2]
Personnel doors^	1.6	1.44	2.2	NT00005B:Surf[23]
Vehicle access & similar large doors	1.3	1.3	1.3	NT000003:Surf[9]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{e-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{e-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

Figure A01.4 – Unit 2 Part L 2022 BRUKL Report – Baseline case building

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Burlesdon Unit 2 Option 3 ASHP

As designed

Date: Thu Jun 05 14:01:56 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 3556.95

The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m²·annum	3.42
Building CO ₂ emission rate (BER), kgCO ₂ /m²·annum	3.54
Target primary energy rate (TPER), kWh _e /m²·annum	36.56
Building primary energy rate (BPER), kWh _e /m²·annum	37.84
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{e-Limit}	U _{e-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	NT000006:Surf[1]
Floors	0.18	0.15	0.15	NT000006:Surf[0]
Pitched roofs	0.16	0.15	0.15	NT000052:Surf[55]
Flat roofs	0.18	0.15	0.15	NT00001C:Surf[0]
Windows** and roof windows	1.6	1.4	1.4	NT000004:Surf[1]
Rooflights***	2.2	2.01	2.01	NT000052:Surf[2]
Personnel doors^	1.6	1.44	2.2	NT00005B:Surf[23]
Vehicle access & similar large doors	1.3	1.3	1.3	NT000003:Surf[9]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{e-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{e-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

Figure A01.5 – Unit 2 Part L 2021 BRUKL Report – Actual building (ASHP)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Burlesdon Unit 2 Option 3 (Be Green)

As designed

Date: Thu Jun 05 01:05:00 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 3556.95

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m²·annum	3.42
Building CO ₂ emission rate (BER), kgCO ₂ /m²·annum	2.37
Target primary energy rate (TPER), kWh _e /m²·annum	36.56
Building primary energy rate (BPER), kWh _e /m²·annum	24.46
Do the building's emission and primary energy rates exceed the targets?	BER <= TER BPER <= TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{e-Limit}	U _{e-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	NT000006:Surf[1]
Floors	0.18	0.15	0.15	NT000006:Surf[0]
Pitched roofs	0.16	0.15	0.15	NT000052:Surf[55]
Flat roofs	0.18	0.15	0.15	NT00001C:Surf[0]
Windows** and roof windows	1.6	1.4	1.4	NT000004:Surf[1]
Rooflights***	2.2	2.01	2.01	NT000052:Surf[2]
Personnel doors^	1.6	1.44	2.2	NT00005B:Surf[23]
Vehicle access & similar large doors	1.3	1.3	1.3	NT000003:Surf[9]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{e-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{e-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

Figure A01.6 – Unit 2 Part L 2021 BRUKL Report – Updated (ASHP and PV)

Please note that a combination of ASHP plus PV panels are expected to be necessary to demonstrate compliance with Part L of the Building Regulations, thus achieve the Policy DM2 of the Eastleigh Borough Local Plan (≥15% carbon emissions reductions target through onsite LZC technologies). Please refer to the Be Green BRUKL document (image on the right) for the proposed strategy including both ASHP and PV panels.

Appendix 02



Modelling Inputs – Base case versus Updated

Table A02.1 – DHW and HVAC Modelling Inputs for Base Case Simulation (differences between base case and updated in blue)

Basecase (Gas Boiler)		UK NCM Type	Heating			Cooling				Hot Water
System Type	System Name		Heat Pump?	Fuel	Seasonal Efficiency	Heat Pump?	Fuel	Nominal EER	Seasonal EER	Heat Pump?
DHW	BursledonOption1-DHW Unit1	Central heating using water: radiators	No	Electricity	0.91	Natural Ventilation				No
	BursledonOption1-DHW Unit2	Central heating using water: radiators	No	Electricity	0.91	Natural Ventilation				No
HVAC	BursledonOption1-HVAC01_Warehouse	Central heating using water: radiators	No	Natural Gas	0.91	Natural Ventilation				No
	BursledonOption1-HVAC02_Office	Variable refrigerant flow	No	Natural Gas	0.91	Yes	Electricity	2.5	5	No
	BursledonOption1-HVAC03_WC	Central heating using air distribution	No	Natural Gas	0.91	Mechanical Ventilation				No
	BursledonOption1-HVAC04_FOH Circulation	Variable refrigerant flow	No	Natural Gas	0.91	Yes	Electricity	2.5	5	No
	BursledonOption1-HVAC05_Kitchenette	Central heating using air distribution	No	Natural Gas	0.91	Mechanical Ventilation				No

Table A02.2 – DHW and HVAC Modelling Inputs for Updated Simulation (differences between base case and updated in blue)

Updated (ASHP)		UK NCM Type	Heating			Cooling				Hot Water
System Type	System Name		Heat Pump?	Fuel	Seasonal Efficiency	Heat Pump?	Fuel	Nominal EER	Seasonal EER	Heat Pump?
DHW	BursledonOption1-DHW Unit1	Central heating using water: radiators	Yes	Electricity	3.1	Natural Ventilation				Yes
	BursledonOption1-DHW Unit2	Central heating using water: radiators	Yes	Electricity	3.1	Natural Ventilation				Yes
HVAC	BursledonOption1-HVAC01_Warehouse	Central heating using water: radiators	Yes	Electricity	3.1	Natural Ventilation				Yes
	BursledonOption1-HVAC02_Office	Variable refrigerant flow	Yes	Electricity	3.1	Yes	Electricity	2.5	5	Yes
	BursledonOption1-HVAC03_WC	Central heating using air distribution	Yes	Electricity	3.1	Mechanical Ventilation				Yes
	BursledonOption1-HVAC04_FOH Circulation	Variable refrigerant flow	Yes	Electricity	3.1	Yes	Electricity	2.5	5	Yes
	BursledonOption1-HVAC05_Kitchenette	Central heating using air distribution	Yes	Electricity	3.1	Mechanical Ventilation				Yes

Bright
ideas.
Sustainable
change.