Paddington Packet Boat, High Road, Uxbridge

Energy Statement

March 2024

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Comments

Comments

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EXECUTIVE SUMMARY

This Energy Statement presents the energy strategy for a proposed scheme at Paddington Packet Boat, High Road, Uxbridge, UB8 2HT.

Development proposals include purpose-built student accommodation units with associated internal and outdoor amenity space, refuse areas, cycle storage and supporting plant room facilities.

Consideration has primarily been given to the planning policy context and other requirements prior to establishing a strategy based upon the energy hierarchy; with a priority given to energy reduction and efficiency. Renewable and low carbon technologies have also been considered in the context of their technical feasibility and financial viability.

The following is therefore proposed:

- High performance building fabric and energy efficient lighting, services and equipment;
- Passive design measures to reduce energy demand for heating, cooling, ventilation and lighting;
- ASHPs for space heating and hot water;
- Roof mounted PV.

The development will satisfy the Council target for an on-site carbon saving of >35% relative to Part L 2021. Residual emissions will be offset with a cash-in-lieu payment.

A copy of the GLA Carbon Emission Reporting Spreadsheet is appended to this report outlining the savings at each stage of the Energy Hierarchy.

Overall, the proposed energy strategy is considered consistent with the National Planning Policy Framework, London Plan and policies of the Council. When implemented, the scheme will provide an efficient and low carbon development.

1. INTRODUCTION

1.1. Waterman Infrastructure & Environment Limited (hereafter 'Waterman') has been commissioned by Paddington Packet Boat Developments Ltd (hereafter referred to as the 'Applicant') to produce an Energy Statement for Paddington Packet Boat, High Road, Uxbridge, UB8 2HT (hereafter 'the Site').

1.2. It is proposed to redevelop the Site to 61 purpose-built student accommodation units with associated common areas and facilities, landscaping, bin and cycle stores and outdoor amenity space (hereafter referred to as the 'Development').

1.3. Supporting the planning application, this report provides a technical appraisal of the regulations requirements and guidance that apply, the energy options considered for the project and the energy conservation measures that will be adopted.

1.4. Each section summarises the proposed key investments that will be implemented in the development to reduce building energy consumption and CO_2 emissions.

2. ASSESSMENT METHODOLOGY

2.1. The optimal approach to minimising carbon emissions from buildings is to firstly focus on reducing the demand for energy before reviewing efficient and renewable technology options.

2.2. However, priorities and performance targets can vary at a local level and the report therefore commences with a review of the planning policy and other considerations.

2.3. The subsequent sections follow the Energy Hierarchy (discussed below) and review the design proposals in relation to passive design and energy efficiency as well as the potential to incorporate low carbon and renewable technology.

2.4. The tiers of the Energy Hierarchy are:

- "Be Lean" - use less energy and manage demand during operation through fabric and servicing improvements and the incorporation of flexibility measures
- "Be Clean" - exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly by connecting to district heating networks
- "Be Green" - maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- "Be Seen" - monitor, verify and report on energy performance through the Mayor's post construction monitoring platform

2.5. The first principle of the Hierarchy is to reduce demand and the need for energy in the first place. Where opportunities to improve the efficiency of the design have been maximised, consideration is then given to the second principle whereby priority is given to the efficient use of energy. This is on the basis that low carbon technologies can be cost-effective and provide significant carbon savings when compared to conventional technologies.

2.6. The third principle of the hierarchy promotes the use of renewable technologies. Whilst these technologies can be relatively expensive to install, they do offer the potential to significantly reduce carbon emissions. The final principle of the Hierarchy seeks to help close the gap between predicted energy use and actual energy use.

2.7. The summary section of the report presents an overview of the findings and the strategy.

3. DESCRIPTION OF DEVELOPMENT

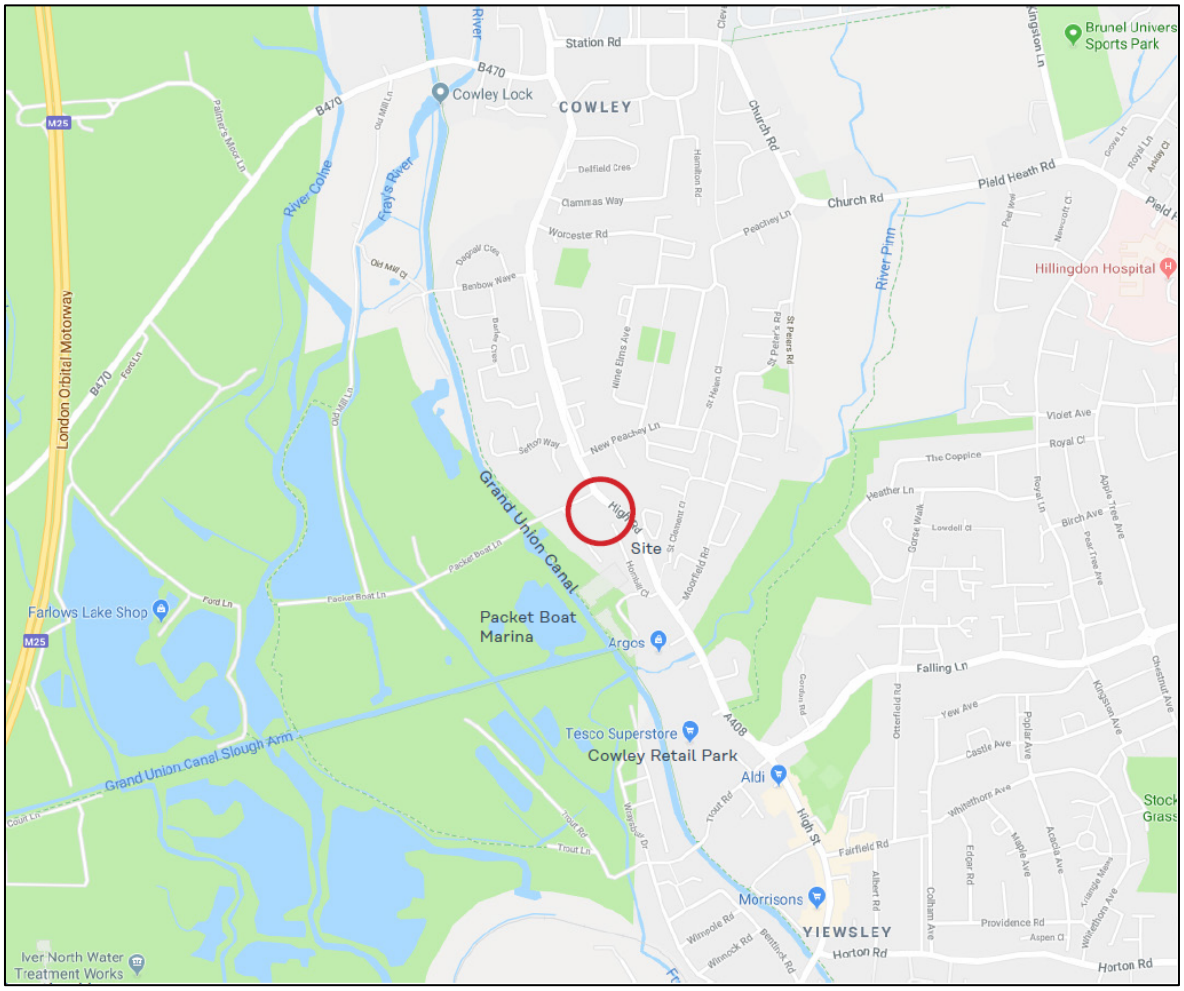
Existing Site and Surrounding Area

3.1. The site is located on the corner of High Road and Packet Boat Lane.

3.2. The site is at the junction of a residential and industrial warehouse area adjacent to the canal system and packet boat marina. The site is classified as a brownfield site as there is already an existing building (a public house) and a large car park area currently occupying the site.

3.3. To the north of the site is Cowley Recreation Ground with Cowley retail park just south of the site.

Figure 1: Site Location



3.4. The proposed site is currently occupied by a public house whose lease has now expired. The premises are now boarded up and currently not trading as a public house.

3.5. The Paddington Packet Boat public house is a two-storey white render building with tiled gabled roof. The building is positioned at an angle on the junction of High Road and Packet Boat Lane.

3.6. There is a small seating area to the south of the building away from the road and a parking area to the west of the site. Access to the parking area is from Packet Boat Lane.

Proposed Development

3.7. The proposed development seeks full planning permission for the demolition of the Paddington Packet Boat public house and construction of 61 purpose built student accommodation units with associated internal and outdoor amenity space, refuse areas, cycle storage and supporting plant room facilities.

Figure 2: Ground Floor Plan

4. PLANNING POLICY FRAMEWORK

4.1. Planning policy relevant to energy is considered below.

National Planning Policy Framework (2023)

4.2. The National Planning Policy Framework (NPPF) was updated in December 2023. Paragraph 7 of the revised NPPF includes reference to the following:

7. "The purpose of the planning system is to contribute to the achievement of sustainable development."

4.3. Chapter 14 of the NPPF includes consideration of climate change and the use and supply of renewable and low carbon energy. Paragraph 157 states:

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

4.4. The key local planning policy documents are listed below.

The London Plan National (2021)

4.5. The key local planning policy

4.6. The London Plan is the overall strategic plan for London, it sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The London Plan is part of the Development Plan and covers a range of planning issues. The presented policies provide a vision for how London should sustainably grow and develop in the future. Policies considered pertinent to this report are presented below:

- Policy SI1 (Improving air quality) – Development proposals should not lead to further deterioration of existing poor air quality.
- Policy SI2 (Minimising greenhouse gas emissions) - Major development should be net zero-carbon and minimise emissions in accordance with the following energy hierarchy: be lean, be clean, be green, be seen. A minimum on site reduction of 35% beyond Building Regulations will be required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Any short fall with the zero carbon target should be addressed through a carbon offset payment. Development referable to the GLA should also calculate whole life-cycle carbon emissions.
- Policy SI3 (Energy infrastructure) - Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system.
- Policy SI4 (Managing heat risk) - Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems.

Energy Assessment Guidance (2022)

4.7. This guidance document explains how to prepare an energy assessment to accompany strategic planning applications referred to the Mayor as set out in London Plan Policy SI 2. It states that the purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy.

4.8. Although primarily aimed at strategic planning applications, London boroughs are encouraged to apply the same structure for energy assessments related to non-referable applications and adapt it for relevant scales of development.

Hillingdon Local Plan Part 1 (2012)

4.9. The Local Plan Part 1 sets out the spatial vision strategic objectives, spatial strategy, core policies to guide development in the local area. The following are considered pertinent to this report:

- Policy BE1 (Built Environment) -all new developments should maximise the opportunities for all new homes to contribute to tackling and adapting to climate change and reducing emissions of local air quality pollutants.
- Policy EM1 (Climate Change Adaptation and Mitigation) – includes a series of requirements for development, including the promotion of low carbon and renewable technologies.

Hillingdon Local Plan Part 2 – Development Management Policies (2020)

4.10. The Local Plan Part 2 Development Management Policies and Site Allocations and Designations were adopted as part of the borough's development plan at Full Council on 16 January 2020.

4.11. Consideration has been given to the following draft policies:

- Policy DMEI 2 (Reducing Carbon Emissions) – all developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.
- Policy DMEI 3 (Decentralised Energy) – encourages connection to District Energy Networks (DEN).
- Policy DMEI 14 (Air Quality) – development should, as a minimum, be air quality neutral.

4.12. A fuller list of considered policies can be found at Appendix A.

5. SITE ENERGY DEMAND AND NOTIONAL BASELINE

5.1. The London Plan promotes a 'regulated' energy approach to calculating the energy demand and carbon baseline of development. The baseline therefore includes the energy consumed in the operation of the space heating/cooling and hot water systems, ventilation and all internal lighting. Reported separately, are the carbon emissions from cooking and all electrical appliances which are not covered by the Building Regulations, this is called 'unregulated' energy.

5.2. When determining this baseline for the purpose-built student accommodation unit, it has been assumed that heating would be provided by an air source heat pump (irrespective of the design proposals) in line with the GLA guidance and SAP10.2 notional building specification. This is to ensure consistency with the GLA guidance.

5.3. All emissions have been assessed using the SAP10.2 carbon factors. Non-domestic unregulated emissions have been taken from the unregulated emissions values generated by the SBEM models.

Table 1: Carbon Dioxide Emissions (SAP10.2) - Baseline

Step	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021of the Building Regulations Compliant Development	5.2	2.9

6. ENERGY EFFICIENT DESIGNS

6.1. In line with the policies of the London Plan and Hillingdon Local Plan Part 1 – Strategic Policies, energy efficiency measures are proposed in order to minimise the energy used by the proposed development and consequently the associated carbon emissions. Furthermore, the proposed energy efficiency measures will ensure that the proposed development surpasses the minimum requirements set out in Approved Document Part L Volume 2 which sets out Building Regulations energy efficiency and emissions targets for new build non-domestic developments.

6.2. In order to realise this potential, both passive and active energy efficiency measures will be adopted. The approach taken has been to firstly reduce the required energy for heating and cooling by careful and intelligent fabric design. Secondly, active elements such as highly efficient motors, variable speed fans and pumps and efficient lighting are utilised to achieve the Building Regulations target.

6.3. The following details the anticipated design proposals:

Fabric Design and Thermal Properties

6.4. The focus of the design team approach has been to limit building energy consumption and carbon emissions through consideration of the performance of the building envelope. The approach has aimed to reduce solar gains and heat losses to levels commensurate with good practice benchmarks as opposed to reliance on energy efficient measures adopted solely to offset the weakness of poor performing building fabric.

Proposed Thermal Conductivities

The following U-values are provided as a guide for the basic building elements:

- External Walls ~0.16 W/m^{2}K;
- Roof ≤0.10 W/m^{2}K;
- Ground Floor ≤0.10 W/m^{2}K;
- Windows ≤1.40 W/m^{2}K.
- Doors ≤1.60 W/m^{2}K.

Reduced Air Leakage

6.5. Good air tightness design will reduce heat losses in winter and heat gains in summer and will increase the efficiency of the mechanical ventilation. The target design air permeability for the proposed development is 3.0m^3/hr/m^2 at 50Pa.

Thermal Bridging

6.6. Thermal bridging is the penetration of the insulation layer by a highly conductive non-insulating material allowing rapid heat transfer from an interior to exterior environment (and vice versa). In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges.

6.7. The building fabric shall be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements.

Air Supply

The model assumes that all air used to ventilate the internal spaces is taken from external air and that ventilation will be provided naturally (e.g. openable windows). Potentially, additional mechanical ventilation will be required for purge ventilation.

In the spaces where the natural ventilation via openable windows is restricted due to acoustic pollution or security considerations as per the Approved Document Part O, comfort cooling would be employed.

Overheating Mitigation

6.8. Solar control glazing shall be installed to the elevations most affected; the precise specification of glazing types for windows and glazed curtain walling is to be based upon further analysis at later stages so that the appropriate balance is found between limiting summer heat gains without compromising daylight harvesting and winter solar gains.

6.9. Thermal mass and internal occupant-controlled shading elements will be considered at the more detailed design stage along with heat reflective finishes of the external building surfaces.

6.10. The above shall be considered in conjunction and interrelationship with the ventilation strategy, to ensure thermal comfort for occupants and energy savings.

6.11. Heat losses from the Hot Water and Low Temperature Hot Water (LTHW) distribution network are considered to be a significant source of potential overheating in well insulated buildings. This issue can be a significant factor affecting comfort and will therefore need full consideration during the detailed design of the mechanical systems.

6.1. The issue of overheating will need detailed and considered assessment at a later stage of design on the basis that, as buildings become progressively better sealed and insulated, the potential for overheating increases. Given that the buildings will have large openable windows, it is considered probable that the risk will be mitigated, although acoustic issues will need to be taken into account, which may mean mechanical cooling is required to maintain thermal comfort levels in certain spaces.

Efficient Lighting

6.2. At this stage, detailed lighting design calculations have not yet been undertaken, but lighting design is intended to be highly efficient and in excess of Building Standards requirements. It is intended that lighting efficacy shall be in excess of 110 lumens/circuit Watt (e.g. LED).

6.3. External lighting shall be highly efficient and employ controls to avoid energy wastage from unnecessary operation during daytime.

7. LOW CARBON TECHNOLOGY APPRAISAL

7.1. Low carbon technologies are energy generation systems which offer the capability to make more efficient and effective use of primary energy resources, emitting significantly lower levels of carbon dioxide than conventional energy generation methods.

District Energy Networks (DEN)

7.2. The term “district energy” applies to the energy distribution network, rather than the origins of the energy and the extent of any carbon savings will be largely determined by the energy source and heat losses on the network.

7.3. Whilst a sufficient heating demand would exist on site, which could be satisfied by a heating network, no network presently exists, and the costs associated with establishment of a network would be very high (upwards of £2,000 per metre of pipe plus costs associated with the energy centre).

7.4. In the absence of a DEN in close proximity to the Site, it is not proposed to accommodate DEN as part of the energy strategy.

Combined Heat and Power (CHP)

7.5. Combined Heat & Power (CHP) systems generate electrical energy and provide the waste heat from the process to be used on site. They are typically gas-powered but can be run off alternative fuel sources. CHP is a highly efficient means to supply heat in developments, providing significant carbon savings and wider environmental benefits (the power generation is much less resource intensive and carbon emitting compared to grid electricity from the average UK power station).

7.6. Whilst the site has a heating demand, it is modest and likely subject to daily / weekly / yearly fluctuation due to occupancy patterns. At this scale, it is generally not economic to install CHP as smaller CHPs tend to have lower electrical efficiencies and therefore higher carbon emissions. CHP also tends to emit higher levels of NOx than other heating systems; potentially adversely impacting local air quality.

7.7. A centralised CHP plant would create complex managerial arrangements and the administrative burden of managing CHP electricity sales to grid when the power is not required on site; combined with the relatively low unit price for small volumes of exported CHP electricity can create incentives for the CHP to be installed but not operated. CHP is therefore not proposed.

8. RENEWABLE TECHNOLOGY APPRAISAL

8.1. Renewable technologies are those which take their energy from sources which are considered to be inexhaustible (e.g. sunlight, wind etc.). Emissions associated with renewables are generally considered to be negligible and the technologies are frequently referred to as “zero carbon”.

Biomass Systems

8.2. Biomass systems are heating systems that use agricultural, forest, urban and industrial residues and waste to produce heat and (depending on the system) electricity. At the building scale, biomass boilers using wood pellets or woodchips are the norm. Biomass should be sourced locally to limit “embodied carbon” associated with transport and ideally be derived from waste wood products to limit the take-up of agricultural land for fuel crops.

8.3. Whilst a sufficient heating demand exists for the application of biomass boilers, carbon emissions associated with cultivation, processing and transport of biomass are not normally considered in the context of planning or Building Regulations meaning that total carbon emissions are likely to be significantly higher than estimated.

8.4. Furthermore, the use of biomass would increase the transport in the vicinity of the site and would have a detrimental effect on local air quality. Biomass is therefore not a preferred technology for the scheme.

Heat Pumps

8.5. Heat pumps draw thermal energy from the air, water or ground (“source”) and upgrade it to be used as useful heat at another location (“sink”). Heat pumps require electricity to operate (or gas in the case of Gas Absorption Heat Pumps) as mechanical input is required to convert harvested energy to useful heat and complete its transport to the “sink”.

8.6. Heat pumps are generally considered as renewable (despite an electrical or gas requirement) because the source of the heat is the ambient temperature in the exterior environment, which is ultimately heated via the sun.

8.7. Reversible systems can provide air conditioning comfort cooling; however, when in cooling mode, the system is not considered renewable as it is not taking advantage of a renewable source of energy.

8.8. Of the heat pump options, air source heat pumps (ASHPs) have been identified as a potential viable and feasible technology.

Micro Hydro Power

8.9. Micro hydro power systems harnesses energy from flowing water by using height differences (called “head”); the minimum allowable head is 1.5m and ideally not lower than 10m. This technology is rejected on the basis that no suitable water body exists close to the site.

Micro Wind Power

8.10. Wind turbines are used to generate electricity; with power production determined by the rotation of the blades and being proportionate to the speed of their rotation. The technology is most efficient for constant, low turbulence wind profiles.

8.11. Whilst wind turbines are considered technically feasible in a limited capacity, wind speeds are relatively low and subject to turbulence. The technology is therefore likely to underperform.

8.12. Furthermore, wind turbines have the potential to affect radar. This is considered undesirable given the proximity of the Site to airport.

8.13. Given the uncertainty over performance, the fact that any contribution will likely be quite minor, micro wind turbines are not proposed for the development.

Solar Systems

8.14. Both solar thermal and photovoltaic (PV) systems convert energy from the sun into a form which can be applied within the building. Solar thermal generates energy for heating (usually for hot water) and PV generates electricity. Hybrid photovoltaic / solar thermal collectors are also available and co-generate heat and power.

8.15. To maximise the performance from the technology, the solar collectors should be pointed towards the sun; which in the UK is maximised when orientated to the south and at an angle of 30°.

8.16. PV is considered technically feasible and is proposed in order to meet policy targets. The PV array area will be maximised in the context of the available roof space and other demands on the roof space (e.g., plant equipment).

9. CONCLUSIONS

9.1. This Energy Statement provides an overview of the energy strategy in consideration of the site context, anticipated energy requirements and local priorities and initiatives.

9.2. A review of the Greater London Authority and London Borough of Hillingdon's planning policy has identified a number of requirements relating to energy. Consideration has also been given to guidance documentation supporting the London Plan.

9.3. The approach follows the Energy Hierarchy, with priority given to efficient design on the basis that it is preferable to reduce carbon emissions by reducing energy demand than through the use of low and/or zero carbon technologies.

9.4. The following passive design and energy efficiency measures are proposed:

- Windows set back to provide a degree of shading from the sun;
- Natural ventilation to allow cooling of spaces during summer months;
- Treatments to glazing to ensure good penetration of daylight but limit excess solar gain;
- Very low U-Values to preserve heat within the properties;
- Low air permeability rates;
- Careful design of the thermal bridges;
- Good lighting efficacy, likely requiring extensive use of LEDs.

9.5. Low carbon and renewable technologies have been assessed and it is proposed to incorporate:

- ASHPs for space and hot water heating;
- Roof mounted PV.

Carbon Savings

9.6. Energy modelling has been undertaken using SBEM and the carbon savings delivered by each of the three steps of the Energy Hierarchy have been estimated (indicative outputs are included in the appendices).

Table 2: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

Step	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	5.2	2.9
After energy demand reduction	4.3	2.9
After heat network / CHP	4.3	2.9
After renewable energy	2.8	2.9

Table 3: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

Step	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	(Tonnes CO_2 per annum)	(%)
Be lean: Savings from energy demand reduction	0.9	17%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	1.5	29%
Total cumulative savings	2.4	46%

9.7. The proposed energy strategy for the development will satisfy the London Plan target (Policy SI2) of 15% specific to non-residential development, with modelling indicating savings of approximately 17% from the energy demand reduction. An on-site carbon saving of >35% relative to Part L 2021 will also be achieved.

9.8. Residual emissions will be offset through a Carbon Offset payment. Using GLA's recommended price of £95 per tonne of carbon dioxide and current modelling, this cost is estimated to be ~£8,036. This will be reviewed at post construction and confirmed by the 'As Built' model.

9.9. A copy of the GLA Carbon Emission Reporting Spreadsheet is appended to this report outlining the above findings at each stage of the Energy Hierarchy.

9.10. Overall, the proposed energy strategy is considered consistent with the National Planning Policy Framework, London Plan and policies of the Council. When implemented, the scheme will provide an efficient and low carbon development.

APPENDICES

A. Planning Policies & Guidance Documents

All relevant planning policy documents have been considered as part of the preparation of this statement. Those considered of greatest pertinence to this report are presented below:

The London Plan (2021)

Policy	
Policy SI1 **Improving air quality [extract]**	[…] B) To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed: 1) Development proposals should not: lead to further deterioration of existing poor air quality […]
Policy SI 2 **Minimising greenhouse gas emissions**	A) Major development should be net zero-carbon. 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. B) Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy. C) 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. D) Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually. E) Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

Policy	
	Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.
Policy SI3 **Energy infrastructure**	A) Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development. B) Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify: 1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing) 2) heat loads from existing buildings that can be connected to future phases of a heat network 3) major heat supply plant including opportunities to utilise heat from energy from waste plants 4) secondary heat sources, including both environmental and waste heat 5) opportunities for low and ambient temperature heat networks 6) possible land for energy centres and/or energy storage 7) possible heating and cooling network routes 8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works 9) infrastructure and land requirements for electricity and gas supplies 10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector 11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures. C) Development Plans should: 1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure 2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks. D) Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

Policy	
	1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy: a) connect to local existing or planned heat networks b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required) c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network) d) use ultra-low NOx gas boilers 2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality 3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date. Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.
Policy SI 4 **Managing heat risk**	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.

Energy Assessment Guidance (2022)

Issue	
Preparing Energy Statements	This guidance document explains how to prepare an energy assessment to accompany strategic planning applications referred to the Mayor as set out in London Plan Policy SI 2. It is for anyone involved in, or with an interest in developing energy assessments including developers, energy consultants and local government officials. Although primarily aimed at strategic planning applications, London boroughs are encouraged to apply the same structure for energy assessments related to non-referable applications and adapt it for relevant scales of development. The purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

Hillingdon Local Plan Part 1 – Strategic Policies (2012)

Issue	
Policy BE1 – Built Environment	The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods, where people enjoy living and working and that serve the long-term needs of all residents. All new developments should: […] 8. Maximise the opportunities for all new homes to contribute to tackling and adapting to climate change and reducing emissions of local air quality pollutants. The Council will require all new development to achieve reductions in carbon dioxide emission in line with the London Plan targets through energy efficient design and effective use of low and zero carbon technologies. Where the required reduction from on-site renewable energy is not feasible within major developments, contributions off-site will be sought. The Council will seek to merge a suite of sustainable design goals, such as the use of SUDS, water efficiency, lifetime homes, and energy efficiency into a requirement measured against the Code for Sustainable Homes and BREEAM. These will be set out within the Hillingdon Local Plan: Part 2- Development Management Policies Local Development Document (LDD). All developments should be designed to make the most efficient use of natural resources whilst safeguarding historic assets, their settings and local amenity and include sustainable design and construction techniques to increase the re-use and recycling of construction, demolition and excavation waste and reduce the amount disposed to landfill; [...]
Policy EM1 – Climate Change Adaptation and Mitigation	The Council will ensure that climate change mitigation is addressed at every stage of the development process by: […] 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. 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, hydroelectricty 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: […]

Issue	
	14. Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.

Local Plan Part 2 - Development Management Policies (2020)

Issue	
Policy DMEI 2: 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 development 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.
Policy DMEI 3: Decentralised Energy	A. All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN). B. Major developments located within 500 metres of an existing DEN, and minor new-build developments located within 100 metres, will be required to connect to that network, including provision of the means to connect to that network and a reasonable financial contribution to the connection charge, unless a feasibility assessment demonstrates that connection is not reasonably possible. C. Major developments located within 500 metres of a planned future DEN, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be required to provide a means to connect to that network and developers shall provide a reasonable financial contribution for the future cost of connection and a commitment to connect via a legal agreement or contract, unless a feasibility assessment demonstrates that connection is not reasonably possible. D. The Council will support the development of DENs and energy centres in principle, subject to meeting the wider policy requirements of this plan and in particular on design and air quality.
Policy DMEI 14: Air Quality	A. Development proposals should demonstrate appropriate reductions in emissions to sustain compliance with and contribute towards meeting EU limit values and national air quality objectives for pollutants. B. Development proposals should, as a minimum: i. be at least “air quality neutral”; ii. include sufficient mitigation to ensure there is no unacceptable risk from air pollution to sensitive receptors, both existing and new; and iii. actively contribute towards the continued improvement of air quality, especially within the Air Quality Management Area.

B. Energy Modelling Outputs (Be Lean)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Paddington Packet - Be Lean

As designed

Date: Wed Mar 06 17:37:36 2024

Administrative information

Building Details

Address: Paddington Packet Boat, High Road, Uxbridge, Address 2, London, UB8 2HT

Certifier details

Name: Pete Jeavons

Telephone number: +44 (0) 20 7846 9041?

Address: 55a Catherine Place, London, SW1E 6DY

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.22

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

Foundation area [m²]: 335.42

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	3.03	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	2.55	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	32.28	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	26.94	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	00000002_W1
Floors	0.18	0.1	0.1	00000002_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.1	0.1	00000002_C
Windows** and roof windows	1.6	1.4	1.4	00000002_W1_O0
Rooflights***	2.2	1.4	1.4	0200001C_C_O0
Personnel doors^	1.6	1.6	1.6	00000008_W1_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average 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

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- ASHP (for space heating)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	5.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (for DHW)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.86	5.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.003
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00_WC	110	-	-
00_Reception	110	100	1.35
00_Resident Lounge	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Bedroom	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Bedroom	110	-	-
01_Ensuite	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
01_Ensuite	110	-	-
01_Circulation	110	-	-
01_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Bedroom	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Bedroom	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Bedroom	110	-	-
00_Ensuite	110	-	-
00_Circulation Area	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Bedroom	110	-	-
02_Ensuite	110	-	-
02_Bedroom	110	-	-
02_Ensuite	110	-	-
02_Circulation Area	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Bedroom Area	110	-	-
03_Bedroom Area	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
03_Circulation Area	110	-	-
03_Bedroom Area	110	-	-
03_Bedroom Area	110	-	-
02_Bedroom	110	-	-
02_Bedroom	110	-	-
01_Bedroom	110	-	-
01_Bedroom	110	-	-
04_Ensuite	110	-	-
04_Bedroom Area	110	-	-
04_Ensuite	110	-	-
04_Ensuite	110	-	-
04_Ensuite	110	-	-
04_Ensuite	110	-	-
04_Bedroom Area	110	-	-
04_Circulation Area	110	-	-
00_Storage	110	-	-
04_Plant Room	110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_WC	NO (-74.9%)	NO
00_Reception	NO (-51.3%)	NO
00_Resident Lounge	NO (-33.4%)	NO
01_Ensuite	NO (-36.5%)	NO
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Bedroom	NO (-52.6%)	NO
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Bedroom	NO (-43.6%)	NO
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Circulation	NO (-31.6%)	YES
01_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Bedroom	NO (-43.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Bedroom	NO (-52.9%)	NO
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Bedroom	NO (-66.1%)	NO
00_Ensuite	N/A	N/A
00_Circulation Area	NO (-23.1%)	NO
02_Ensuite	NO (-36.5%)	NO
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	NO (-32.2%)	NO
02_Bedroom	NO (-59.8%)	NO
02_Ensuite	N/A	N/A
02_Bedroom	NO (-54.6%)	NO
02_Ensuite	N/A	N/A
02_Circulation Area	NO (-29.9%)	NO
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	NO (-32.3%)	NO
03_Ensuite	N/A	N/A
03_Bedroom Area	NO (-67%)	NO
03_Bedroom Area	NO (-58.8%)	NO
03_Ensuite	N/A	N/A
03_Ensuite	NO (-43.5%)	NO
03_Ensuite	N/A	N/A
03_Circulation Area	NO (-42.5%)	NO
03_Bedroom Area	NO (-75.3%)	NO
03_Bedroom Area	NO (-70.6%)	NO
02_Bedroom	NO (-64%)	NO
02_Bedroom	NO (-60.8%)	NO
01_Bedroom	NO (-62.2%)	NO
01_Bedroom	NO (-59.9%)	NO
04_Ensuite	NO (-66.2%)	NO
04_Bedroom Area	NO (-63.3%)	NO
04_Ensuite	N/A	N/A
04_Ensuite	N/A	N/A
04_Ensuite	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04_Ensuite	NO (-39.8%)	NO
04_Bedroom Area	NO (-68.9%)	NO
04_Circulation Area	NO (-57.2%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1709	1709
External area [m^2]	2245.9	2245.9
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	654.82	1003.88
Average U-value [W/m^2K]	0.29	0.45
Alpha value* [%]	60.32	28.88

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
13	**Residential Institutions: Residential Schools**
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
87	**Residential Spaces**
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	7.54	7.94
Cooling	1.67	2.84
Auxiliary	0	0.62
Lighting	4.1	5.12
Hot water	4.66	5.31
Equipment*	12.43	12.43
TOTAL**	**17.97**	**21.82**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0.19
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0.19*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	107.22	130.51
Primary energy [kWh_{PE}/m^2]	26.94	32.28
Total emissions [kg/m^2]	2.55	3.03

HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	71.6	25.2	7.7	1.7	0	2.59	4.11	2.64	5.5
	Notional	76.9	45.8	8.1	2.9	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	113.4	542.5	0	0	0	0	0	0	0
	Notional	65.3	480.4	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

C. Energy Modelling Outputs (Be Green)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Paddington Packet - Be Green

As designed

Date: Thu Mar 07 17:44:37 2024

Administrative information

Building Details

Address: Paddington Packet Boat, High Road, Uxbridge, Address 2, London, UB8 2HT

Certifier details

Name: Pete Jeavons

Telephone number: +44 (0) 20 7846 9041?

Address: 55a Catherine Place, London, SW1E 6DY

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.25

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

Foundation area [m²]: 335.42

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	3.03	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	1.65	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	32.28	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	17.26	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	00000002_W1
Floors	0.18	0.1	0.1	00000002_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.1	0.1	00000002_C
Windows** and roof windows	1.6	1.4	1.4	00000002_W1_O0
Rooflights***	2.2	1.4	1.4	0200001C_C_O0
Personnel doors^	1.6	1.6	1.6	00000008_W1_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average 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

Appendices

Paddington Packet Boat, High Road, Uxbridge

Project Number: WIE18432

Document Reference: WIE18432.109.R.1.1.1

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- ASHP (for space heating)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (for DHW)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.2	5.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.003
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00_WC	110	-	-
00_Reception	110	100	1.35
00_Resident Lounge	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Bedroom	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Ensuite	110	-	-
01_Bedroom	110	-	-
01_Ensuite	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
01_Ensuite	110	-	-
01_Circulation	110	-	-
01_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Bedroom	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Bedroom	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Ensuite	110	-	-
00_Bedroom	110	-	-
00_Ensuite	110	-	-
00_Circulation Area	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Ensuite	110	-	-
02_Bedroom	110	-	-
02_Ensuite	110	-	-
02_Bedroom	110	-	-
02_Ensuite	110	-	-
02_Circulation Area	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Bedroom Area	110	-	-
03_Bedroom Area	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-
03_Ensuite	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
03_Circulation Area	110	-	-
03_Bedroom Area	110	-	-
03_Bedroom Area	110	-	-
02_Bedroom	110	-	-
02_Bedroom	110	-	-
01_Bedroom	110	-	-
01_Bedroom	110	-	-
04_Ensuite	110	-	-
04_Bedroom Area	110	-	-
04_Ensuite	110	-	-
04_Ensuite	110	-	-
04_Ensuite	110	-	-
04_Ensuite	110	-	-
04_Bedroom Area	110	-	-
04_Circulation Area	110	-	-
00_Storage	110	-	-
04_Plant Room	110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_WC	NO (-74.9%)	NO
00_Reception	NO (-51.3%)	NO
00_Resident Lounge	NO (-33.4%)	NO
01_Ensuite	NO (-36.5%)	NO
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Bedroom	NO (-52.6%)	NO
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Bedroom	NO (-43.6%)	NO
01_Ensuite	N/A	N/A
01_Ensuite	N/A	N/A
01_Circulation	NO (-31.6%)	YES
01_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Bedroom	NO (-43.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Bedroom	NO (-52.9%)	NO
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Ensuite	N/A	N/A
00_Bedroom	NO (-66.1%)	NO
00_Ensuite	N/A	N/A
00_Circulation Area	NO (-23.1%)	NO
02_Ensuite	NO (-36.5%)	NO
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	N/A	N/A
02_Ensuite	NO (-32.2%)	NO
02_Bedroom	NO (-59.8%)	NO
02_Ensuite	N/A	N/A
02_Bedroom	NO (-54.6%)	NO
02_Ensuite	N/A	N/A
02_Circulation Area	NO (-29.9%)	NO
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	N/A	N/A
03_Ensuite	NO (-32.2%)	NO
03_Ensuite	N/A	N/A
03_Bedroom Area	NO (-67%)	NO
03_Bedroom Area	NO (-58.8%)	NO
03_Ensuite	N/A	N/A
03_Ensuite	NO (-43.5%)	NO
03_Ensuite	N/A	N/A
03_Circulation Area	NO (-42.5%)	NO
03_Bedroom Area	NO (-75.3%)	NO
03_Bedroom Area	NO (-70.6%)	NO
02_Bedroom	NO (-64%)	NO
02_Bedroom	NO (-60.8%)	NO
01_Bedroom	NO (-62.2%)	NO
01_Bedroom	NO (-59.9%)	NO
04_Ensuite	NO (-66.2%)	NO
04_Bedroom Area	NO (-63.3%)	NO
04_Ensuite	N/A	N/A
04_Ensuite	N/A	N/A
04_Ensuite	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04_Ensuite	NO (-39.8%)	NO
04_Bedroom Area	NO (-68.9%)	NO
04_Circulation Area	NO (-57.2%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1709	1709
External area [m^2]	2245.9	2245.9
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	654.82	1003.88
Average U-value [W/m^2K]	0.29	0.45
Alpha value* [%]	60.32	28.88

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
13	**Residential Institutions: Residential Schools**
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
87	**Residential Spaces**
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	4.97	7.94
Cooling	1.67	2.84
Auxiliary	0	0.62
Lighting	4.1	5.12
Hot water	4.16	5.31
Equipment*	12.43	12.43
TOTAL**	**14.91**	**21.82**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	3.39	0.19
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*3.39*	*0.19*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	107.22	130.51
Primary energy [kWh_{PE}/m^2]	17.26	32.28
Total emissions [kg/m^2]	1.65	3.03

HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	71.6	25.2	5.1	1.7	0	3.92	4.11	4	5.5
	Notional	76.9	45.8	8.1	2.9	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	113.4	542.5	0	0	0	0	0	0	0
	Notional	65.3	480.4	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

D. GLA Spreadsheet Outputs

Non-residential

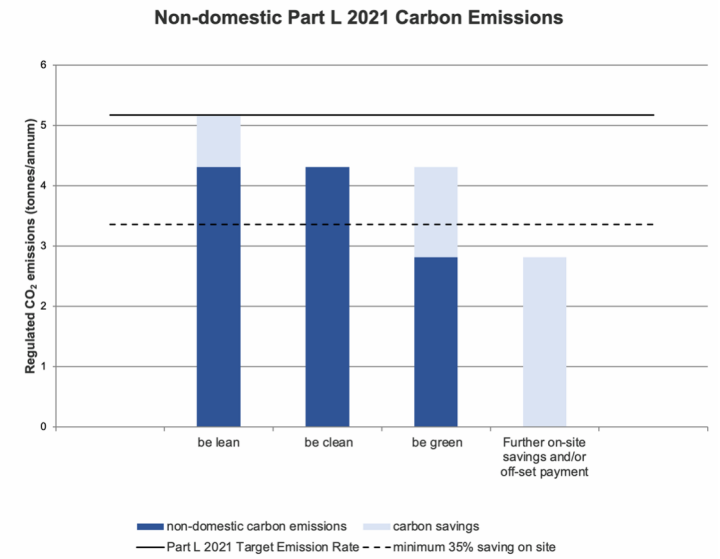
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	5.2	2.9
After energy demand reduction (be lean)	4.3	2.9
After heat network connection (be clean)	4.3	2.9
After renewable energy (be green)	2.8	2.9

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.9	17%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	1.5	29%
Total Cumulative Savings	**2.4**	**46%**
Annual savings from off-set payment	2.8	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**85**	-
Cash in-lieu contribution (£)	**8,036**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



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