ENERGY STATEMENT

for

The Proposed Development

at

Hillingdon Water Sports Facility & Activity Centre

By

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1.0 INTRODUCTION

This report has been produced to support the planning application for the proposed development at Hillingdon Water Sports Facility & Activity Centre. It sets out the policy framework and the proposed approach to energy and sustainability.

1.1 Sustainability Targets

The sustainability targets set for the development are as follows;

(1) Achieve a Building Emission Rating (BER) that is lower than the Target Emission Rating (TER) for compliance with the Building Regulations Part L 2021.

(2) Achieve a Building Primary Energy Rating (BPER) that is lower than the Target Primary Energy Rating (TPER) for compliance with the Building Regulations Part L 2021.

(3) To achieve a 35% CO2 reduction compared to 2013 Building Regulations with 2021 uplift.

1.2 Planning Policy

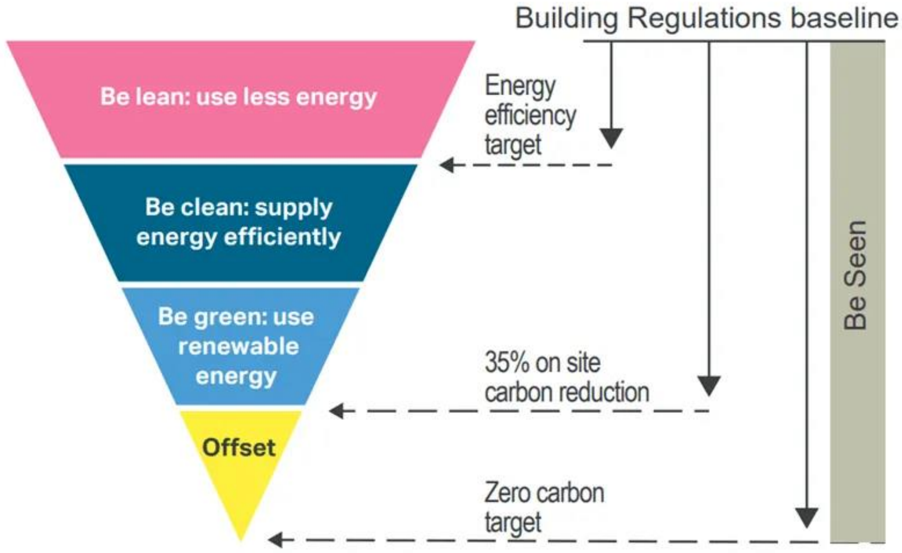
The London Plan 2021 Policy SI 2 sets out a clear energy hierarchy to reduce operational carbon emissions from new developments. The policy requires all major developments to be net-zero carbon. This is achieved through energy hierarchy “Be Lean, Be Clean, Be Green. Be Seen”.

In addition to this the policy also states a minimum on-site reduction of 35% in regulated carbon emissions beyond the standards of Part L of the Building Regulation (2013 with 2021 uplift). For non-residential buildings, at least 15% of this reduction must come from energy efficiency measures.

The residual carbon shortfall (below net zero) will be offset through a carbon offset contribution, in line with the local authority’s guidance

1.3 Design Approach

The design team’s approach to energy strategy is to follow the industry’s best practice guidance and can be generally summarized using energy hierarchy and principles of “be lean, be clean and be green” for energy management. The philosophy behind the approach is to reduce the building’s demand for natural resources using passive design measures, before using low carbon and renewable technologies.



Be Lean:

- The building has been designed to have a high fabric efficiency and air permeability target. All external elements will show an improvement of the Building Regulations Part L 2021 U value targets resulting in low wintertime heating loads.
- The spaces are equipped with large glazing units to improve daylight provision and reduce artificial lighting use.

Be Clean:

- The proposed system specification capitalizes on the ongoing grid decarbonization in providing an all-electric building solution.
- A high-efficiency central water source heat pump serves the buildings heating loads.
- The majority of occupied spaces are naturally ventilated, with other occupied spaces served by Mechanical Ventilation Heat Recovery where necessary, to maintain comfortable internal conditions and mitigate against overheating.

Be Green:

- A solar PV array is proposed to cover the roof of the building. Favourably orientated and with minimal overshading, the array will complement the building's all-electric energy generation. The operational schedule of the building also coincides with peak generation times increasing the system's viability and carbon emission reduction potential.

Be Seen:

- A plan will be developed to monitor, verify, and report on energy performance post-construction, in accordance with the GLA's 'Be Seen' guidance.

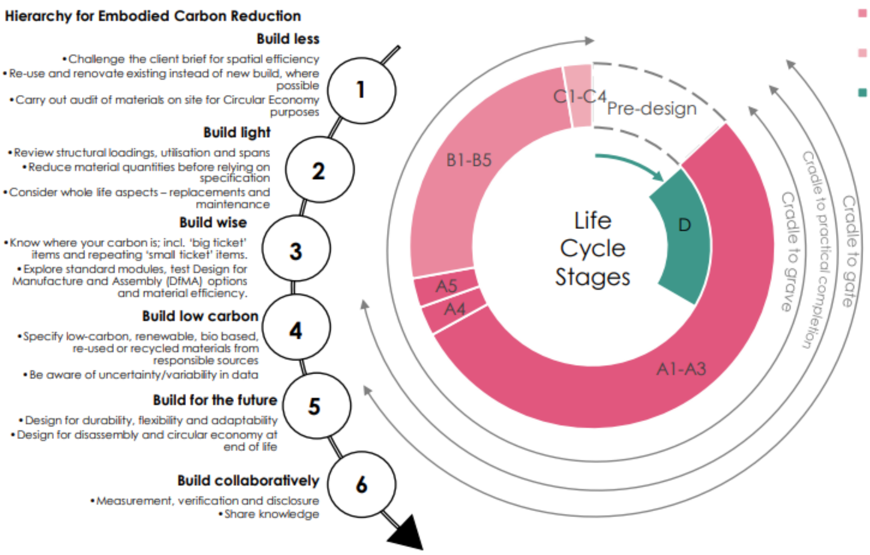
1.4 Methodology

The National Calculation Methodology (NCM) used to determine the CO_2 emission rates and Primary Energy Rates was IESVE 2021 producing a Building Regulations UK Part L (BRUKL) report. The Part L assessment software produces evaluations of energy use in non-residential buildings for compliance with the Building Regulations and Building Energy Performance Certification (EPC) purposes.

A Notional Building of the same geometry, space use, construction and specific features for HVAC, DHW and Lighting systems is generated along with the actual building that is assessed. Compliance with Part L is based on the comparison between the energy use and Target Emission Rate (TER) and Target Primary Energy Rate (TPER) derived from the notional and the energy use and the actual Building Emission Rate and actual Building Primary Energy Rate where the actual building emission rate and actual building primary energy rate must be less than or equal to the target emission rate and target primary building rate respectively.

Please note that the NCM calculations are designed as a compliance tool only and do not necessarily represent the finished buildings energy consumption in real-life operation.

The building will also be designed in accordance with the UKGBC framework methodology and the project will target <300kgCO_2/m^2 embodied carbon. This will be achieve by following the hierarchy for embodied carbon reduction as detailed below.



2.0 Part L Modelling Inputs

This section details the parameters and assumptions used in modelling the proposed building.

The model geometry has been created following drawings issued by Haverstock LLP dated August 2024.

Dynamic thermal modeling has been undertaken using approved modelling software IESVE, using the approved CIBSE London TRY weather file.

2.1 Building Fabric

Building envelope performance is key to demonstrating Part LV2 (2021) compliance. The enhancement of U-values whilst limiting thermal bridging and uncontrolled air ingress/leakage (air permeability) can significantly reduce the energy demand of the building. As such the building envelope is proposed to achieve an excellent standard of thermal insulation with limited thermal bridging* and optimised air tightness

The following table summarises the proposed buildings fabric U-value performances:

Building Element	Thermal Transmittance U-value ($W/m^2.K$)
Insulated wall elements	0.20
**Glazing (incl. curtain walling)	1.40
Ground contact/Exposed floors	0.15
Roof	0.15
Opaque Personnel Doors	1.40

* **Default Part LV2 (2021) thermal bridging factors** applied to all thermal elements (10%)

** **Glazing for the Crew Wellbeing Room** modelled with a **G-value of 0.26 (26%), All other glazing** modelled with a **G-value of 0.40 (40%) and Light Transmittance rating of 70%**

2.1.1 Air Permeability

An 'As-Built' building air permeability target of $5.0m^3/hr.m^2$ is targeted

2.1.2 Lighting Scheme Efficiency and Associated Controls

Lighting energy consumption represents the main source of 'regulated' (Part LV2) CO_2 emissions and for this reason the proposed compliance strategy is heavily reliant upon the specification of highly efficient (ambient lighting) luminaires throughout the building. It is currently proposed that LED luminaires are to be specified which help to achieve demanding performance targets.

In summary, it is proposed that **luminaire lumens/circuit watt values** are 120lm/W throughout the proposed buildings and that brightness (Lux) levels are both carefully specified as not to be excessive whilst still meeting specific design requirements.

In terms of lighting controls:

- The use of **occupancy presence sensors** is proposed in Circulation zones, WCs, and Store Rooms – AutoON/AutoOFF.
- The use of **occupancy absence sensors** is proposed in Office Areas. – Manual On/Auto Off.
- The use of **Photoelectric daylight dimming sensors** is proposed for the Office spaces and Reception area.
- **Lighting control parasitic power consumptions** are to be minimised (<$0.10W/m^2$ per area/room served)

2.1.3 Thermal Mass

Exposed thermal mass (heavyweight building fabric) is an important thermal comfort design consideration, especially for naturally ventilated spaces. As the building is predominately mechanically ventilated, thermal mass exposure becomes less of a concern, however, architectural design is encouraged to expose building thermal mass where at all possible as this serves to help maintain a more stable and thermally comfortable internal environment.

2.1.4 Auxiliary Energy (Fans/Pumps/Controls)

'Auxiliary energy' (fans/pumps/controls) consumption is a key Part LV2 consideration of 'regulated' (Part LV2) CO_2 emissions. For this reason, the following design measures/specifications are proposed to be implemented:

- **MVHR specific fan powers (SFPS') are to be minimised** – in some instances this may require significant oversizing of units in order to enable efficient fan speed operation
  - **Mechanical Ventilation Heat Recovery supply and extract systems with will target 1.80W/l.s in the following areas,**
    - ***All Changing Rooms and Associated Areas***
    - ***Training Room, Operations Office***
    - ***Observation Area***
  - **High efficiency heat recovery (≥ 75%) is also proposed**
  - **Extract Ventilation from WCs is proposed to be 0.5W/l/s**

2.1.5 DHW Generation

It is proposed that DHW will be met by a Water Source Heat Pump and a storage capacity of 4000 litres for the Operations Building and 1200litres for the Camp Building.

2.1.6 Space Heating

The buildings heating demands are proposed to be met with underfloor heating served by a water source heat pump.

- SCOP: 3.0 kW/kW

2.1.7 Renewables

The feasibility of effectively and efficiently incorporating renewable technologies into the development has been analysed. An overview of each of the renewable energy technologies assessed in this study are as follows. The technologies have been given a feasibility status of: 'Recommended', 'Considered', or 'Not Recommended' for the described reasons. Wind power has been discounted as there are no viable locations to locate wind turbines and they would likely be a hazard to the local wildlife. Biofuel has also been discounted as biomass deliveries by heavy goods vehicles are not feasible due to site constraints and would have associated noise and safety considerations.

Combined Heat and Power

Overview	A CHP engine maximises fuel and converts it into electricity, increasing the efficiency of a power generation system. Waste heat is recovered from the engine by removal from the exhaust, water jacket and oil cooling circuits, and is redirected as useful heat energy. This reduces energy consumption and resulting carbon dioxide emissions.
Status	Not Recommended
Reasons	Electrical output from CHP can be very small, Larger units are typically more noisy.

Solar/Photovoltaics

Overview	Photovoltaics (PV) modules convert sunlight directly to DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases silicon. When sunlight shines on the cell it creates an electric field causing electricity to flow: the greater the light intensity, the greater the flow of electricity. Individually, PV cells only provide a small amount of electricity, and they are generally grouped together into a module for convenience and higher output.
Status	Recommended
Reasons	- The orientation of the building and the roof structure means space is available to implement this system. - The roof is not overshadowed and will be of suitable construction to accommodate this type of system.

Ground Source Heat Pump

Overview	Space heating and cooling can be provided by circulating water through the ground or via subterranean water. Ground water cooling and heating makes use of the relatively stable ground/water temperatures throughout the year, typically ranging between 10-14°C. The heat pump extract or dumps heat to the ground via a ground contacting heat exchanger. Ground source heat pumps require no flues and have no acoustic issues.
Status	Considered – Not Recommended
Reasons	- Constrained site with no obvious location to site bore holes - Significant additional capital cost

Air Source Heat Pump

Overview	Works in a very similar way to a ground source heat pump extracting heat energy from the air to provide heating to a building or hot water system. The heat pump extracts or dumps heat to the outside air via a heat exchanger. Air source heat pumps require no flue.
Status	Considered – Not Recommended
Reasons	- Noise Concerns for the local environment and wildlife may preclude its use on this development.

Water Source Heat Pump

Overview	A water source heat pump (WSHP**)** extracts low-grade heat from a nearby water body—such as a river, lake, aquifer, or even wastewater—and upgrades it to a usable temperature for space heating or hot water in buildings.
Status	Recommended
Reasons	- High Efficiency and able to provide a stable environment - Suitable for this site due to the nearby stable water source.

Energy Storage

Energy storage, such as solar battery storage, is available and will be proposed for this development due to potential on-site generation from photovoltaic panels. The battery storage will be used for power for the DHW generation when power from the PV panels is not fully available. In addition to this there will be an opportunity to feed the energy back into the grid as part of a frequency stabilisation scheme during closed periods as the expected occupancy and use of the buildings are only between April and October.

Measures to be Adopted

WSHP will be fully adopted. In addition, the use of photovoltaics panels will be implemented and the building will be designed to maximize the usefulness of this technology.

Photovoltaic panels (panel efficiency of 20.1%) with an orientation permitted by the build's orientation (East Facing) and an inclination of 15° has been assessed for the unit.

The amount of PV proposed for the site is 500m^2. This will be installed on the Safety Zone building and metering to each building individually.

Approximately 440m^2 will be metered to the operations building and a minimum of 60m^2 will be metered to the Camp Zone Building. Although it may be possible to reduce these amounts as the design is developed and manufacturers' efficiencies are known.

3.0 Energy Modelling Inputs and Assessment Methodology

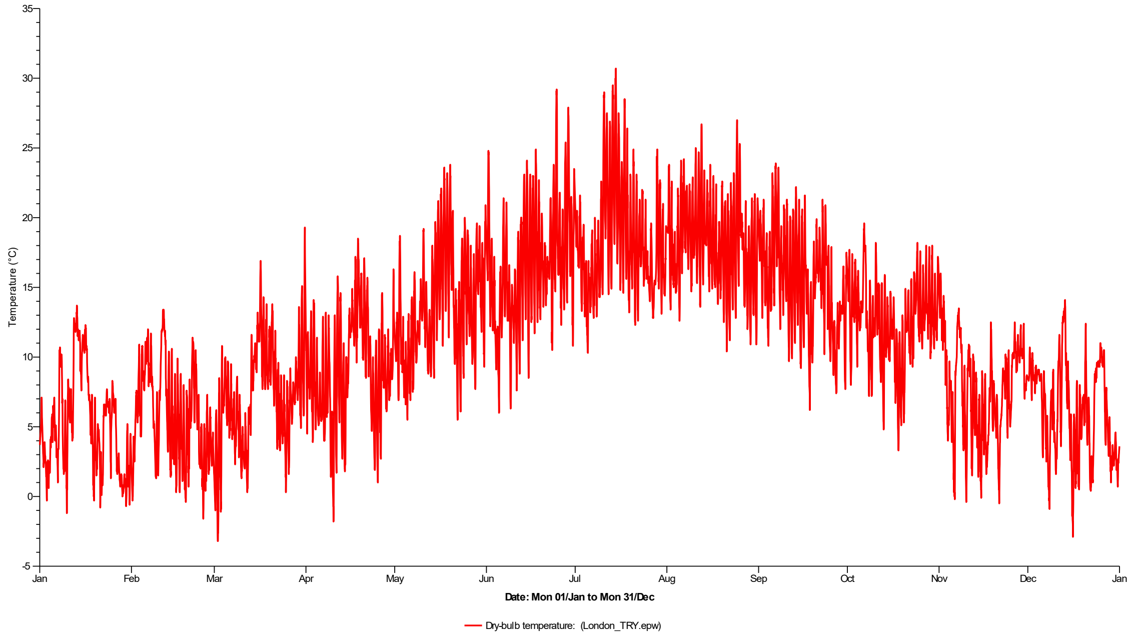
Analysis has been performed in order to access the currently proposed architectural and engineering services strategy in terms of total annual operational energy consumption and associated carbon dioxide (CO_2) emissions.

As required, the performance of the proposed design has been benchmarked against the Part LV2 (2021) Notional target building. IES version. 2024.1.0.0, VE Compliance version. 7.0.28.0 has been used, and specifically the following modules:

- 3D Modeller – to create the building model data such as geometry, site location and orientation.
- Building Simulator - used to assign proposed fabric performances, assign room usage type templates.
- Daylight Analysis – to calculate the daylight factors for each space.
- UK Building Regulation 2021 Studio –used to define the proposed HVAC and lighting strategies and perform the annual operational energy/CO2 emissions calculations for both the 'Actual' design and the Part LV2 2021 Notional Building.

3.1 Weather Data

Iterative annual simulations adopted the mandatory Part LV2 2021 national calculation methodology (NCM) and the CIBSE London TRY weather data set:



CIBSE London TRY Weather – External Dry Bulb Temperature

3.2 Assigned NCM Building Class:

- **Proposed Leisure Building:** D2: General Assembly and Leisure (Sports Centre)

Building geometry, fabric constructions and HVAC/LZC systems have been input in accordance with the National Calculation Methodology and represent the proposed architectural, mechanical and electrical design.

3.3 Regulated and Non-Regulated Energy

Building Regulations Part LV2 (2021) compliance calculations are concerned with measuring the performance of the actual building against a ‘Notional’ compliant building in terms of ‘regulated’ energy/CO2 emissions only.

Regulated energy includes that associated with;

1. Space heating and cooling generation
2. DHW generation
3. Auxiliary energy (fans/pumps/controls)
4. Internal Lighting (external lighting is excluded)

In line with Part LV2 a ‘regulated energy’ approach to calculating the energy demand/CO2 emissions has been taken.

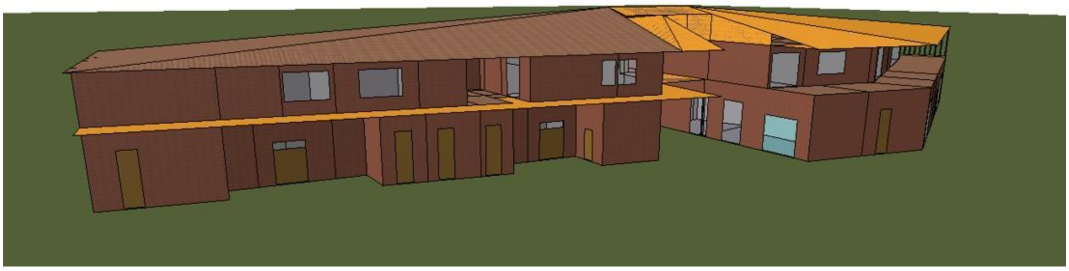
3.4 Architectural Drawings Details

The proposed buildings were developed based on the following architectural drawings as issued August 2024;

- 1329-1020 – Site Plan
- 1329-1001-D – Building Floor Plans
- 1329-1010-A – Building Roof Plans
- 1329-2002 – Operations Building Elevations 1 of 2
- 1329-2003 – Operations Building Elevations 2 of 2
- 1329-2006 – Camp Zone Elevations

3.5 Thermal Model Visualisations

The following IESVE image illustrate the Proposed Operations building.



4. Energy Hierarchy – Energy and Carbon Emissions by Use

In summary and as shown within the energy hierarchy performance tables and summary chart below the combined Lean, Clean and Green Buildings **achieves >35% regulated CO2 emissions reduction vs a Part LV2 2021 compliant target emission rate (TER).**

Operations Building

CO2 emissions (Tonnes CO2 per yr)		Primary Energy Consumption (kWh/m^2 per yr)	
Baseline: Part L 2021	Proposed Design	Baseline: Part L 2021	Proposed Design
9.61	6.23	102.99	62.93

Camp Zone Building

CO2 emissions (Tonnes CO2 per yr)		Primary Energy Consumption (kWh/m^2 per yr)	
Baseline: Part L 2021	Proposed Design	Baseline: Part L 2021	Proposed Design
10.39	6.30	111.77	62.99

This level of performance demonstrates compliance with Criterion 1 of Part LV2 (2021) and therefore also satisfies the requirement of London Plan Policy SI 2

Lifecycle Cost of Photovoltaics

For Life Cycle Costing Analysis and payback periods, the following fuel costs will be used, mains electricity 25p/kW and natural gas 7p/kW.

PV panels are still relatively expensive and generate approximately 350-400 watts per m2 of panel area, so a considerable area of panels is required to generate a meaningful electrical supply.

The generation of the electrical supply is constant, even if there is no electrical load in the building to use it, but what electricity is not used can be transported to other buildings on site or sold back to the national grid.

The annual fuel cost saving from the PV system being adopted is as follows;

Annual Yield of Electricity Generated by the measured PV Array (500m^2) = 80896 kWh

Annual Fuel cost saving = 80896 x £0.25/kW = £20224

The expected cost of the proposed PV array is approximately £150000

Therefore the expected payback period is expected to be approximately 7-8 years.

Available Grants

The installation of renewable technologies and LZC systems are being actively encouraged by central Government and grants to help with cost of installing systems are often available.

However, many grants have limited funds or run for limited periods depending on the technology being encouraged at the time the development is constructed.

Presently the only fund available is the Industrial Energy Transformation Fund (IETF).

The above grant can be found on the BEIS website, www.gov.uk

5. CONCLUSIONS

This Energy Strategy overview has assessed the service strategy and likely energy consumptions and CO_2 emissions for the proposed development at Hillingdon Water Sports Facility & Activity Centre

This document demonstrates how improvement on the baseline carbon emissions has been achieved, in accordance with the energy hierarchy (lean, clean and green):

- Lean – Measures include U-values that better Part LV2 (2021) requirements, minimised thermal bridging, and robust air tightness
- Clean – Space, DHW and air heating and cooling requirements met via WSHP.
- Green – implementing LZC technologies to further reduce the CO2 emissions from the building.

The proposed buildings have been shown to be able to meet the minimum for Part LV2 compliance and Policy SI 2 of the London Plan.

Whilst the development does not achieve Net Zero, offset payments are likely to be required. However, should Net Zero be targeted the operations building will require approximately 1100m^2 of PV and the Camp Zone will require approximately 130m^2 of PV.