The People's Project

Bramley-Moore Dock – Planning Addendum

Energy Statement

September 2020

BUROHAPPOLD ENGINEERING

The People's Project

Energy Statement

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1 Executive Summary

1.1 Executive Summary

This Energy Statement has been prepared on behalf of Everton Stadium Development Limited to support a full planning application for the development of a stadium (52,888 seat capacity) with associated facilities and infrastructure at Bramley-Moore Dock, Liverpool (hereafter referred to as 'BMD').

The statement sets out the energy strategy for the proposed development, in line with planning policies and the Key Performance Requirements established in conjunction with The Club and laid out in Buro Happold's Sustainability Performance Framework.

In order to achieve these set targets, MEAN, LEAN and GREEN energy efficient strategies have been proposed in the design. These include, but are not limited to:

- Improved thermal performance of the building envelope against minimum building regulations requirement;
- Improved glazing performance to reduce unwanted solar gain whilst maintaining the potential for daylight against minimum building regulations requirement;
- High efficiency heat-recovery devices to harness energy within exhausted air and recirculate it back into the building to reduce heating and cooling loads;
- Centralised heating plant to allow for ease of future connection to a district heat network; and
- Efficient lighting and lighting controls.

The following GREEN energy generation strategies have been proposed:

- Photovoltaic array generating 312 MWh/yr of renewable energy (this equates to 2,050m2 of active PV area which is proposed to be constructed on the stadium's south stand roof);
- Utilising battery storage and smart grid technologies.

1.2 Part L Results Summary

The results from Building Regulations Part L calculations for The People's Project demonstrated that the above energy efficiency design strategy has the potential to reduce the regulated carbon emissions by at least **4%** compared to the target notional building and therefore meet the Building Regulations.

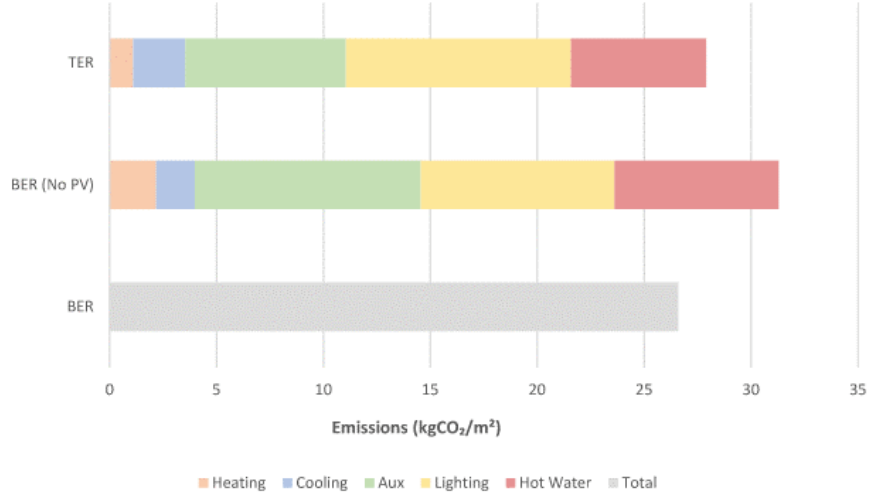

Figure 1-1 - Part L Target and Buildings Emissions Ratings (with and without electrical generation via PV)

2 Introduction

2.1 Scope of the document

This Energy Statement has been prepared on behalf of Everton Stadium Development Limited to support a full planning application for the development of a stadium (52,888 seat capacity) with associated facilities and infrastructure at Bramley-Moore Dock, Liverpool (hereafter referred to as 'BMD').

This statement describes the energy objectives and strategy for the project, demonstrating compliance with national legislation, local planning policy and stakeholder aspiration. It responds directly to building regulations Part L by demonstrating that the energy and CO_2 performance required by the policies can be achieved and that the aspirations established with the client in Buro Happold's Sustainability Performance Framework (also submitted with the full planning application) are embedded in the proposed development.

2.2 Proposed Development

A detailed description of the proposed development is provided in the Planning Statement and Environmental Statement submitted with the full planning application. In summary, the proposed development is for a 52,888 seat capacity stadium with associated facilities and infrastructure.

To enable the proposed development, all buildings will be demolished with the exception of the Grade II listed Hydraulic Tower, which will be retained. The Grade II listed BMD walls will also be retained and infilled, with a shallow water channel, oriented north to south, to be excavated from the infill on the western side of the dock.

A Fan Zone (public realm area) is proposed to the east of the site between the stadium and Regent Road. Within the Fan Zone, the existing BMD wall coping will be exposed within the external hard landscaping / public realm works. The Hydraulic Tower will be incorporated into the Fan Zone and potentially used as an exhibition/cultural centre. Any physical works (internal or external) to the tower will be subject to appropriate listed building consent submissions.

Three additional site access points are proposed through the Regent Road wall to enable pedestrian access to the site via the Fan Zone. The existing northern and southern access points are proposed to be maintained for both pedestrian and vehicular access (subject to appropriate management).

A Distribution Network Operators compound with switch rooms and transformers (DNO compound) is proposed at the north of the West Quay area adjacent to an Outside Broadcast (OB) compound. Refer to the Pattern and Plan-It drawings submitted with the planning application.

An area of hardstanding outside Sandhills station will be constructed to provide a suitable area for pedestrians to wait in a safe environment whilst they wait for trains at Sandhills in the post-match / post event period. The facility will be located on land owned by Merseytravel. It is envisaged that this would be secured via a Section 106 contribution. Other specific off-site infrastructure works currently designed as part of the proposed development include the following, which are all described in detail in the Transport Assessment (Appendix 7.1, ES Volume III):

- Regent Road cycle lane changes;
- New controlled parking zone (for residents and businesses);
- Minor signing and lining to re-enforce existing parking restrictions;
- Changes to bus stops and parking bays on Sandhills Lane.

In addition to the above, the proposed development would include installation of future connection points for the new electrical supplies involving installation of electrical cables from the crossroads on Great Howard Road (A565) with Blackstone Road (A5054), as well as the requirement for trenching along Blackstone Road and the recently upgraded Regent Road for cables to enter site via the southern entrance.

Stadium Activity / Use

The proposed stadium will primarily cater for football and it is anticipated that a total of 28 games (19 of which are league home fixtures) would be played per season (subject to Everton's progress in Domestic and European cup competitions). A further 4 no. non-football major events (at full capacity), such as concerts or non-football sporting events (boxing, rugby etc.) are also proposed.

The stadium also will accommodate the club's ticket office and club shop. The hospitality areas proposed in the east stand (to be used as a café on non-football / major event days) and west stand (to be used as a restaurant) will also have public access. In addition, the following events may also take place throughout the year:

- Meetings/Conferences – potential for up to 261 days per year
- Exhibitions/Conventions – potential for up to 339 days per year
- Weddings – potential for up to 79 days per year
- Funerals – potential for up to 261 days per year
- Banqueting – potential for up to 339 days per year
- Christmas Parties – potential for up to 27 days per year
- Stadium Tours – potential for up to 339 days per year

The Hydraulic Tower is intended to function as an exhibition/cultural space at the start/end point for the River Walk (to be connected to the wider approved Liverpool Waters scheme).

Off-site infrastructure works may comprise:

- Implementation of queue management systems at Sandhills station to maintain safety. It is anticipated that a crowd corralling area will be required at land owned by Merseytravel adjacent to the existing station access (waiting area required to enable managed access to the platform post-match);
- Highways works (S278 works); and
- Improvement works to infrastructure including utilities (detailed report submitted with planning application).

2.3 Liverpool Waters – Future Baseline

2.3.1 Liverpool Waters

Peel Land & Property secured outline planning permission (LPA ref. 10O/2424 – latest non-material amendment is ref. 19NM/1121) in 2013 for a mixed-use development comprising a maximum of 1,690,000m² of mixed use including 9,000 dwellings and 310,000m² of office space (figures rounded). The site stretches from Princes Dock in the south to Bramley-Moore Dock to the north. The timeframe for full delivery of the scheme at the time of planning application was 2041.

Developments which have been consented at Princes Dock and the Liverpool Waters site since planning approval include the standalone applications. The Lexington (16F/1370 304 apartments), Quay Central and Park Central (17F/1628 2 blocks of 237 apartments), Liverpool Cruise Liner Terminal (17O/3230) and Isle of Man Ferry Terminal (18F/323).

Since planning permission was granted, Peel Land & Property has submitted a series of discharge of conditions applications, reserved matters and non-material amendment applications. A neighbourhood masterplan for the Central Docks has been submitted (ref:19DIS/1315) in accordance with the requirements of the planning conditions attached to the outline planning permission and was approved on the 12th November 2019.

2.3.2 Bramley-Moore Dock

It should be noted that the proposed stadium site is located within the Northern Docks (comprising Nelson Dock and Bramley-Moore Dock) proposed in the Liverpool Waters planning application for development to take place between 2036 and 2041 for the following uses:

- C3 Dwellings- 219,500m².
- A1 Retail- 5,000m².
- A2 Financial & Professional services- 300m².
- A3 Food & drink- 2,200m².
- A4 Drinking establishments- 1,200 m².
- B1 Business- 1,800m²
- D1 Non-Residential Institutions- 6,600m².
- D2 Assembly and Leisure-1,000m².
- Sui Generis- 1,000m²

The amount of the development listed above which relates to Bramley-Moore Dock (excluding Nelson Dock) is not specified in the permission, which details the amount of development per Neighbourhood only.

2.4 Energy Strategy Implications of Liverpool Waters

As part of the Liverpool Waters development to the South of Bramley Moore Dock, Peel Energy have developed a heat network proposal to serve the development. The scheme is known as "Mersey Heat" and is to serve the developments to the South of Liverpool Waters initially (around Princes Parade) before being expanded in a phased approach to serve developments to the North towards Bramley Moore Dock. At the time of writing the installation of the pipework to serve the initial phases is underway. Mersey Heat is a registered company owned by Peel Energy who will own the network and associated assets.

A number of heat generation technologies have been considered during the design period of the project such as biomass and combined heat and power (CHP). The current proposal is for the network to be served by ground source heat pumps with gas fired boilers for backup. This has been proposed due to the reduced carbon emissions which could be realised with a heat pump solution. Planning permission has been granted to install a district heating network servicing Central Docks South, and Central Government funding has been secured via HNIP (Heat Network Investment Project).

3 Planning Policy Context

3.1 Scope of the policy review

Section 38(6) of the Planning and Compulsory Purchase Act 2004 and Section 70(2) of the Town & Country Planning Act 1990 require that planning applications to be determined in accordance with the statutory development plan, unless material considerations indicate otherwise. The statutory development plan for the City of Liverpool currently comprises the Unitary Development Plan (adopted 2002).

An overview of the key policy and sector drivers relevant to the energy strategy of the TPP is provided in this chapter. A number of national and local policies have driven the choice of energy strategy, especially those relating to sustainability. The UK Sustainable Development Strategy 'Securing the Future' sets out the UK Government's approach to delivering sustainable development, and is defined as follows:

> "*The goal of sustainable development is to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations*".

Whilst the Liverpool UDP is the statutory development plan, given that it was adopted in 2002, an overview of the relevant national planning policies and guidance is provided before summarising the relevant 'saved' plan policies. It is acknowledged at the outset that the NPPF is a material consideration in assessment of the planning application (likewise is the draft Liverpool Local Plan although full weight cannot be afforded to relevant policies as it has yet to be formally examined in public).

3.2 National Scale

3.2.1 Climate Change Act 2008

The Climate Change Act 2008 sets a target for the UK to achieve an 80% reduction in CO_2 emissions on the 1990 baseline by 2050 and a 34% reduction by 2020.

3.2.2 Building Regulations Part L

The Buildings Regulations Part L: conservation of Fuel and Power facilitate carbon reduction in the built environment by specifying maximum allowable emissions rates per unit area of buildings.

Results from the Part L model have formed the baseline energy target for the building as well as informing design decisions such as the requirements for renewables and other MEP design aspects such at the space heating and domestic hot water strategies. The results have also informed the baseline, stretch and pioneering energy targets within the sustainability framework proposed by BuroHappold.

3.2.3 National Planning Policy Framework

The National Planning Policy Framework (NPFF) ensures that local planning systems contribute to the achievement of sustainable development, as set out in "Securing the Future'. The NPPF underpins planning policy at a national level, as published by the Department for Communities and Local Government (updated February 2019). The key objectives of this are summarised in the figure below.

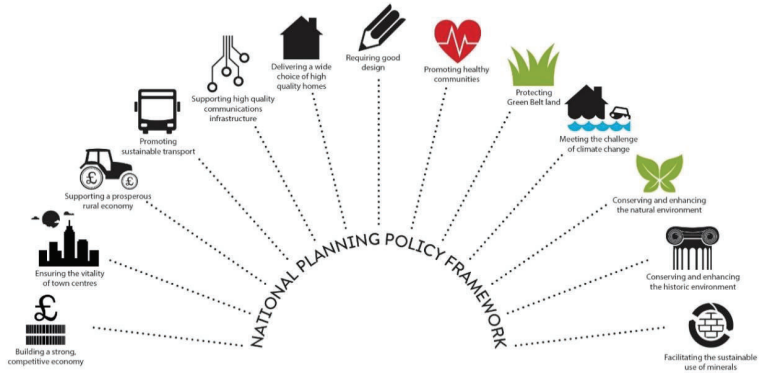

Figure 3-1 - National Planning Policy Framework Key Objectives

3.3 Regional Scale

3.3.1 Climate Emergency Declaration

In May 2019, the Liverpool City Region Combined Authority declared a climate emergency.

The Combined Authority has committed to producing a Climate Action Plan by December 2019 in which it will set out how it plans to tackle the climate emergency. A number of key policies have however already been introduced, including:

- A Zero Carbon target of 2040;
- A £10m Green Investment Fund;
- The Mersey Tidal Commission;
- £460m investment in new, state-of –the-art trains for Merseyrail network – improving and future proofing green public transport; and
- Establishment of a Clean Air Taskforce;

Climate emergency declarations comprise two core components: reducing carbon emissions (operational and embodied) and protecting and enhancing natural capital. Table 3-1 summaries how the TPP Sustainability Framework is aligned to the carbon emissions reduction core component of the climate emergency declaration:

Table 3-1 - TPP Performance Requirements Related to Reducing Carbon Emissions

	TPP Performance Requirements
Reducing carbon emissions	• Resource efficiency: all performance requirements within this section support the principal of reducing carbon emissions. All key aspects of the project lifecycle are considered; from operational energy consumption, water use and waste through to embodied carbon and construction site management. • UE3 Embracing technology: this particular performance requirement will seek to identify how the proposed technology strategy can support the Club in encouraging pro-environmental sustainable behaviour change within fans.

3.3.2 Liverpool Climate Change Strategic Framework

Liverpool's Climate Change framework is set out to ensure that all the City's policies and programmes are aligned to their 2009 carbon emissions reduction target of 35% by 2024, and to ensure that the City is well adapted for future climate.

3.4 Liverpool Unitary Development Plan (UDP)

As previously detailed, the UDP, which was adopted in 2002, is the statutory development plan against which the planning application is determined. The following objectives and policies have been considered during the design of this proposed development's energy strategy.

Table 3-2 - Liverpool UDP Environmental Protection Policies

Policy Reference	Summary of Requirements
EP 11 Pollution	• Ensure that the development is not likely to result in unacceptable levels of air/water/noise/other pollution, unless there are suitable strategies in which to combat these.
EP16 Renewable Energy	The City Council will support the development of renewable energy projects provide that the proposal: • Prevents detrimental impacts on neighbouring uses. • Prevents detrimental impacts on environmentally sensitive areas. • Is in accordance with other policies in the 'Plan'.
HD21 Energy Conservation	• Minimise energy demand.

3.5 Liverpool Local Plan (Submission Version)

The NPPF requires the preparation of a local plan to be based on evidence about the economic, social and environmental characteristics and prospects of the area.

The Liverpool Local Plan (Draft Submission Version) was submitted for formal examination in May 2018. Therefore, in accordance with the NPPF (para. 48) it has substantial but not full weight until it has been examined and ultimately adopted. The following draft policies are of relevance to the energy strategy:

Table 3-3 - Liverpool Local Plan Environmental Protection Policies

Policy Reference	Summary of Requirements
UD 5 New Buildings	Requires new buildings to be *"robust and adaptable"* and *"highly sustainable, including recycling and renewables"*.
R1 Air, light and noise pollution	Planning permission will not be granted for development with the potential to create unacceptable air, water, noise or other pollution or nuisance.
R7 Decentralised Energy Networks	Minimise energy demand.
R8 Wind Turbines	Identifies the River Mersey frontage as a location with potential for wind turbine development. Applications proposing wind turbines must be able to demonstrate community engagement and support for the wind turbine development. Proposals must also demonstrate that there will be no harm caused as a result of the size and scale of wind turbine development on the character of the wider area.
R9 Solar Panels	Supports *"appropriately sited"* solar panel installation, in particular building-mounted panels, subject to other Local Plan policies.
R10 Non-fossil fuel energy sources	Supports the adoption of non-fossil fuel technologies to generate locally-sourced energy, providing proposals demonstrate that they are appropriately sited and will not have adverse effects on the surrounding environment – particularly in relation to cultural landscape and visual amenity.
STP2 Sustainable Growth Principles and Managing Environmental Impacts	New development should seek to avoid negative impacts on the environment through adoption of best practice. Where a negative effect is identified this should be mitigated by appropriate measures. To ensure the sustainable growth of the City, new development should minimise environmental impact, with sustainability features incorporated into buildings, spaces and neighbourhoods at an early stage of the design process in line with and which results in the efficient use of resources generally including materials, water and energy; reduces carbon emissions and thus contributes to achieving zero carbon buildings

3.6 Project Drivers

3.6.1 Context

A bespoke Sustainability Framework has been developed for the proposed scheme in order that appropriate sustainability principles are embedded within the project design, construction and operation. This has resulted in a framework in which "minimum performance requirements" are mandatory and discharge all relevant planning conditions as a minimum. "Stretch" targets have also been developed to set out aspirational targets. Reference should be made to the sustainability statement, prepared by Buro Happold, submitted with the planning application.

3.6.2 Proposals

With regards to the Key Performance Indicators (KPIs) set out in the Sustainability Framework, it is proposed that:

1. All minimum performance criteria are viewed as mandatory and will be delivered by The Club as a minimum development requirement; and
2. The project team will endeavour to deliver the stretch performance targets but these will not form part of the minimum development requirements

3.6.3 Key Performance Requirements

Sustainability is at the heart of The Club's ambitions for the site. This is set out through the 11 Key Principles set out by The Club. Examples include:

- To harness the unique features of the Bramley-Moore site to create an environmentally friendly and sustainable stadium;
- To maintain 'The People's Club' ethos by listening to, investing in, working with and inspiring not only fans, but communities across the city and beyond;
- To build on the award-winning work of Everton in the Community, facilitating sustainable economic and social benefits for the area;
- To work with conservation agencies and Historic England, to ensure that development is sensitive to the history and significance of the Bramley-Moore site; and

- To embrace cutting-edge technology and present a much needed regeneration opportunity for the North of Liverpool.

Everton Football Club commissioned Buro Happold Engineering to develop a bespoke Sustainability Framework. The purpose of the Sustainability Framework is to ensure the client's sustainability aspirations for the project are embedded within The Peoples Project (TPP). Through drawing on a robust evidence base, the Sustainability Framework has empowered the client and project team to make more informed decisions throughout the project lifecycle.

4 Energy Strategy Analysis

This section outlines the proposed energy strategy and the analysis that has been undertaken in order to comply with Part L 2013 of the Building Regulation and to show the contribution the proposed LZC technology can achieve as measure by the Building Regulations Compliance calculation.

4.1 Energy hierarchy

In order to meet the planning targets a Mean, Lean, Green hierarchy has been implemented as displayed below:

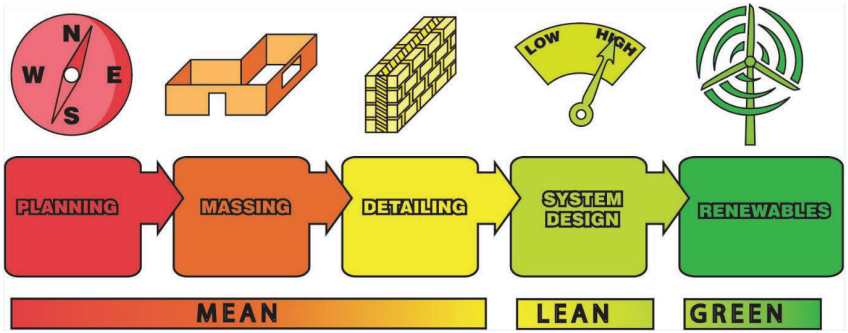

Figure 4-1 - Lean Clean Green strategy

4.2 "Mean" energy strategy

The energy approach adopted has followed a fabric first approach whereby the thermal envelope of the building is enhanced to improve the overall energy efficiency of the building. This approach is in line with Liverpool's Local Plan as well as The People's Projects specific key performance indicators. The design measures adopted include, but are not limited to;

- **Building Fabric** exceeding minimum requirements of building regulations
- **Optimum Glazing** and shading performance to maximise daylight whilst reducing unwanted heat gain
- **Improved Air Tightness** to minimise thermal losses and gains from internal areas through air infiltration from outside
- **Zoning** the control of the HVAC system to allow different thermal and fresh air demands to be compartmentalised, permitting optimum flexibility and load balancing.

4.3 "Lean" energy strategy

- **Highly Efficient System Design** selected to meet project requirements. The plant generates heating and cooling at high efficiencies and ensures efficient delivery throughout the building distribution, minimising loss. This compliments the passive fabric strategy, reducing building energy and fuel use.
- **Heat Recovery** devices harness the energy within exhausted air and recirculate it back into the building to reduce heating and cooling loads.
- **Demand Controlled Ventilation** controls airflow in order to respond to occupancy and internal temperature. These controls will be linked to the building management system, with CO_2 and temperature sensors provided to occupied zones.
- **Energy Efficient Lighting.** LED lighting can incorporate automatic controls that respond to daylight and human presence to minimise the buildings electrical lighting load.
- **Centralised Heating Plant** enables ease of connection to a future district heat network connection and minimises storage losses in comparison to a distributed heating solution.

4.4 "Green" energy strategy

- **Photovoltaics** will be provided to offset a portion of the sites electrical loading.
- **Battery Storage Technology** has been sized to provide backup for life safety and essential loads whilst having capacity to facilitate energy market participation and perform load balancing.

4.5 Low and zero carbon technologies assessment

BuroHappold have produced a technologies matrix to assess various technologies against the sustainability themes and assessment criteria set out in the Sustainability Framework. Figure 4-2 displays just the criteria that are relevant to the energy strategy of The People's Project. Those that have been marked Y under considered are discussed further in the following chapters as more in depth techno-economic analyses were carried out to which may be the most appropriate for implementation on The People's Project.

Technology		Assessment criteria						Notes	Considered?
Name	Overview	CAPEX	OPEX	Payback period	Technical viability	Level of innovation	Positive environmental outcome		
Solar thermal	Solar thermal technologies turn sunlight into heat instead of power and were actually the first solar energy products to be commercialised in the UK.	High	Low	High	Low	Low	High	Low and intermittent hot water demand would be more efficiently served by boiler technology. Has the potential to serve non-match day hot water demand but PV more economically viable.	N
Solar PV	Solar photovoltaic (PV) panels convert direct and diffuse radiation from the sun into electrical energy.	Medium	Low	Low	Medium	Low	High	Photovoltaics can be installed in a visible manner that would serve as a statement of environmental intent. Due to intermittency of generation may require energy storage to gain most benefits.	Y
Biomass	Biomass is a generic term referring to organic materials that can be used as fuels. Solid bioenergy options include woodchips and pellets. Using these types of biomass fuel as a heating source is well established across Europe and the UK.	Low	Medium	Medium	Low	Low	Low	The scale of the project would require a very large generator setup. Large volume of fuel storage would also be required, along with a viable fuel delivery route. This technology has a high CO2 reduction potential when using renewable timber as fuel but it produces combustion gasses and may reduce air quality locally (potential to conflict with Liverpool Air Quality Management Area).	N
GSHP	Ground source heat pumps can pump heat from the ground into a building to provide space heating and domestic hot water. For every unit of electricity used to pump the heat, 3-4 units of heat can be produced.	High	Low	Medium	Low	Medium	High	Requires consistent and balanced base heating and cooling load, which will not be the case for a stadium.	Y
ASHP	Air source heat pumps (ASHPs) use the external air as a heat source to provide heat for buildings. They work by running a low-temperature, lower pressure refrigerant fluid in heat exchanger coils through the external air.	High	Low	High	Medium	Medium	Medium	Can be utilized as efficient electrical heating/cooling/hot water generators that require little plant space. Lower efficiencies when compared to other heat pump types.	Y
WSHP	Water source heat pumps (WSHPs) use the circulating water as a heat source to provide heat for buildings. They work by running a low-temperature, lower pressure refrigerant fluid in heat exchanger coils through the circulating water.	High	Low	Medium	Medium	Medium	High	Location farourable for using this technology, however the inconsistency of the heating and cooling load profiles make it economically challenging.	Y
CHP	Combined heat and power (CHP), sometimes referred to as cogeneration, is a process in which the heat that is created as a by-product of power generation is captured and used rather than simply being wasted.	Low	Medium	Low	Low	Low	Low	A CHP perfoms best under steady high load conditions. Intermittent and "peaky" demand of a stadum does not produce the best conditions for efficeint operation. A smaller CHP system backed by another technology to meet peak demends may prove beneficial. Produces combustion gases.	N
Wind power	Wind is a clean, plentiful renewable energy source. The UK has relatively good and easily exploited wind resources.	High	Medium	High	Low	Low	Low	Wind turbine may serve as statement of environmental intent. High uncertainty in generation capacity and maintenance requirements may make this technology unfeasible on smaller scales. Will be challenging due to location in a World Heritage Site.	Y
Hydropower	Hydroelectricity is electricity generated by hydropower, that is, power derived from the kinetic energy of falling or flowing water. It can be generated from streams, lakes and rivers or man-made structures such as dams, lagoons and reservoirs.	High	Low	High	Low	Medium	Medium	Hydropower is not commonly used to serve single developments and a bespoke solution will be required.	N
District heat netwo	District heating (also known as heat networks or teleheating) is a system for distributing heat generated in a centralized location through a system of insulated pipes for residential and commercial heating requirements such as space heating and water heating.	Unknown	Low	Medium	Unknown	Low	Medium	Mersey Heat scheme currently under development to serve adjaent Liverppool Waters development. There is potential for the stadium to connect.	Y

Figure 4-2 - Energy Specific Technologies Assessment Matrix

4.5.1 Solar photovoltaic

A provision of 2050m^2 for panels with an annual yield of 312MWh would be sufficient to ensure 4% betterment over Part L of the building regulations.

Policy R9 of the Draft Liverpool Local Plan supports the installation of solar panels, where appropriately sited – taking into account the impact on visual amenity and the wider cultural and heritage landscape of the site.

Soft market testing has been carried out which show such a scheme could payback in 10-12 years or less, making it a viable option.

The location of the PV array is to be on the South Stand roof shown in the image below. There is also an aspiration for the club to expand the PV area in the future. To ensure this is possible there is sufficient structural strength within all other areas of the roof with standing steam cladding to allow for this future expansion to occur without the need for structural reinforcement.

Figure 4-3 - Proposed location of PV array on the stadium roof

Verdict : PV would give reasonable payback of maximum 12 years. Area indicated of 2050m^2 would satisfy minimum requirements of Part L – this has been incorporated into the proposed scheme.

4.5.2 Large scale wind

This option would comprise a single large-scale (125m to blade tip) wind turbine, with a rated turbine power of 2.5 MW. Although presenting a high capital cost of circa £3m, such a turbine could save 1,460 tonnes of CO2 per year by contributing a significant renewable proportion to the stadium's electricity use.

Whilst Policy R8 of the Draft Local Plan identifies the River Mersey frontage as a potential site for wind turbine development and turbines are visible in the surrounding landscape (Peel Energy installed the existing Port of Liverpool wind farm adjacent to the site, which incorporates 4no. 2.5MW turbines.), provision of wind turbines as part of the application proposal has not been progressed as:

- The site is located within the designated World Heritage Site ('WHS') and the implications arising from this sensitive location (harm on character of the wider WHS area etc.)
- There is an extant outline planning permission (LPA ref. 19NM/1121 – latest non-material amendment to the original Liverpool Waters permission ref. 10O/2424) for residential-led development on Nelson Dock to the immediate south of the application site. Given that the existing approved development blocks on the east and west quaysides of Nelson Dock extend into the application site then it is assumed that residential development will be constructed up to the application redline boundary. There are potential residential amenity impacts arising from accommodating turbines within the scheme.
- There are safety issues arising from turbines as evidenced by a scheme for large-scale wind turbine close to the Etihad stadium being scrapped in 2010 (following the grant of planning permission in 2006) due to the necessitation of a safety exclusion zone around the turbine impacting on the available car parking and media facilities.

Verdict: due to concerns over WHS locational sensitivities, proximity to future residential developments, safety and the payback period of over 50 years, this option is not considered viable as a project cost.

Figure 4-4: The scrapped 360ft wind turbine at the Manchester Sportcity development

4.5.3 Small scale wind

This strategy proposes installing a series of small vertical axis wind turbines (VAWTs) in the car park. The site could be well suited to wind technology as it benefits from a waterside location, with potentially high wind speeds due to the exposed location. The series of turbines would also give a visual indication of the Club's commitment to sustainability.

A series of 20no. turbines is proposed, giving a total capacity of 150kW. This results in a limited carbon reduction of around 27 tonnes per year, but the technology is easily scalable to incorporate more turbines to provide a greater renewable energy contribution.

Verdict: The feedback from the cost consultant on the capital cost produces a payback period of well over 50 years, therefore this option is not considered viable.

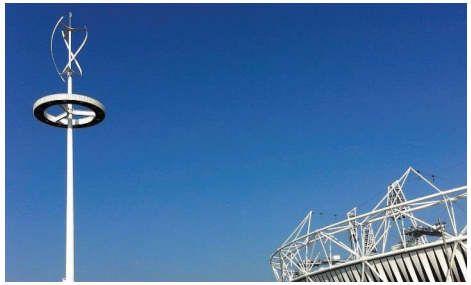

Figure 4-5: VAWT at the London Olympic Park

4.5.4 Heat pumps

Heat pumps utilise electricity to produce heating and/or cooling via a refrigerant cycle. Air, water and ground source heat pump scenarios have been analysed. Air source is relatively straightforward, with air source units being supplied to deliver a base load in lieu of some air cooled chillers. A ground source system has also been analysed with improved efficiencies relative to an air source system, but with increased capital cost. A water source heat pump (WSHP) option has also been analysed, extracting low level heat from the adjacent Nelson Dock to transfer it into the stadium's heating system. During hot weather, the pumps can be run in reverse, extracting heat from the building and therefore providing cooling inside and transferring the heat into the dock. The water source option provides and engaging environmental story, utilising the existing historic Liverpool docks to provide sustainable energy for the stadium.

The CO_2 emissions reduction compared to conventional heating is dependent on the CO_2 emissions associated with the electricity source. Therefore, the predicted decarbonisation of the electricity grid may significantly increase the lifetime of CO_2 savings of heat pumps.

The heat pumps in the analysis was sized based on the baseload of the heating demand, meaning that the capacity is limited. The Renewable Heat Incentive subsidy has not been confirmed beyond 2021 and thus cannot be relied upon at this stage. The results of a financial study are shown below.

	Water/Ground Source Heat Pump	Air Source Heat Pump
System Size	**400kW** (Meet base heating & DHW load)	**400kW** (Meet base heating & DHW load)
System efficiency	**280%** (Calculated for 70°C supply)	**180%** (Calculated for 70°C supply)
System lifespan	**20 years** (Past project experience)	**20 years** (Past project experience)
Capital cost	**£480,000** (£1,200/kW Past project experience)	**£360,000** (£900/kW Past project experience)
Payback Period	Does not payback without RHI	Does not payback

Figure 4-6 - Heat pump financial analysis

Verdict: Without subsidy via the RHI scheme, heat pumps fail to pay back relative to gas fired boilers as the technology relies on relatively expensive grid electricity for heating rather than the baseline of natural gas.

4.5.5 District heating network

Policy R7 of the Draft Local Plan supports proposals for renewable and low carbon energy generating and distribution networks at all scales of development, where meeting other requirements set out in Local Plan policies. Where a decentralised network is programmed to be constructed, this policy requires future development in the network area to connect as part of a planning obligation, unless it can be demonstrated that this would not be viable.

Peel Land & Property is currently progressing with a district heat network serving the Liverpool Waters development (LPA ref. 10O/2424 – latest non-material amendment is ref. 19NM/1121), named "Mersey Heat". The first phases of the installation are underway serving areas to the South of the application site with plans to extend to the nearby Collingwood Dock within the year. Please refer the following planning permission references for further information: 18F/3233, 19F/0079, 19F/2989, 19F/1485 and 19F/1745.

Verdict - Due to the potential to connect to the proposed "Mersey Heat" network; design, space and cost allowance has been made for potential future connection to this infrastructure,

4.5.6 Battery Storage

The installation of a battery storage system provides access to many Smart Grid and energy market opportunities, which are otherwise closed. Battery costs are currently high but are following a downward trend in £/kWh which is set to continue.

Batteries have many practical advantages over equivalent sources of electricity (namely, diesel generators). They react very fast to mains-failure signals and are able to operate without producing excessive noise or exhausting toxic fumes. In addition, using batteries as a secondary power source can reduce building emissions and offer a prospective revenue source whilst future-proofing the site for upcoming smart grid applications.

For The Peoples Project the installation of a battery storage system has been incorporated. Its primary use is to provide backup for:

- Life safety;
- Essential loads; and
- Match day continuation on event days.

As an additional use, the battery will be able to use the 'Match Continuation' capacity for energy market participation on non-event days. The total capacity of the battery installation is proposed at 8MVAh. This will be made of up 4 no. discrete arrays located within the stadium as shown in the images below, each housing 2MVAh battery capacity.

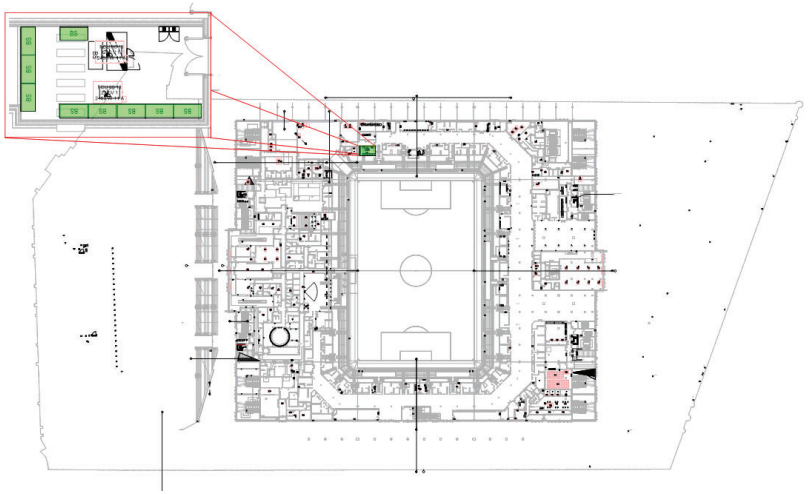

Figure 4-7 – Proposed Battery Storage Location, Ground Floor

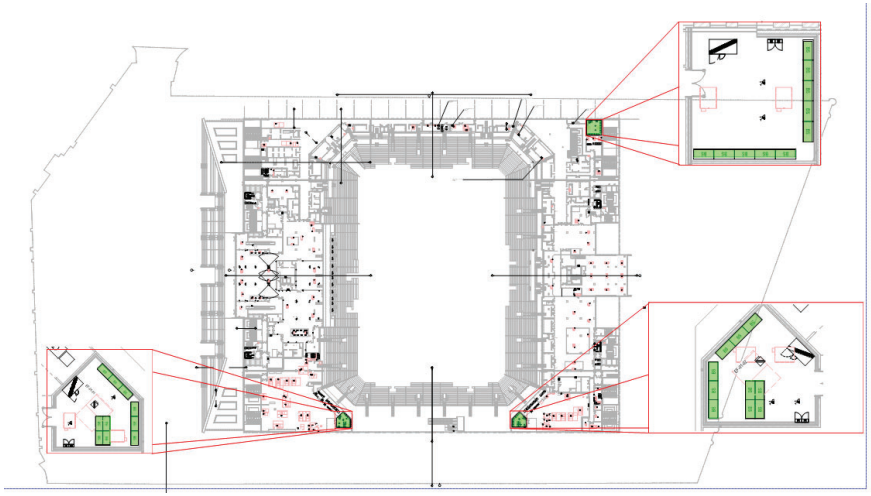

Figure 4-8 – Proposed Battery Storage Location, First Floor

Verdict: Due to having both a primary use, for life safety and essential loads as well as potential for revenue generation, battery storage technology has been incorporated into the proposed scheme.

5 Part L Compliance

5.1 Introduction

This chapter has been produced in order to demonstrate Building Regulation Part L compliance for the proposed stadium. Figure 5-1 shows the 3D representation of the Part L model. Following the assessment methodology, any spaces that are open to the outside, or not heated or mechanically ventilated are not considered within the calculation.

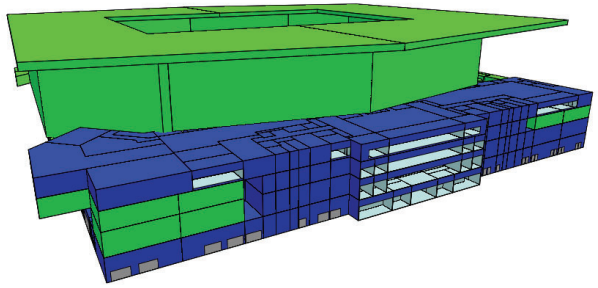

Figure 5-1 – Compliance model geometry as viewed from northwest

5.2 Part L Results

The base case model has been setup as per the latest MEP design and architectural planning freeze Revit model. The building requires 312MWh/yr of electricity generation via photovoltaics in order to achieve a compliance margin of **4% over Part L 2013 Target Energy Rating (TER)**. This equates to approximately 2,050m2 of active PV area. Figure 5-2 demonstrate the breakdown of carbon emissions by end use and shows the renewable energy generation required for the current design to achieve compliance.

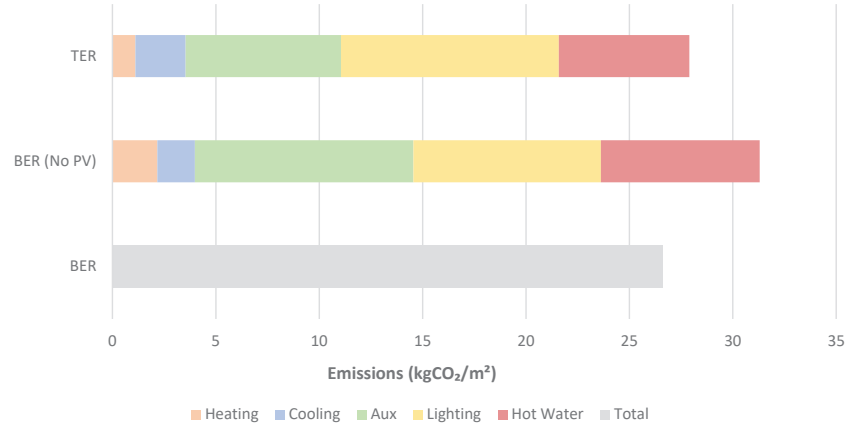

Figure 5-2 - Part L Target and Buildings Emissions Ratings (with and without electrical generation via PV)

5.3 Part L Assumptions

Building Geometry

Table 5-1 - Building Geometry

Model Origin	Date of submission	Model description
Pattern	08/06/2020	Stage 4 Advanced

Building Fabric Standards

The tables below summarise the minimum building fabric standards that has resulted in a building regulations Part L.

Table 5-2 - Building Fabric

Building Fabric	Units	U-Value	Notes
External Wall	W/m²K	0.22	
Ground Floor and Exposed Floor	W/m²K	0.22	
Roof	W/m²K	0.18	
General Glazing	W/m²K	1.5	Including Frames

Table 5-3 - Daylight Factors

Orientation	Light Transmission	G Value
General	0.6	0.3

Table 5-4 - Permeability Factors

Air Permeability and thermal bridging			Notes
Air Permeability	m°/hr/m²	10.0	This will only require pressure testing to discrete areas of the stadium, to be agreed with Building Control
Thermal Bridging		10% of the overall building fabric U-value	Default value as not specifically calculated

Room Activity Definition

Room activities have been set based on the planning class D2 General Assembly and Leisure (Stadium).

HVAC standards

HVAC systems have been applied to the building and are detailed in the following tables.

Table 5-5 - HVAC Systems – Heating and Cooling

Heating and Cooling	Units	Circulation, Locker rooms, Eating/Drinking areas	Office, Dry sports halls, Retail area, Boxes	Server Room
NCM System		Single Duct VAV	Fan Coil Systems	Fan Coil Systems
System		Boiler		N/A
Seasonal Eff	%	91		N/A
Emitter		Air Supply Grilles	Fan Coils	Fan Coils
Fuel		Electricity		
Generator		Air cooled adiabatic chiller		
Emitter		All Air	FCU	FCU
Cooling Seasonal Efficiency	%	500		
Terminal Unit SFP	W/l/s	N/A	0.3	0.3

Table 5-6 – HVAC Systems – No Cooling

Heating and Cooling	Units	Concourses	Toilets, Storage	Concession Stands	Medical Areas	Medical Areas	GA Family Areas
NCM System		Untreated	Extract Only	Supply and Extract	Central heating using water	Central heating using water	Other local room heater: unfanned
System		N/A	N/A	N/A	Gas Boiler	Gas Boiler	Electricity
Seasonal Eff	%	N/A	N/A	N/A	91	91	1
Emitter		N/A	N/A	N/A	Radiator	UFH	Panel Radiator

Table 5-7 - DHW System

DHW	Units	West Stand - Hospitality	*GA – Concourse/WC/*	East Stand
Fuel		Gas	*Gas*	Gas
Generator		Main boiler system	*Main Boiler System*	Main Boiler System
Main System Efficiency	%	91	*91*	91
Storage Capacity	Litres	6,800	*N/A*	1000
Storage Loss Factor	kWh/l/day	0.0047	*N/A*	0.0047
Secondary Circulation Pipe Losses	W/m	8.0	*N/A*	8.0
Secondary Circulation Pipe Length	M	2000	*N/A*	200

Table 5-8 - Ventilation System Efficiencies and Control

Ventilation	Units	Circulation, Locker rooms, Eating/Drinking areas	Office, Dry sports halls, Retail area, Boxes	Kitchen	Toilets, Storage, Kitchens
AHU SFP	W/l/s	1.4	1.4	1.6	N/A
Extract air volume	ACH	NA	NA	40	10(WC, Showers) 6 (stores)
Local Extract SFP	W/l/s	NA	NA	NA	0.56
Heat Recovery Efficiency	%	75	75	NA	NA
Ductwork leakage		Class A	Class A	Class A	Class A
AHU CEN Classification		Class L2	Class L2	Class L2	Class L2
Ventilation control		Demand Control Variable Speed	No Demand Control	No Demand Control	No Demand Control, Fan Remote From Zone

Electrical Services

The following tables summarise the standards assumed for the compliance calculations

Table 5-9 - Electrical Services

Room Type	Light level	Lamp Efficacy	Lighting Control	
	(Lux)	(lm/W)	Control	Parasitic Power (W/m^2)
Changing Rooms	200	90	Presence Detection	0.1
Circulation	200	90	Presence Detection	0.1
Stores	100	90	Absence Detection	0.1
Sports Hall	500	90	N/A	N/A
Eating/Drinking Areas	300	90	N/A	N/A
Kitchens	500	90	N/A	N/A
Plant	300	90	N/A	N/A
Toilets	200	90	Presence Detection	0.1
Offices	400	90	Absence Detection	0.1
Boxes	300	90	N/A	N/A
First Aid Rooms (wards)	200	90	N/A	N/A
Physiotherapy	200	90	N/A	N/A
Hydrotherapy	200	90	N/A	N/A
Server Room	200	90	N/A	N/A
Sales Area	500	90	N/A	N/A

Table 5-10 - Sub-Metering Allowances

Sub-meter	Provision	Comments
Sub-Metering	Automatic monitoring and targeting software with alarms for out of range values to include a complete installation that measures, records, transmits, analyses, reports, and communicates meaningful energy management information from all building energy meters and sub-meters to enable the building operator to manage the energy the building uses.	Building Energy Monitoring and Targeting Software must be installed
Heating	Heat meter all heating	
DHW	Gas meter to all semi-instantaneous units Meter cold water feed to DHW supplies	
Kitchen Gas	Gas meter	
HVAC	Meter all MCC Panels	
Cooling	Meter electrical supply to refrigerant based cooling units and air cooled chillers	
Lighting	Metering on a distribution board by distribution board basis	
Small Power	Metering on a distribution board by distribution board basis	
PV Installation	Meter electricity generated by PV installation	
Power Factor Correction	Above 0.95	Power factor monitoring equipment must be installed. Should the stated power factor not be achieved power factor equipment must be installed.

6 Conclusion

This report demonstrates that the proposal complies with all relevant national and local policies relating to energy. The key prescriptive policies are listed below with demonstration of compliance:

National Policy	Summary of Requirements	Summary of compliance
Part L Building Regulations	Demonstration of compliance	4% improvement over Part L of the building regulations is achieved
Liverpool Unitary Development Plan		
EP 11 Pollution	• Ensure that the development is not likely to result in unacceptable levels of air/water/noise/other pollution, unless there are suitable strategies in which to combat these.	Assessment of technologies carried out considered where technologies are likely to cause pollution, such as biomass impacting local air quality and wind turbines generating visual and noise pollution.
EP16 Renewable Energy	The City Council will support the development of renewable energy projects provide that the proposal: • Prevents detrimental impacts on neighbouring uses. • Prevents detrimental impacts on environmentally sensitive areas. • Is in accordance with other policies in the 'Plan'.	Assessment of technologies carried out considered where technologies may have a detrimental effect on neighbouring uses or environmentally sensitive areas. Again this includes biomass impacting local air quality and wind turbines generating visual and noise pollution as well as safety.
HD21 Energy Conservation	• Minimise energy demand.	The principles of "mean, lean, green" have been adopted, with reduction of energy consumption prioritised.
Liverpool Local Plan (Submission version)		
UD 5 New Buildings	Requires new buildings to be *"robust and adaptable"* and *"highly sustainable, including recycling and renewables"*.	Photovoltaics are proposed as a means of renewable energy generation, with batteries ensuring the infrastructure is adaptable to future change.
R1 Air, light and noise pollution	Planning permission will not be granted for development with the potential to create unacceptable air, water, noise or other pollution or nuisance.	Assessment of technologies carried out considered where technologies are likely to cause pollution, such as biomass impacting local air quality and wind turbines generating visual and noise pollution.
R7 Decentralised Energy Networks	Minimise energy demand.	The principles of "mean, lean, green" have been adopted, with reduction of energy consumption prioritised. The building services design has ensured a connection to the local Mersey Heat network could be introduced
R8 Wind Turbines	Identifies the River Mersey frontage as a location with potential for wind turbine development. Applications proposing wind turbines must be able to demonstrate community engagement and support for the wind turbine development. Proposals must also demonstrate that there will be no harm caused as a result of the size and scale of wind turbine development on the character of the wider area.	The assessment of technologies considered and ruled out wind turbines due to the economic viability and sensitive location within a World Heritage Site.
R9 Solar Panels	Supports *"appropriately sited"* solar panel installation, in particular building-mounted panels, subject to other Local Plan policies.	PV panels have been included to provide 312MWh/yr of electricity generation via photovoltaics in order to achieve a compliance margin of 4% over Part L 2013 Target Energy Rating (TER). This equates to approximately 2,050m2 of active PV area, which is proposed to be located on the roof of the South Stand.
R10 Non-fossil fuel energy sources	Supports the adoption of non-fossil fuel technologies to generate locally-sourced energy, providing proposals demonstrate that they are appropriately sited and will not have adverse effects on the surrounding environment – particularly in relation to cultural landscape and visual amenity.	The assessment of technologies considered the use of heat pump technologies as non-fossil fuel energy source, but the inconsistency and unbalanced nature of the heating and cooling loads deemed the technologies economically unviable, Potential connection to low carbon Mersey Heat network has been allowed for.
STP2 Sustainable Growth Principles and Managing Environmental Impacts	New development should seek to avoid negative impacts on the environment through adoption of best practice. Where a negative effect is identified this should be mitigated by appropriate measures. To ensure the sustainable growth of the City, new development should minimise environmental impact, with sustainability features incorporated into buildings, spaces and neighbourhoods at an early stage of the design process in line with and which results in the efficient use of resources generally including materials, water and energy; reduces carbon emissions and thus contributes to achieving zero carbon buildings	The passive first approach adopted, and technologies assessment described show how energy demand reduction has been prioritised in the stadium design and the viability of a range of low and zero carbon technologies has been considered.

Appendix A BRUKL Report

Administrative information

Building Details

Address: Bramley-Morre Dock, Liverpool, L3 0AP

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

BRUKL compliance check version: v5.6.a.1

Owner Details

Name: Everton FC

Telephone number:

Address: Goodison Park stadium, Goodison Rd, Liverpool, L5 9SR

Certifier details

Name: Thomas Sharma

Telephone number:

Address: Eastgate, Castle Street, 2nd Floor, Manchester, M3 4LZ

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	27.8
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	27.8
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	26.6
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	33471.1	33471.1
External area [m^2]	75307	70383.8
Weather	MAN	MAN
Infiltration [m^3/hm^2@ 50Pa]	10	3
Average conductance [W/K]	18867.9	21919
Average U-value [W/m^2K]	0.25	0.31
Alpha value* [%]	10.17	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
94	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
6	**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	12.33	6.96
Cooling	3.39	4.7
Auxiliary	20.37	14.47
Lighting	17.44	20.25
Hot water	35.48	29.19
Equipment*	51.14	51.14
TOTAL**	**89.02**	**75.57**

* 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	9.31	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	84.55	85.68
Primary energy* [kWh/m^2]	183.02	161.99
Total emissions [kg/m^2]	26.6	27.8

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

Appendix B Sustainability Performance Tracker (Energy KPIs)

BUROHAPPOLD ENGINEERING

Ref.	The Peoples Project Specific Key Performance Requirement	RIBA Stage	Performance Indicator	TPP performance target: minimum	TPP performance target: stretch	Progress status: minimum	Progress status: aspirational	Related Assessment System	Ownership	Supporting Notes
RESOURCE EFFICIENCY										
RE1	**Operational energy consumption**									
RE1.1	To minimise primary energy consumption and associated CO_2 emissions	**Throughout project lifecycle**	% improvement over PartL 2A	Compliance with PartL 2A	10	**On track**	**Derogation**	BREEAM New Construction 2018 (Ene 01)	BuroHappold / Principal contractor	**Design stage evidence required:** PartL 2A study **Construction stage evidence required:** PartL 2A study BuroHappold will be responsible for developing the design in line with the requirement. The contractor will be responsible for ensuring this performance standard is monitored during technical design and construction, and ultimately delivered in operation. **06/08/19** The current design is achieving a 6% improvement over PartL (based on WS2 Design inc. 2,000m2 of PV, as per cost plan). BHE have issued a DN to the client which sets out LZC options; integration of options 2 and 4 within this will meet and exceed the 10% performance performance improvement. Decision from Everton FC required. **30/06/20** Revised energy statement confirms 4% improvement over PartL.
RE1.2	Undertake operational energy modelling during the design stage following CIBSE TM54 method	**4 - 6**	Consultant appointment and study output	-	Production of study and implementation of recommendations	**Not applicable**	**Under review**	BREEAM New Construction 2018 (Ene 01)	BuroHappold / Principal contractor	**Design stage evidence required:** - **Construction stage evidence required:** TM54 study at RIBA WS4, updated at the end of each RIBA Workstage **28.04.20** Requiement presented to LOR, LOR to confirm how they wish to progress. **11.06.20** BHE (re)communicated to LOR that LOR will be responsible for producing TM54 study. LOR to confirm how to progress. **22.06.20** BHE issued scope of works to LOR for undertaking a TM54 study
RE1.3	Provide a BEMS with monitoring infrastructure (i.e. all building energy meters connected) to allow building users to view, log and export energy consumption data by building zone and by end use.	**Throughout project lifecycle**	Engineering specifications and metering schematics	Embedded in specifications / witnessed at completion	-	**On track**	**Not applicable**	Industry best practice	BuroHappold / Principal contractor	**Design stage evidence required:** tender specification **Construction stage evidence required:** as built schematic and witnessing **30.06.20** Part B10 of the (revised, 22.05.20) BHE Mechanical Specification Section B sets out the BMS and energy metering requirements.
RE1.4	Review actual in use performance against predicted energy performance from the TM54 study.	**7**	kWh/m2	-	Target to be set based on outcomes pf TM54 study	**Not applicable**	**Under review**	BREEAM New Construction 2018 (Ene 01)	BuroHappold / Principal contractor	**Design stage evidence required:** tbc **Construction stage evidence required:** tbc **22.06.20** BHE issued scope of works to LOR for undertaking a TM54 study
RE2	**Low or zero carbon technologies**									
RE2.1	Undertake a feasibility study to inform the selection of the most appropriate low or zero carbon technologies	**2**	LZC feasibility study and engineering specification	Production of study	-	**Achieved**	**Not applicable**	BREEAM New Construction 2018 (Ene 04)	BuroHappold	**Design stage evidence required:** LZC feasibility study **Construction stage evidence required:** n/a **17/10/12** BHE presented LZC analysis as part of detailed energy workshop with Club **02/08/19** BHE issued further design note with developed PV options. Decision from Everton FC required. **03/07/20** The revised energy statement confirms the inclusion of 2,000 sqm of PV (~305MWh/yr).
RE2.2	Provide local energy metering for low or zero carbon technologies so onsite consumption and export can be easily determined and link this data to an energy management system	**Throughout project lifecycle**	Engineering specifications and metering schematics	Embedded in specifications / witnessed at completion	-	**On track**	**Not applicable**	BREEAM New Construction 2018 (Ene 01)	BuroHappold / Principal contractor	**Design stage evidence required:** tender specification **Construction stage evidence required:** as built schematic and witnessing **03/07/20** Part B10 of the (revised, 22.05.20) BHE Mechanical Specification Section B sets out the BMS and energy metering requirements.
RE2.3	Monitor energy performance of low or zero carbon technologies and achieve targeted on or near site energy generation after Year 1	**7**	% of total annual demand p.a.	5	15	**On track**	**Under review**	BREEAM New Construction 2018 (Ene 01)	BuroHappold / Principal contractor / Client	**Design stage evidence required:** PartL 2A report **Construction stage evidence required:** PartL 2A report **12/09/19** As above, options have been presented by BuroHappold as to how both targets could be achieved. A client and project team decision is required in order inform the selected approach. **28/04/20** BHE confirmed that current design sits at 9% based on 2,000sqm of PV **30/06/20** Based on the BRUKL presented in the revised energy statement the 2,050 sqm PV array will generate approximately 10% of the buildings energy demand (based on predicted predicted energy produced (kWh/m2) / predicted use (kWh/m2)).

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