EXPEDITE

Trader’s Yard 2, Cardiff

Urban Centric

Expedite Building Services

MEP – Energy Strategy Report

P03 – June ‘26

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P02	Section 3.4 updated.	GJ	DH	Jan '26
P03	Revised for new plans	JJ	JD	June'26

1. Introduction

The energy strategy for the proposed development at Trader's Yard 2, Penarth Road, Cardiff, CF10 5DR, has been prepared to support the planning application.

It details the holistic sustainable approach and summarises the energy efficient and renewable technologies which could be appropriate for the site.

The development comprises of a planning application for a thirteen-storey building; comprising of amenity and commercial spaces at ground level and apartments on the levels above.

The development is due to provide approx. 228 units (229 beds)

The address at the centre of the site and Ordnance Survey Grid Reference are given in the table below.

Site referencing information	
Site Address	Penarth Road, Cardiff, CF10 5DR
Grid Reference	Latitude: 51.472683 Longitude: -3.1790252 Easting: 318207 Northing: 175517 Grid Ref: ST 18207 75517

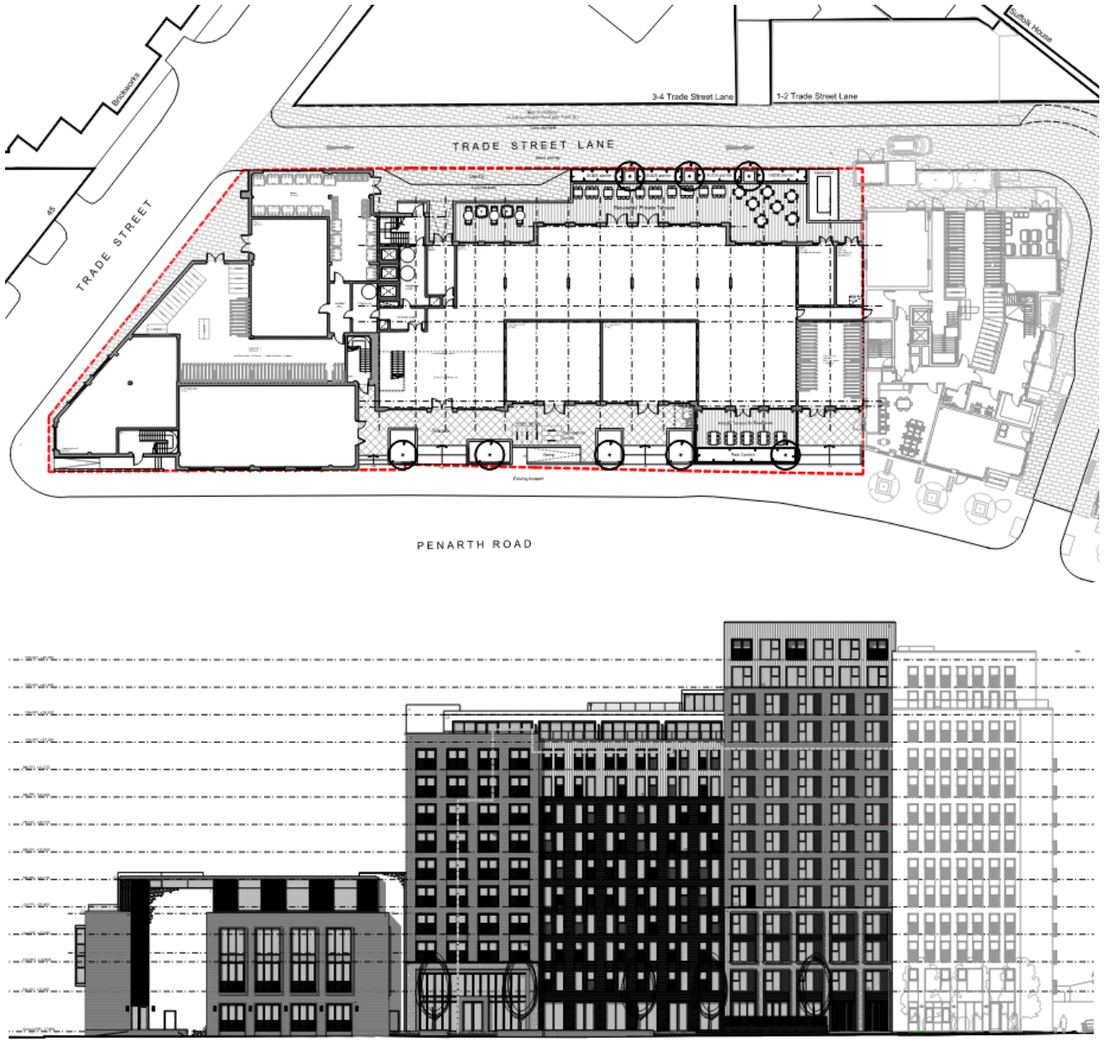


Figure 1 - Site location plan and elevation

2. Philosophy.

2.1 Potential aspirations

The energy strategy for Trader's Yard 2 should reflect the client's aspirations and respond to local policy requirements to deliver an effective development commensurate to the local community. With respect to energy, the following principles could be considered.

2.1.1 Energy Hierarchy

The project will follow the energy hierarchy of be lean, be clean and be green:

Be Lean - The energy strategy aims to firstly implement passive design and energy efficiency measures to reduce energy demand and CO_2 emissions.

Passive design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.

These are the most effective and robust measures for reducing CO_2 emissions as the performance of the solutions, for example wall insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is possible to have confidence that the benefits of the measures would continue at a similar level for the duration of their installation.

The Be Lean philosophy promotes that the design of the elevations should seek to passively minimise heating, cooling, and lighting requirements:

Be Clean - The strategy will be to consider the use of clean energy source using heat pump technologies where appropriate.

Be Green - Significant CO_2 savings are expected through the Be Lean and Be Clean measures. However, to maximise CO_2 reduction, the potential for renewable energy sources will be assessed.

The strategic approach to the development of the site will be to reduce demand for energy consumption in the first instance (Be Lean) prior to the consideration of integrating low/zero carbon (LZC) energy sources (Be Clean and Be Green).

2.1.2 Fabric Efficiency

A 'fabric first' approach should be taken in order to reduce the energy demand and CO_2 emissions from the proposed development.

In buildings with poor airtightness, additional heating energy is required in winter as a result of higher heat losses. The scheme should be designed to reduce air infiltration rates through robust detailing and high-quality construction techniques.

2.1.3 Zero combustion

By serving all demands for heat and hot water via electrical systems, the need for on-site combustion is removed. This has co-benefits for both local air quality and CO_2 emissions, future-proofing the development for a transition to zero carbon as the grid decarbonises further.

2.1.4 Generate

Unobstructed roofscapes lend themselves to the integration of solar PVs and thus potential exists to generate a portion of the electrical energy requirements from the incident solar radiation.

2.2 National Policy

The energy strategy of the proposed development has been developed using the current Building Regulations Part L methodology at the time (Volume 2, Wales, 2022).

2.2.1 Future Wales: the national plan 2040

- Policy 12 (Regional Connectivity) states where car parking is provided for new non-residential development, planning authorities should seek a minimum of 10% of car parking spaces to have electric vehicle charging points.
- Policy 16 (Heat Networks) states that as a minimum, proposals for large-scale, mixed-use developments of 100 or more dwellings or 10,000sqm or more of commercial floorspace should consider the potential for a heat network. However, there is also potential for heat networks below this threshold and developers and planning authorities should explore these opportunities wherever possible.
- Policy 17 (Renewable and Low Carbon Energy and Associated Infrastructure) states that in determining planning applications for renewable and low carbon energy development, decision makers must give significant weight to the need to meet Wales' international commitments and our target to generate 70% of consumed electricity by renewable means by 2030 in order to combat the climate emergency.

2.2.2 Planning Policy Wales 2021

Planning Policy Wales states that Development proposals should:

- Mitigate the causes of climate change, by minimising carbon and other greenhouse gas emissions associated with the development's location, design, construction, use and eventual demolition; and
- Include features that provide effective adaptation to, and resilience against, the current and predicted future effects of climate change.

The Welsh Government planning policy recognises an energy hierarchy. The Welsh Government expects all new development to mitigate the causes of climate change in accordance with the energy hierarchy for planning as set out below:

- Reduce energy demand
- Use energy efficiently
- Renewable energy generation
- Minimising carbon impact of energy generation
- Minimise extraction of carbon intensive energy materials

All aspects of the energy hierarchy have their part to play, simultaneously, in helping meet decarbonisation and renewable energy targets.

The Welsh Government has set targets for the generation of renewable energy. The most relevant for our proposals is 'for Wales to generate 70% of its electricity consumption from renewable energy by 2030'. The planning system has an active role to help ensure the delivery of these targets, in terms of new renewable energy generating capacity and the promotion of energy efficiency measures in buildings.

2.2.3 Technical Advice Note 12 (Design)

TAN 12 states that Developments should achieve environmental sustainability by incorporating:

- Sustainability measures to reduce the environmental impact associated with buildings and minimising the demand for energy (low and zero carbon sources), water, and materials and creation of waste;

- Approaches to development which create new opportunities to enhance biodiversity; and
- Adaptable and flexible development that can respond to social, technological, economic and environmental conditions/changes (e.g. the current and future effects of climate change) over time to minimise the need to demolish and rebuild.

2.3 Local Policy

As well as national Building Regulations and national policy, the proposed development is required to comply with local policy in place at the time of the planning submission, including the Cardiff City Council (CCC) policy documents.

2.3.1 Cardiff Local Plan 2006 - 2026

Policy T1 (Walking and Cycling) encourages sustainable modes of transport.

Policy KP5 (Good Quality and Sustainable Design) states that all new developments will be required to be of a high standard, sustainable design and make a positive contribution to the creation of distinctive communities, places and spaces. With regards to sustainability the policy states that development should do this by:

- Providing a healthy and convenient environment for all users that supports the principles of community safety, encourages walking and cycling, enables employment, essential services and community facilities to be accessible by sustainable transport and maximises the contribution of networks of multi-functional and connected open spaces to encourage healthier lifestyles;
- Maximising renewable energy solutions;
- Achieve a resource efficient and climate responsive design that provides sustainable water and waste management solutions and minimise emissions from transport, homes and industry.

Policy KP15 (Climate Change) states that to mitigate against the effects of climate change and adapt to its impacts, development proposals should take into account the following factors:

- Reducing carbon emissions;
- Protecting and increasing carbon sinks;
- Adapting to the implications of climate change at both a strategic and detailed design level;
- Promoting energy efficiency and increasing the supply renewable energy;
- Avoiding areas susceptible to flood risk in the first instance in accordance with the sequential approach set out in national guidance; and
- Preventing development that increases flood risk.

Policy EN12 (Renewable Energy) states that development proposals are required to maximise the potential for renewable energy. The Council will encourage developers of major and strategic sites to incorporate schemes which generate energy from renewable and low carbon technologies. This includes opportunities to minimise carbon emissions associated with the heating, cooling and power systems for new development. An independent energy assessment investigating the financial viability and technical feasibility of incorporating such schemes will be required to support applications.

The 2017 Planning Obligations supplementary planning document (SPD) also mentions a Renewable Energy being prepared to provide additional guidance but from our research this has not yet been delivered by the Council.

The Cardiff Green Infrastructure SPG provides planning advise on a number of areas relating to development and the environment. It aims to make best use of land to deliver a wide range of economic, health and community benefits.

2.4 Decarbonisation of the electricity grid

The carbon factor of the National Grid, representing the quantity of carbon dioxide released per kilowatt-hour (kWh) of electricity generated and distributed, is acknowledged in building regulations guidance. In the 2022 edition of the regulations, the carbon factor for electricity is 0.136 kgCO2/kWh. This marks a notable decrease compared to the earlier edition, released in 2014, where the carbon factor was 0.519 kgCO2/kWh.

This reduction is a reflection of the changing mix of electricity generation methods towards greener solutions. Figure 2 shows how the mix of generation techniques serving the National Grid, as well as the associated carbon factor, has varied over the past ten years. It shows how the carbon intensity of the grid has reduced to less than half its value in 2012.

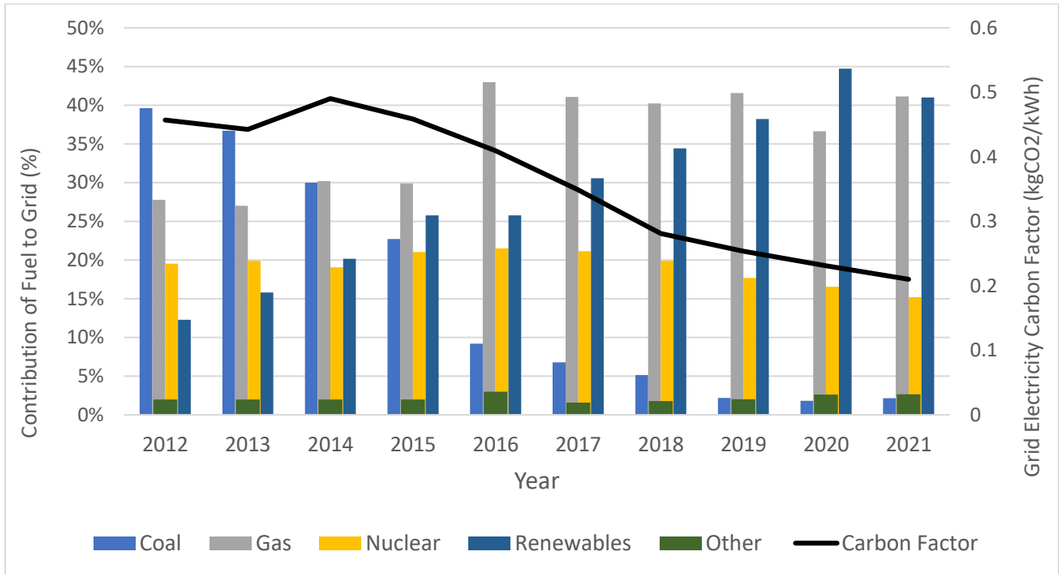


Figure 2 - Historic mix of generation methods and associated carbon factor for the National Grid

2.5 Impact of grid decarbonisation

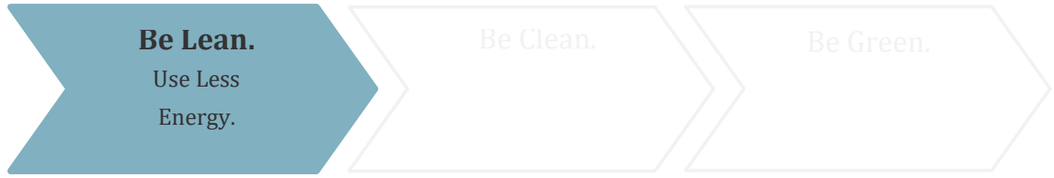
The carbon emissions associated with the combustion of natural gas are unlikely to change significantly in the coming years, whereas the carbon factor of grid electricity, and consequently the emissions from operating electrical plant, is projected to decrease in the long-term.

2.6 Energy Performance Certificate

Energy Performance Certificates (EPC) indicate how energy efficient a building is and give it a rating from A, very efficient, to G, inefficient. As part of the strategy, there are aspirations to achieve, as a minimum, an EPC Rating B. This aligns with both local and national objectives for reducing carbon emissions and promoting energy efficiency.

3. Strategy

3.1 Be Lean.



The following sections detail the passive design and energy efficiency measures that are considered viable for the proposed development.

3.1.1 Building Envelope

A 'fabric first' approach should be taken in order to reduce the energy demand and CO_2 emissions from the proposed development. The overriding objective for the façade design should be to achieve the optimum balance between providing natural daylighting to reduce the use of artificial lighting, the provision of passive solar heating to limit the need for space heating in winter, and limiting summertime solar gains to reduce space ventilation demands.

3.1.2 Thermal Insulation

The conversion and extension should be designed to incorporate an efficient thermal envelope.

As this is a new build, all improvements upon the U-value performance standards required by Building Regulations Part L will be implemented where determined to be beneficial and viable. Additionally, all opportunities to improve the thermal performance of retained elements shall be considered. This will improve the thermal performance of the element and also reduce air infiltration.

3.1.3 Fabric Air Permeability

Fabric air permeability is a measure of the volume of air that can penetrate through the fabric of a building, leading to ventilation heat loss and gain.

High air permeability can lead to uncomfortable draughts and dramatically increase the demand for space heating in winter, and space cooling in summer, when the air-flow works in reverse i.e. cool air escaping from the building. The proposed development shall seek to improve the air permeability of the retained elements and achieve a high standard for the new build elements through the incorporation of robust building detailing and high-quality construction techniques.

Table 1 illustrates target fabric parameters that are proposed for the development. These performance characteristics shall be fully reviewed throughout the design process through detailed thermal modelling.

Table 1 - Summary of Target Building Envelope Parameters

Element	Target Value
External Walls	0.26 W/m^2/K
Ground Floor	0.15 W/m^2/K
Roof	0.10 W/m^2/K
Glazing (including frame)	1.27 W/m^2/K
Air Permeability	5 m^3/hr/m^2
G-value	0.4 - 0.6 orientation dependant and as required for overheating mitigation

3.1.4 Glazing Energy & Light Transmittance

As noted, the design of the elevations of the buildings shall consider an appropriate approach to fenestration, which would help to ensure a balance between the benefits of passive solar heating in winter months whilst limiting the likelihood of high internal temperatures in summer.

Percentages of glazing in combination with the use of shading and solar control glazing with appropriate g-values will be considered. Where the risk of overheating is low higher g-values would be evaluated as this would assist in minimising space heating demands in winter.

3.2 Energy Efficiency Measures

Energy efficiency measures are those which seek to service the demand for energy (i.e. the remaining demand after implementation of passive design measures) in the most efficient way.

3.2.1 Hot Water

To limit the demand for hot water, the development will include water-efficient fixtures and fittings including WCs with low flush volume, flow reducers in the taps of wash hand basins and aerated shower heads, to limit overall water consumption in line with Building Regulations Part G.

3.2.2 Ventilation

Ventilation rates are to be in accordance with Part F, whether this is through Mechanical Ventilation with Heat Recovery (MVHR), mechanical extract only or natural ventilation.

All ventilation systems shall be designed to very low specific fan power (SFP) ratings with controls to allow for 'boost' ventilation rates as required by the occupiers. Purge ventilation will be achieved through adequately sized opening windows.

Ductwork should be rigid type and appropriately insulated with minimal flexible ductwork connections.

3.2.3 Cooling

The need for active cooling shall be designed out wherever possible; where not, the cooling demand will be minimised. At this stage, it is assumed cooling will only be provided to ancillary areas including retail spaces to suit the high occupancy and equipment loads. The cooling demand shall be met through energy efficient heat pump systems.

3.2.4 Lighting

Accommodation areas will be provided with low-energy, efficient light fittings throughout, to achieve an efficacy of at least 80 lamp lumens per circuit Watt (lml/Wc) and total output of greater than 400 lamp lumens. External lighting will also be low-energy efficient fittings, and linked to daylight sensors and / or presence detectors to prevent unnecessary use.

If implemented inefficiently, lighting can provide a significant contribution to the regulated CO_2 emissions of a development. As such, the implementation of energy efficiency lighting design is paramount to reducing overall emissions for the Proposed Development as a whole.

The lighting specification for the proposed development will be considered in conjunction with the potential for lighting control systems incorporating daylight linkage and presence detection.

As well as reduced energy requirement that would be achieved by implementing these strategies, the contribution to the internal heat gains would be reduced. This would further reduce the propensity for overheating and CO_2 emissions of each building.

3.2.5 Controls

The control of the heating, cooling, ventilation and lighting systems will be fundamental to the energy efficiency of each typology. The use of the following measures will be explored:

- Zoned thermostatic control
- Time control
- BMS (Building Management System) automated control
- Lighting PIR (Passive Infra-Red Sensor) control
- Daylight linked lighting control
- Energy management control

3.2.6 Energy Metering

Metering and sub-metering will be utilised to enable the efficient use of resources. Energy metering allows the monitoring of the following energy uses:

- Domestic hot water generation
- Major fans
- Lighting
- Small power
- Contribution from LZC technologies
- Any other major energy uses.

3.2.7 Unregulated Energy

Unregulated energy includes small power electricity use (computers, plug in devices) and catering energy consumption.

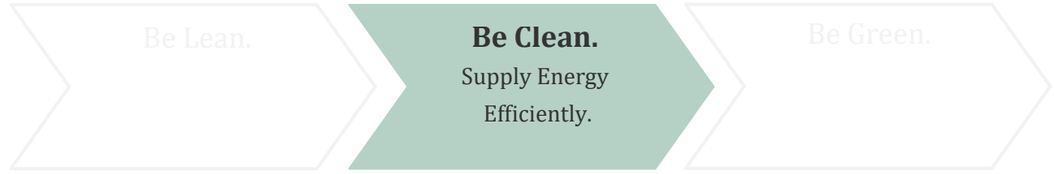
It is foreseeable that energy efficiency and the rising cost of energy would play an increasing role when future building users are deciding which appliances to purchase and the frequency of their use. However, it is not possible at present to quantify the extent of this potential reduction.

Given the uncertainty, measures to educate the future building users on how they can reduce their equipment energy use could be encouraged. This could be provided in the form of building user guides and tenant guides.

The guidance measures detailed within these types of documents could consider:

- Use of A / A+ rated white goods;
- Energy star rated computers and flat screen monitors;
- Energy efficient lifts; and
- Voltage optimization and power factor correction.

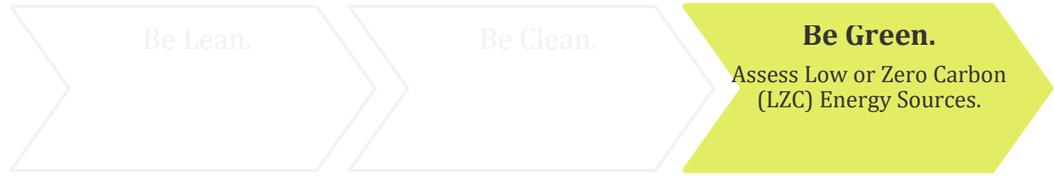
3.3 Be Clean.



This stage of the energy hierarchy refers to the use of technologies to provide energy whilst reducing consumption from the national grid and gas networks.

Section 4 summarises the services strategy options that shall be pursued as part of the detailed design stages. These include air source heat pumps (ASHP) for hot water generation, energy monitoring, highly efficient LED lighting with automatic sensing and control.

3.4 Be Green.



The following sections discuss various low carbon and renewable energy generation measures. Table 2 identifies the technologies that have been considered but discounted whilst the following sections describe those that are considered suitable for the proposed development.

Table 2 - Summary of Renewable Options

Renewable Option	Brief Description	Appraisal
Solar thermal	Solar thermal panels operate by capturing solar energy and transferring to a thermal store to generate hot water.	Technically viable but needs to utilise the same roof area as any PV installation and PV is considered the most suitable. This is because both PV and solar thermal essentially achieve the same end result (the production of heat albeit indirectly for the PV system which would power the ASHP installation). Distance between the roof panels and basement level thermal storage vessels increases energy losses and costs for the solar thermal option.
Ground source heat pumps (GSHP)	Ground source heat pumps can be used to extract heat from the ground by circulating a fluid through a system of pipes to a heat exchanger which transfers the energy to a distribution network.	Area of land available for a closed-loop GSHP installation severely limits the contribution this system can offers which makes it cost prohibitive.
Vertical axis wind turbine	Wind turbines use the force of the wind to drive a rotor and generator to produce electricity.	Significant visual impact to the site considering the height of this development. Flicker from turbines impacting on adjacent

		buildings. Limited output for a single turbine.
Combined heat and power (CHP)	A CHP engine is a device that when burning fuel will produce useful electricity, as well as heat.	Whist CHP units can be an efficient solution in certain applications, the thermal base load may not be adequate to achieve sufficient operation. A gas fired installation would not be considered a sustainable technology due to the carbon factor of gas and hydrogen CHP, as a new technology, is still in its infancy.
District Heating	District heating, also known as a heat network, is a system that uses a singular central heat source to distribute hot water through a network of insulated pipes to multiple individual dwellings or buildings.	We are cognisant of the Cardiff Heat Network Project, the first phase of which is being constructed at the time of writing. However, the current MEP strategy aims to utilise a standalone systems of electric panel heaters and ASHPs for the generation of space heating and domestic hot water respectively. This strategy provides a scheme which balances low carbon technology and cost effectiveness. As space heating would be provided by electrical means, a connection to the DHN would just provide the energy required to heat the domestic hot water. As such, it is anticipated that the cost and disruption to the local areas, involved in providing a connection, would be prohibitive to this scheme.

3.4.1 Air Source Heat Pumps (ASHP)

Heat pumps generate heating and hot water using a refrigeration cycle, the result of which is significantly higher efficiencies than using the electricity directly. Efficiencies of upwards of 300% for hot water generation can be achieved, as represented by the unit's coefficient of performance (COP).

The emissions reductions offered by heat pumps will continue to increase as the grid decarbonises, meaning they are a futureproof technology.

Further to this, heat pumps require no on-site combustion and do not, therefore, contribute to any degradation of local air quality.

3.4.2 Energy Storage

Renewable generating technologies are advantageous as they are able to offset higher carbon forms of energy. However, most of these technologies rely on unpredictable or intermittent natural energy to operate (i.e. solar radiation or wind) which do not necessarily occur at times of energy demand. Energy storage offers the opportunity to capture the generated energy for use at a time of later demand.

For electricity, this is advantageous for multiple reasons. Firstly, the price to import (consume) a unit of electricity from the grid is significantly greater than the price at which the network operator will buy any generated electricity. As such, if locally generated electricity can be used on site to offset grid-supplied electricity, substantial financial savings can be made.

In the transition to electric vehicles and heating, grid resilience is an increasing concern. By storing electricity either generated locally, or at off peak times, the battery can then supply the electricity demands at times of peak grid demand. This reduces the development's overall peak demand and consequent impact on the local grid infrastructure.

Conversations with the local distribution network/systems operator (DNO/DSO) could result in a reduction in the necessary financial contribution should it be shown that the chosen storage and management strategy provide a tangible reduction in peak electricity demand.

3.4.3 Photovoltaic Cells (PV)

Photovoltaic panels harness energy from daylight and convert this into useful energy in the form of electricity. A PV system requires viable roof space in order for the system array to be installed and function effectively.

To compliment the energy strategy and achieve the sustainability aspiration of the development we will consider PV systems as the site offers good potential for the technology. The main roof area has been identified as suitable for a PV installation to serve the development.

3.4.4 Summary of Technologies

Following the LZC appraisal, the following strategy and technologies shall be taken forward to the final design:

- Air source heat pump generation for hot water generation
- Provision of PV panels to the roof. PV area dependent upon layout design considering optimum orientation and space requirements for external plant.

The above strategies are described in greater depth in section 4.

4. Services Overview

Ensuring high thermal performance will reduce overall energy demand and high efficiency systems will reduce the energy required to meet this demand, the result of which should be lower energy bills and high levels of thermal comfort.

4.1 Servicing strategy

4.1.1 Primary Heating

An all-electric heating and cooling strategy is to be implemented in line with the sustainability aspirations of the development.

By providing enhanced levels of thermal insulation, a lower heating demand will need to be met within the accommodation areas such that it could be met from small local electric heaters only. This represents a simple, energy efficient, low cost and easy to control heating solution which negates the need for extensive hot water pipework distribution that often contributes to overheating issues within similar building types.

Each electric panel heater would be provided with individual, programmable controls e.g., time schedule, heat output and electric thermostat.

For communal areas, it is likely that heating will be provided from a combination of electric panels heaters and small VRF air conditioning installations dependent on the room usage. Refer to 4.1.2 for further details regarding the VRF installation.

4.1.2 Cooling

It is currently anticipated that cooling will mainly be required to support some of the retail and amenity spaces. These spaces will likely utilise VRF type units that could provide heating in addition to cooling.

All external condensers associated with the cooling system shall be located externally.

4.1.3 Domestic Water Generation

We anticipate that domestic hot water generation will be the dominant building load and our strategy is to utilise air source heat pumps to achieve domestic hot water production.

The delivery of domestic hot water will be via LTHW plate heat exchangers which shall serve smaller calorifier/buffer vessels.

The plate and buffer vessels are to be sized to achieve enough storage to accommodate intermittent peak flows and provide some resilience but not to have excessive storage that is energy demanding.

Primary ASHP equipment will be located externally on the roof.

4.1.4 On-Site Renewable Energy

To compliment the primary heating and domestic water strategy, we shall utilise on-site electrical generation through use of photovoltaic (PV) panels mounted on the roof of the development. This will achieve direct contribution to the electrical requirements of the building.

4.1.5 Lighting

According to the Carbon Trust, lighting accounts for around 20% of the electricity used in the UK and 75% of installations are out of date and unable to meet current design standards.

LEDs are one technology that represents an immediate and potentially significant opportunity for organisations, when it comes to reducing energy bills and improving carbon credentials.

Building regulations are increasingly calling for the adoption of intelligent lighting and environment control systems that will help improve efficiency and reduce energy consumption.

LED lighting combined with smart controls can reduce energy use while providing a high-quality light experience. At a basic level, such systems can be used to turn off or dim unnecessary lighting, by sensing when someone is in the area. But going far beyond that, advanced systems can now provide additional benefits for businesses, such as improved monitoring and maintenance, and an enhanced experience for occupants.

Daylight harvesting is to be considered for the scheme. It works by monitoring the level of ambient/natural light in a space and dimming or switching off lighting when sufficient natural light is present (as well as when the space is unoccupied). This not only helps reduce energy use and expenditure, but improves the working environment.

Lighting strategy:

- Use LEDs to reduce lighting energy costs by around 30-50%
- Use occupancy sensors that dim or switch off lighting when there is nobody in the area to reduce electricity use by up to 30%
- Use sensors to adjust artificial lighting based on the amount of natural light available to reduce electricity use by up to 40%

4.2 Energy Performance

Although energy modelling is yet to commence, we anticipate that the development will achieve a minimum EPC rating B with the above building parameters and services strategy.

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