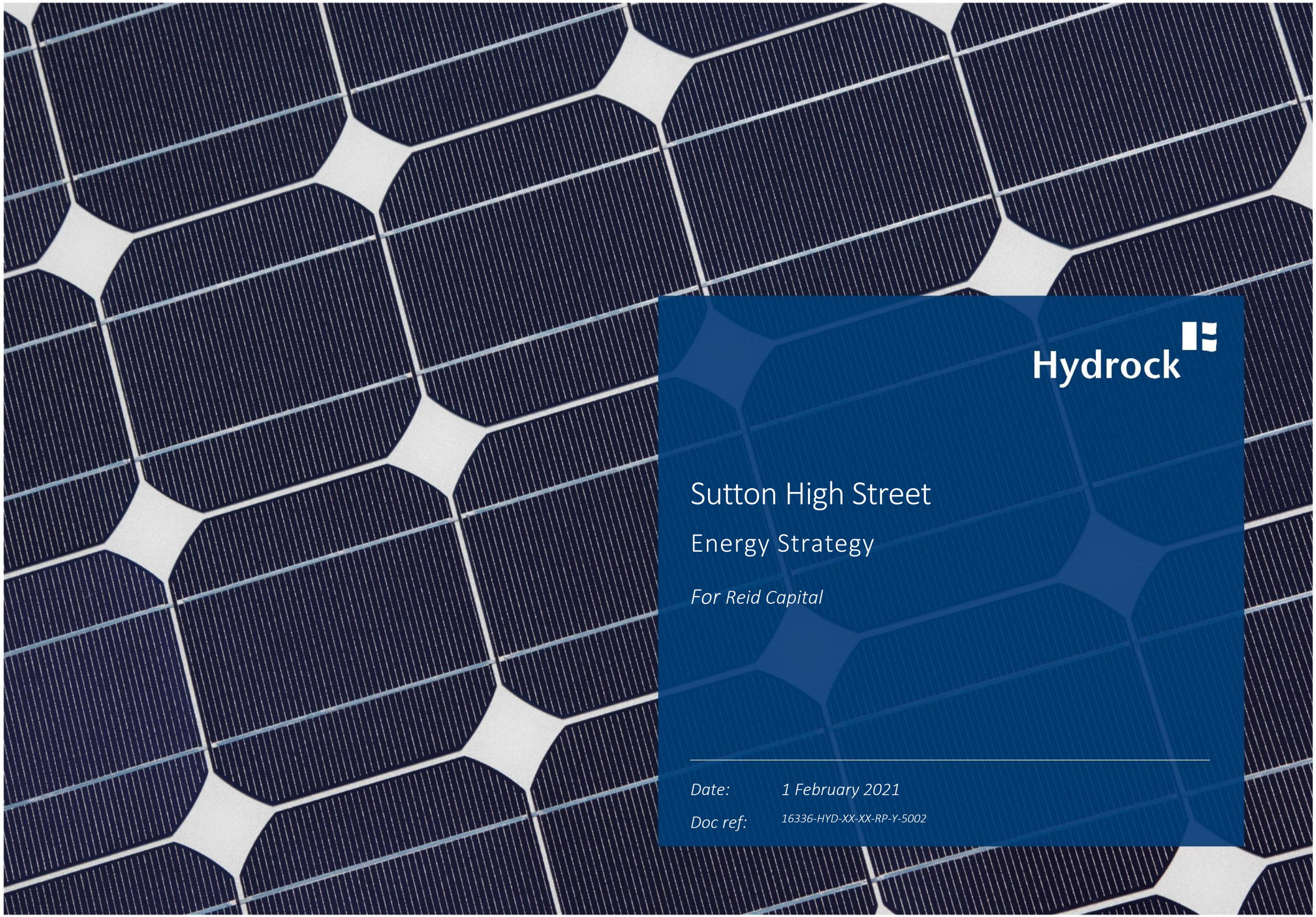

Hydrock

Sutton High Street

Energy Strategy

For Reid Capital

Date: *1 February 2021*

Doc ref: *16336-HYD-XX-XX-RP-Y-5002*

DOCUMENT CONTROL SHEET

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Introduction

Hydrock SES has been appointed by prepare an Energy Strategy for the proposed development at 219-227 Sutton High Street, in the London Borough of Sutton.

1. PUPOSE OF REPORT

This document forms part of the planning submission for the development and will inform the Council of the proposed energy and sustainability strategy for the proposals.

The energy strategy provided within this report follows the guidance set out by national legislation and the requirements of local planning policy. Throughout this report carbon emissions are split into two categories:

- **Regulated:** Emissions associated with heating, cooling, hot water, lighting and any other fixed building services equipment (those that are covered under Building Regulations Part L); and
- **Unregulated**: Emissions that are associated with small power and plug-in items and any other process or plant equipment (these are not covered by Building Regulations Part L).

2. DEVELOPMENT PROPOSALS

2.1 Site Context

Sutton High Street is approximately 11 miles south of London. The site it currently with a three-storey building with a small Argos store at ground level. Sutton High Street is pedestrianised and within walking distance to a number of key transport links into London.

The site itself is bounded by Sutton High Street to the east, the ASDA superstore to the north, and existing high street buildings to the south. There is a new development under construction to the southwest of the proposed development.

2.2 Development Details

The proposed development includes 36 no. units with a mix of one- and two-bedroom apartments.

The development is split across 9 storeys plus a basement with a communal roof garden at fourth floor level.

The ground floor proposals consist of three small A1/A3 use commercial units, and apartment concierge spaces.

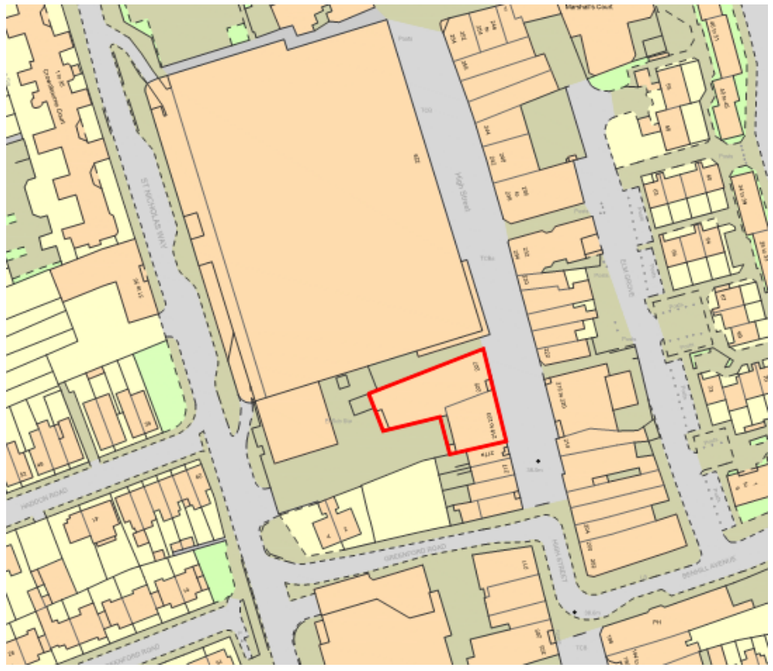

Figure 1 - Site location plan

Policy Context

This section outlines the national, regional and local level energy and policy that is relevant to the development at 219-227 Sutton High Street.

3. NATIONAL PLANNING POLICY

3.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was first published on 27 March 2012 to set out government planning policy for England, removing all regional level planning policy at this time in favour of 'a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.'

All Local and Neighbourhood Plans must therefore align with the polices of the NPPF.

The NPPF states clearly that the purpose of planning is to help deliver sustainable development and defines three mutually dependent pillars that must be equally considered in order to achieve this:

- Economic
- Social
- Environmental

A revised NPPF was published in July 2018, focusing on the following key areas:

- Promoting high-quality design for new homes and places.
- Offering stronger protection for the environment.
- Constructing the right number of homes in the right places.
- Focusing on greater responsibility and accountability of councils and developers for housing delivery.

In terms of the environment, the revised NPPF seeks to further protect biodiversity by aligning the planning system with Defra's 25-year Environment Plan. Not only does this protect habitats, it also emphasises air quality protection in relation to development proposals.

The revised NPPF was updated again on 19 February 2019 but this update included only minor changes to the text to provide additional clarity in some areas.

3.2 Building Regulations (Part L)

All areas of the proposed development will need to meet Energy Performance standards are set for non-dwellings by Building Regulations Approved Document Part L1A and L2A, Conservation of Fuel and Power in New Dwellings, and Conversation of Fuel and Power in New Developments in Buildings other than Dwellings.

It is the role of Part L of the Building Regulations to include a minimum level for regulated carbon emissions defined by the Target Emission Rate (TER) which relates to a 'Notional Building', automatically generated as part of the and Simplified Building Energy Model (SBEM) toolkits.

The resulting Building Emission Rate (BER) and Dwelling Emission Rate (DER), must be less than the TER in order to comply. A benchmark Energy Performance Certificate (EPC), rated A (most efficient) through G (least efficient) will also be calculated as part of this assessment via comparison of each building assessed to a 'Reference Building', also automatically generated as part of the SAP and SBEM toolkits.

These changing national regulations will drive energy efficiency and carbon reduction improvements in new buildings. It was the intention via progressive changes to Part L to require zero carbon homes by 2016. However, in July 2015 the Government Productivity Plan ("Fixing the Foundations") announced that it would not proceed with the zero-carbon allowable solutions carbon offsetting scheme, or the proposed 2016 increase in on-site energy efficiency standards, committing instead to keeping standards 'under review'.

Recently, consultation on a 2020 update to Part L was held alongside a proposed national 'Future Homes Standard' to come into effect in 2025. No government response to the consultation has yet been published but on this basis, an updated to Part L for new homes is imminent.

A consultation to make similar updates to Part L 2A for new non-domestic buildings is also expected in early 2021 and developments should be aware of proposed changes and any transitional arrangements that may come into effect before works have started on site.

Also important is the changes to the carbon emissions within the new SAP10 which will replace the existing figures in SAP 2012. The emissions emission factors demonstrate the significant decarbonisation of the national grid and confirm that natural gas will have a higher carbon factor than electricity going forward.

4. REGIONAL POLICY

4.1 The London Plan

The London Plan is the Mayor of London's statement on London planning policy and provides 'regional' level material considerations when determining planning applications in London Boroughs.

Updated London Plan Energy Assessment Guidance

For referable developments from January 2019, applicants are encouraged by the GLA to use the updated SAP 10 emission factors. Applicants are advised to continue to use the current Building Regulations methodology for estimating energy performance against Part L 2013 requirements but with the outputs manually converted for the SAP 10 emission factors.

Table 1 SAP10 carbon factors

Fuel	SAP 2012 Carbon Factor ($kgCO_2/kWh$)	SAP10 Carbon Factor ($kgCO_2/kWh$)
Grid Electricity	0.519	0.233
Gas	0.216	0.210

The updated Energy Hierarchy no longer adopts CHP as a recommended solution. The new order is as follows:

1. Connection to an area wide heat network
2. Communal heating system
3. Individual heating system

Emerging London Plan

Following Examination, an 'Intent to Publish' version of the new London Plan was released upon at the end of 2019 and the Mayor is now taking the statutory steps to finalise and adopt the Plan which will replace the existing London Plan policies in its entirety. In planning terms, the emerging plan is at a very late stage of preparation and prior to adoption should remain a 'material consideration' when determining planning applications in the London Boroughs in 2020.

Key policies for energy and sustainability are detailed below.

4.1.1 *Policy GG6: Increasing energy efficiency and resilience*

The policy updates the strategic position of the previous London Plan (Policy 5.1) by requiring development proposals to move towards a low carbon circular economy contributing towards London becoming a xero-carbon city by 2050.

Buildings and infrastructure must be designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating and avoiding contributing to the urban heat island effect.

Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

4.1.2 *Policy SI 2 Minimising Greenhouse Gas Emissions*

The previous London Plan (Policy 5.2) set out an energy hierarchy to follow when designing schemes which has been updated within the new plan as follows:

1. **Be Lean** – use less energy and manage demand during operation.
2. **Be Clean** – exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
3. **Be Green** – maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
4. **Be Seen** - monitor, verify and report on energy performance.

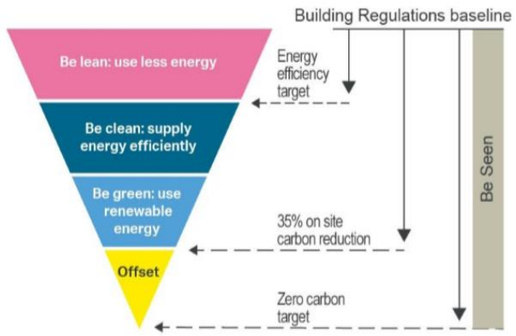

Figure 2- GLA Energy Hierarchy (2020)

The priority is to minimise energy demand, and then address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings.

The policy also sets out the updated carbon dioxide emissions reduction targets for new buildings:

- Major development should be net zero-carbon, providing an on-site carbon reduction of at least 35% beyond Part L Building Regulation compliance.

The above requirement must be demonstrated by an Energy Statement which provides the relevant energy assessment and associated outputs in relation to the on-site carbon reduction targets of the London Plan and within the framework of the energy hierarchy.

It is noted by Policy SI 2 that where the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough council to secure delivery of other CO_2 reduction projects.

Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

4.1.3 *Policy SI3 Energy Infrastructure*

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system, evaluating and selecting the heat source in accordance with the following principles:

1. connection to local existing or planned heat networks
2. use of zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
3. use of low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
4. use of ultra-low NOx gas boilers

The design of such systems should also seek to minimise impacts on air quality (as per Policy SI 1).

4.1.4 *Policy SI4 Managing Heat Risk*

The policy states that developments should be designed to limit their contribution to the heat island effect and encourages spaces to be designed to avoid overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1. Minimise internal heat generation through energy efficient design;
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
4. Passive ventilation;
5. Mechanical ventilation;
6. Active cooling systems (ensuring they are the lowest carbon options).

5. LOCAL POLICY

The London Borough of Sutton Local Plan was adopted on 26 February 2018 and provides a strategic policy framework to guide development in the area up to 2031. The Local Plan replaces the Core Strategy (2009) and the Site Development Policies DPD (2012).

In addition to the Local Plan document the Council prepared a Technical Guidance Note to provide further detail on the Carbon Offset Fund, Biodiversity Accounting and Green Space Factor.

Key Policies of the adopted Local Plan for the London Borough of Sutton and the Building a Sustainable Sutton Technical Guidance Note are detailed below.

5.1 Sutton Local Plan (2018)

The Sutton Local Plan sets out the planning strategy and policies for the borough. It deals with a wide range of subjects including: major new regeneration areas, new housing development, retail, office and industrial development, infrastructure provision, the protection of green space, character and design, cutting pollution, climate change and transport.

The following adopted policies are of relevance in relation to energy and sustainability and the proposals for the proposed care home:

5.1.1 *Policy 31 – Carbon and Energy*

Proposed major non-residential developments should meet a minimum 35% reduction in CO_2 emissions expressed as a percentage improvement over Part L of the 2013 Building Regulations.

In seeking to minimise CO_2 emissions in line with the above targets, all proposed developments will apply the London Plan energy hierarchy.

Major developments will be expected to achieve at least a 20% reduction in total CO_2 emissions (regulated and unregulated) through renewables though guidance suggests that offset payments to reach the 35% target will be permissible.

All planning applications should be supported by an Energy Statement incorporating 'as-designed' Building Regulations Part L (BRUKL) outputs to demonstrate how the relevant targets for reducing CO_2 emissions will be met.

The Energy Statement should include calculations of energy demand and emissions at each stage of the Mayor's energy hierarchy for both regulated and non-regulated elements in line with GLA '*Guidance on Preparing Energy Assessments*'.

In addition, Policy 31 includes a requirement for all major non-residential development to demonstrate BREEAM 'Excellent' via a pre-assessment to be included as part of the planning submission.

5.1.2 *Policy 33 – Climate Change Adaptation*

Development proposals should minimise vulnerability of people and property and be fully adapted and resilient to the future impacts of climate change by minimising overheating and contribution to the urban heat island effect.

The above may be achieved by permeating the development with blue and green spaces and by incorporating a range of natural cooling measures as part of the design and layout, including passive design measures (e.g. building orientation), shading, planting and soft landscaping, trees, ponds and SuDS. Policy requirements include consideration of the following:

- Compliance with cooling hierarchy in Policy 5.9 of the (previous) London Plan;
- Use of green roofs or green walls (where feasible);
- for previously developed sites - Increase in overall green space coverage of at least 10% compared to baseline conditions prior to development.
- for previously developed sites - Improved Green Space Factor (GSF) score of at least +0.2 compared to the baseline GSF score prior to re-development.

5.2 Building a Sustainable Sutton: Technical Guidance Note for Developers (2018)

A Technical Guidance note was finalised in April 2018 in support of the new Local Plan to provide more detailed guidance on three key aspects of local policy:

- Carbon Offset Fund
- Biodiversity Accounting
- Green Space Factor

Major developments are expected to achieve at least a 20% reduction in total CO_2 emissions (regulated and unregulated) through renewables though offset payments to reach the 35% target are permitted by the Council.

The Technical Guidance Note confirms the current carbon offset rate is £60/tonneCO_2/year over 30 years.

The Guidance on Biodiversity Accounting is less relevant to these proposals given that the site is previously developed land.

The Green Space Factor (GSF) is used in relation to local Policy 33 to help determine the appropriate level of urban greening in new developments. Urban greening measures including soft landscaping, tree planting, green roofs, sustainable drainage (SuDS) measures and open water features are not only highly effective in counteracting overheating and the 'urban heat island' (UHI) effect during summer heatwaves, but also achieve a range of other important benefits for people and wildlife.

Sutton's GSF scoring system is set out within the Technical Note. The overall GSF score for both existing conditions on the site prior to development (baseline) and for the proposed development should be calculated using the methodology provide and reported in the Energy and Sustainability Statement and/or Overheating Report.

An initial assessment from the project team should provide as the basis for discussions with the council at the pre-application stage.

6. POLICY SUMMARY

The carbon benefit of gas Combined Heat Power (CHP) (the most commonly proposed technology in energy strategies) has diminished as gas becomes more carbon intensive relative to grid electricity.

Emerging national and regional level policy updates consider this decarbonisation and the significant impact of low carbon delivery of new developments over the coming years.

An Energy Statement remains a requirement of the new London Plan which sets a higher target for new non-residential development to reduce carbon emissions by 35% beyond a Part L compliant baseline.

Performance beyond Part L is echoed within the Local Plan policy for the London Borough of Sutton. However, there is an expectation to achieve at least a 20% reduction in total CO_2 emissions through renewables. The Council permit offset payments to reach the 35% target.

The Technical Guidance Note developed by Sutton Council provides further information on the Carbon Offset fund mechanism in place.

As the scheme is referable the London Plan carbon targets will need to be adhered to which are more onerous than the Sutton Local plan. Therefore, a target of 35% reduction on the Part L baseline will be targeted.

The energy and carbon performance of the proposals is provided in the following sections of this report alongside details of other sustainable design measures in order to minimise the number of separate application documents and help to provide a holistic view of the sustainability performance of the proposals which extend beyond just energy and carbon targets.

In addition, Local Policy requires proposals to consider Climate Change Adaptation measures that can be incorporated within the design. The Technical Guidance Note provides details on the Green Space Factor (GSF) that should be included within energy and sustainability reporting for new developments.

Energy and Carbon Baseline

This section establishes the baseline energy consumption and associated CO_2 emissions for the scheme based upon a Building Regulations 2013 Part L compliant development.

This baseline will then be used as the comparison for carbon emissions reduction throughout this report. The requirements for this baseline are specified by the London Plan guidance. All calculations have used the new SAP 10 carbon factors.

7. SAP ENERGY MODELLING

The dwellings on site have been assessed under Part L 2013 using the Government's Standard Assessment Procedure (SAP). The apartments have been assessed using Stroma FSAP software.

As dwelling typologies repeat across the floors throughout the development, a representative selection has assessed to provide an overview of the development's performance. The following dwellings have been assessed in detail.

- Flat 101, 103, 105, 107
- Flat 201, 203, 205, 207
- Flat 701, 703

7.1 Solar Gains

Solar gains are calculated automatically by the modelling software and are based on the orientation of the building, the transmission coefficients of the glazing and the solar angles. SAP also takes into account shading devices.

7.2 Internal gains

Gains from lighting, appliances, cooking and from the occupants are estimated from the floor area.

7.3 Building Fabric

In order to reduce the overall heating demand for the development, building fabric that is in excess of the notional building requirements has been specified. This is shown in detail below:

Table 2 - Notional building fabric properties

Building Element	Notional Building Fabric
Roof	0.13 W/m^{2}k
External Wall	0.18 W/m^{2}k
Glazing (g-value)	1.4 W/m^{2}k (0.65)
Air Permeability	5 m^3/m^2/hr @ 50 Pa

Additionally, it has been assumed that the party walls between the apartments and communal corridors are cavity filled/ solid construction.

7.4 Building Services

To calculate the baseline CO_2 emissions the dwellings are assumed to use a communal gas boiler system with heat interface units (HIU) for heating and hot water, and grid derived electricity for all lighting and power.

Dwellings are assumed to be naturally ventilated with mechanical extract for wet areas (kitchens and bathrooms). All efficiencies match the case for the notional building.

7.5 Weather data

Weather data is based on the climatic data provided by SAP for the dwellings, the weather file used for the exercise is the London Test Reference Year (TRY) as required by the National Calculation Methodology (NCM).

8. SBEM MODELLING

Under Building Regulations Part L, the development must be assessed under the Simplified Building Energy Model (SBEM) methodology using the National Calculation Methodology (NCM) conditions for the appropriate planning use class.

The development proposals have been assessed using IES VE software to estimate the energy and carbon emission baseline for the development from the 'notional building' used by SBEM to set the Target Emission Rate (TER) for Part L compliance.

8.1 Internal gains

SBEM calculations utilise weather data files to model solar gains based on the orientation of the building and the properties of the glazing. The site-specific design measures in order to prevent overheating will be tested via the SBEM as part of the detailed design process.

All occupancy, lighting and equipment gains are specified within the NCM internal conditions for each use class and will therefore remain consistent across all care home developments.

8.2 Building fabric

All fabric efficiencies for the baseline case are as per the Part L2A notional building for Use Class A1/A3. The table below shows the baseline U-values for a Part L2A baseline development. Table 3 -Notional Building U-values

Table 4 - Part L2A notional building U-values

Building Element	Part L2A 2013 Notional Building U-value
Roof	0.18 W/m^{2}k
Wall	0.26 W/m^{2}k
Floor	0.22 W/m^{2}k
Glazing	1.60 W/m^{2}k

The air permeability (air leakage index) for the notional buildings is 3 m^3/hr/m^2 at 50 Pa though air permeability of up to 10 m^3/hr/m^2 at 50 Pa is permitted by the Building Regulations.

8.3 Building services

As specified in the London Plan the heating system for the baseline is a gas-based system for domestic hot water and space heating, with notional boiler efficiency.

All other system efficiencies are based on the Building regulations notional values.

9. BASELINE CARBON EMISSIONS

9.1 Regulated Carbon Emissions

The baseline regulated carbon emissions rate for development is **38,300 kgCO_2/yr.**

9.2 Unregulated Carbon Emissions

Unregulated emissions relate to any energy consuming activities that are not covered under Building Regulations Part L1A and L2A. For proposed development, this will include:

- Lifts;
- Small power –Computers and other electrical equipment.
- Kitchen equipment –fridges and dishwashers etc.
- Laundry equipment – washers and dryers.

The total unregulated carbon emissions baseline for the development is calculated at approximately **49,790 kgCO_2/yr.**

The proposed strategy includes measures that will reduce unregulated energy consumption though this is difficult to quantify via energy modelling for Part L.

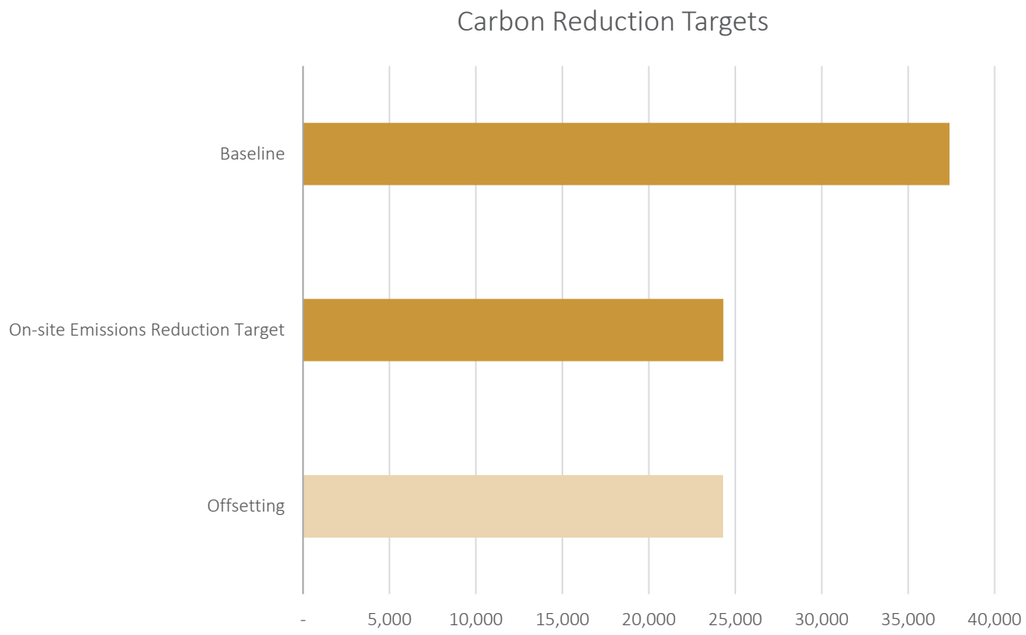

Figure 3 - Baseline carbon emissions and carbon reduction targets

Be Lean – Reduce the Demand for Energy

This section of the report responds to the first stage of the energy hierarchy (Be Lean) and discusses both passive and active design measures that could be included within the development to reduce energy use and subsequent carbon emissions.

Design strategies typically include building form and fabric measures (passive design) and energy efficient building services (active design). Focusing on form and fabric in particular at an early stage in the build process is often the most cost-effective way to reduce energy consumption and CO_2 emissions.

10. PASSIVE DESIGN MEASURES

Passive design options are those which utilise building form, massing and glazing ratios to exploit the natural surroundings of the site to help reduce energy demand. The proposed design includes the following:

- Optimising daylight through higher floor to ceiling heights or dual aspect buildings;
- Control of solar gain to benefit from heat when required without causing overheating in summer via the size and depth of windows on different elevations;
- Increased efficiency of building fabric, particularly the roof and walls to reduce heat loss;
- Maximising air tightness to minimise the impacts of uncontrolled air infiltration; and
- Strategic planting of trees to shelter lower level buildings from high winds and provide shading from the sun.

Passive design measures have been carefully considered within the development proposals as appropriate to the construction type and end use.

The building has been orientated with respect to the sun path at the site to maximize solar gain at the appropriate time of the year when required in cold climate and to minimise solar gain during summer months.

Glazing layout and specification has been strongly influenced by the passive design goals of the project, with windows placed to increase the amount of natural daylight and reduce the reliance on artificial lighting.

Improved U-values for the floor, roof and glazing have also been confirmed as per Table 5 below.

Table 5 - Proposed building fabric properties both the dwellings and retail unit

Building Element	U-value
Roof	0.12 W/m^{2}k
Floor	0.12 W/m^{2}k
Walls	0.18 W/m^{2}k
Glazing	1.20 W/m^{2}k

Air permeability of 3 m^3/hr/m^2 at 50 Pa has been utilised at this stage within modelling for the actual building though this may be improved upon during detailed design with inputs from the operator and principal contractor.

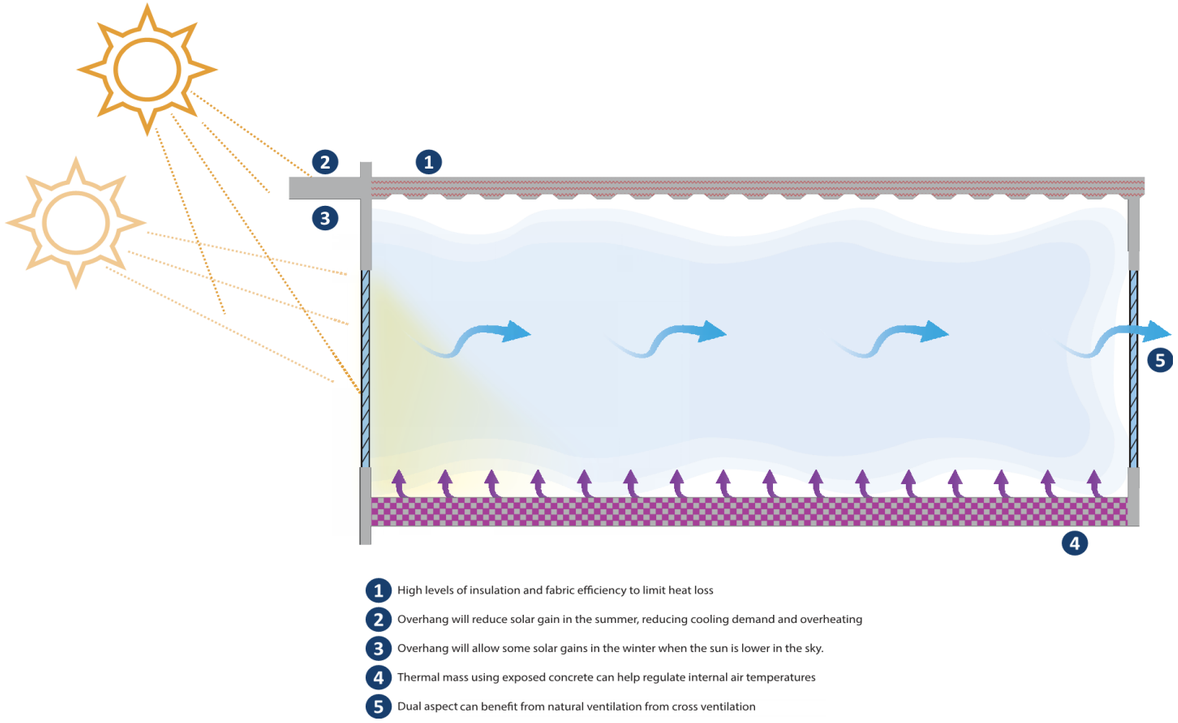

Figure 4 - Passive design measures

11. ACTIVE DESIGN MEASURES

Active design relates to energy efficiency measures that can be included within the building services specification to reduce energy consumption. All services will be designed to meet at least the minimum recommended performance requirements contained in the UK Government Domestic and Non Domestic Building Services Compliance Guide s(2013).

The following active design measures are recommended for inclusion within the scheme:

11.1 Regulated Energy

The heating system will ensure appropriate zoning and segregation of internal spaces to allow effective temperature control by residents as appropriate.

The heat emitters in all residential areas will be low surface temperature radiators. Hot water delivery will include high levels of insulation, coupled with efficient fittings to minimise water consumption and energy consumption. The system delivery efficiency is assumed at 91%.

To ensure a suitable acoustic environment, ventilation will be provided via mechanical ventilation with heat recovery (MVHR). Equipment will be selected to have a low specific fan power (SFP) to reduce energy use and carbon emissions.

Generally, all equipment will be specified to achieve a high efficiency (e.g. high thermal conversion efficiency for heating equipment) and low distribution losses (low fan and pump power, insulation in accordance with relevant standards), with pumps utilising variable speeds.

To reduce energy, demand all lighting installed will be high efficiency LED type and communal areas will also be provided with absence detection to avoid lights being on in unoccupied spaces. Both measures will further reduce building energy use.

External lighting has been designed to minimise impact on the surrounding areas and will be controlled by daylight photocell dimming and a timeclock to ensure lower lighting levels for set periods to minimise any potential effects on wildlife or the local environment.

The retail unit is being designed as Shell & Core, however it is envisaged that ceiling mounted MVHR will be used for ventilation, with VRF heating and cooling.

11.2 Unregulated Energy

The unregulated energy use will be mostly attributed to small power with plug-in devices and white goods providing the highest contribution. The most cost effective way to reduce unregulated energy use in dwellings is to provide information to residents to encourage equipment to be switched off when not in use.

In addition, energy efficient equipment will be specified to follow the principles outlined in CIBSE Guide TM50, where possible. For example, small domestic white goods (such as fridges where provided), will be specified to be A+ rated under the EU Energy Efficiency Labelling scheme.

Due to the high reliance on occupant behaviour patterns, it is difficult to predict the reduction in energy consumption and carbon emissions that can be achieved through the inclusion of these measures.

It is anticipated that these measures will be sufficient to meet the unregulated energy reduction requirements of the Council.

12. SUMMARY OF CARBON EMISSIONS

The carbon emissions reduction after the Be Lean stage of the Energy Hierarchy are shown in Table 6 below:

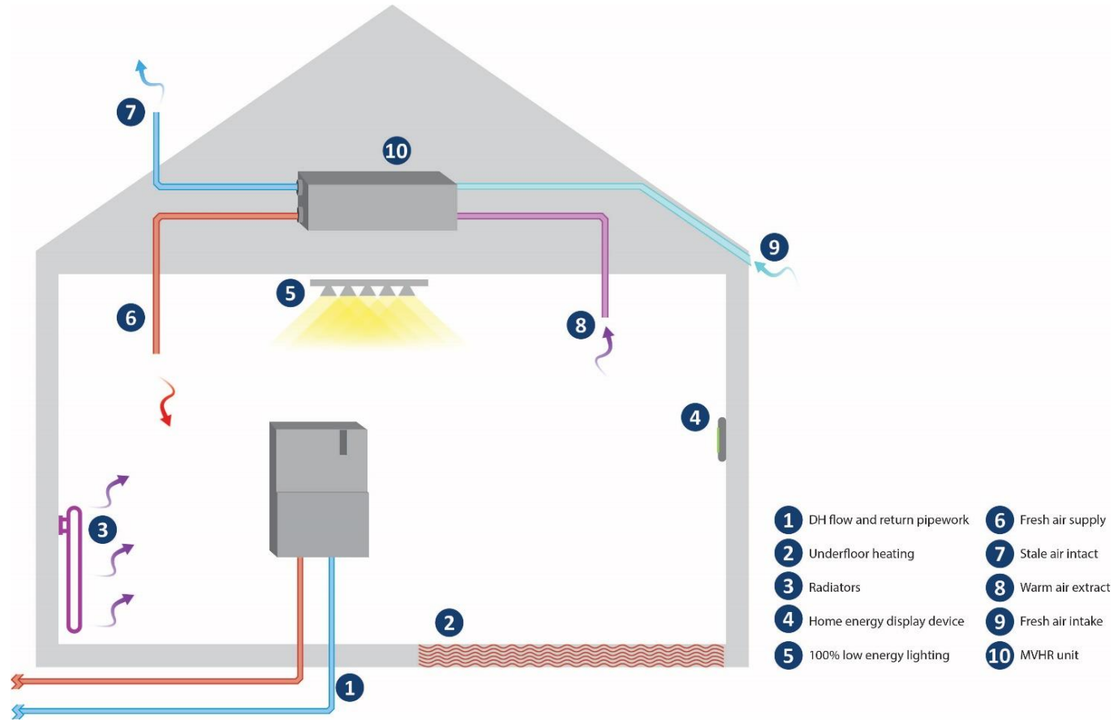

Figure 5 Active design measures

Table 6 - Carbon emissions reduction after the Be Lean stage of the energy hierarchy

Energy Hierarchy Stage	Carbon Emissions $kgCO_2/yr$	Carbon Reduction $kgCO_2/yr$	Percentage Reduction
Baseline Carbon Emissions	38,300	NA	NA
After Be Lean	36,300	1,900	5%

Be Clean – Supply Energy Efficiently

This section of the report will explore ways in which the developments heating and hot water could be provided via connection to any existing or planned district heating networks. The heating infrastructure will be selected in line with the hierarchy outlined in London Plan Policy SI3 Energy Infrastructure.

13. ENERGY INFRASTRUCTURE INTRODUCTION

In relation to London Plan policy SI3 on Heating Infrastructure, it was confirmed by a GLA report (2017) that the carbon benefit of gas Combined Heat Power (CHP) (previously the most commonly proposed technology in energy strategies) has diminished as gas becomes more carbon intensive relative to grid electricity. The GLA encourage the use of SAP 10 (2019) carbon emission factors for residential proposals, under which gas engine CHP provides less carbon savings over its lifetime and no longer helps London to meet its carbon targets. By comparison, a transition to heat pump technologies shows increasingly greater carbon savings as the grid decarbonises.

14. DE OPPORTUNITY AREA AND HEAT MAPPING

The UK Market Report (January 2018) published by the Association for Decentralised Energy states that there are about 17,000 heat networks in the UK providing around 2% of the overall UK heat demand across all sectors.

An updated heat map for Greater London (see Figure 8) was prepared by the Centre for Sustainable Energy in 2019 and demonstrates both the low heat demand across the Sutton borough and the very limited existing and potential heat network opportunities in the area.

The map covers the whole of Greater London, and provides very local information to help identify and develop DE opportunities, including data such as:

- Heat demand values for each building
- Locations of existing energy supply plants
- Locations of existing district heating networks
- A spatial heat demand density map layer

Figure 7 - London Heat Map for Sutton, Centre for Sustainable Energy (on behalf of the GLA)

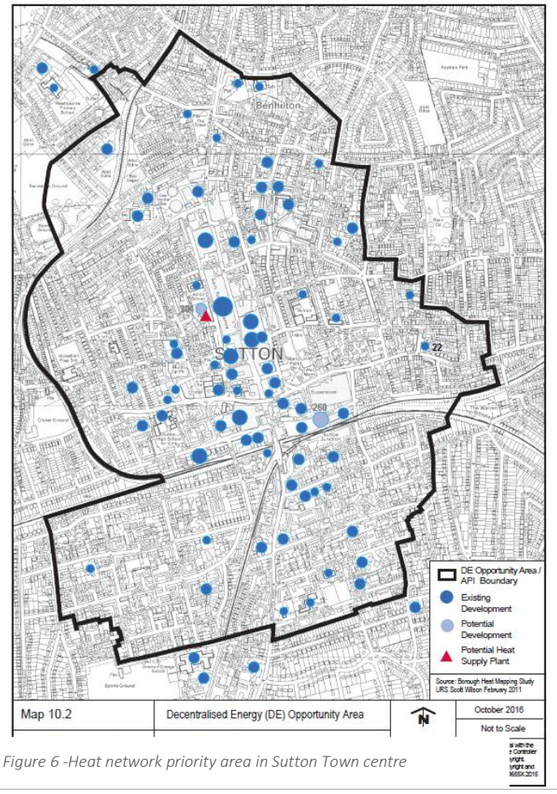

Figure 6 -Heat network priority area in Sutton Town centre

This is supported by the Local Plan evidence base, Map 10.2 which identifies an Decentralised Energy (DE) Opportunity Area for Sutton Town Centre identifying only one potential heat supply plant location.

The proposed site sits within of the DE Opportunity Area and connection to existing DE networks will be explored.

14.1 Sutton Decentralised Energy Network (SDEN)

Sutton Decentralised Energy Network Limited (SDEN) is a sustainable energy supplier that will provide low-carbon energy to homes and businesses in Sutton.

In the future SDEN will deliver energy to residents and businesses across South London, meeting the heating and hot water needs of homes and businesses across the region. SDEN will use energy generated by the new Energy Recovery Facility (ERF) and the existing landfill gas engines in Beddington. This will provide low-carbon energy in the form of hot water, meeting the heating and hot water needs of homes and businesses in Sutton and neighbouring boroughs.

The SDEN network is currently exploring the viability of providing connection to Sutton town centre. However, due to the current Covid-19 pandemic this process has been halted.

If the SDEN network is extended to serve Sutton town centre in the future, there could be potential for the proposed development to connect to the network. Connection to the network as it stands is not viable as the closest connection point is approximately 6km away.

15. SUTTON DECENTRALISED ENERGY PROTOCOL SCHEDULE 10.A

The development site lies within an area that has been identified as an Decentralised Energy Network Opportunity Area. As such, the development is required to follow the Council's Decentralised Energy Protocol (see Appendix A

for full schedule). This protocol includes a hierarchy of measures that should be followed for developments within DE opportunity areas that fall within the following categories:

1. Where proposed development is adjacent to an existing DE network.
2. Where there is an existing DE network that requires extension in order to supply the proposed development.
3. Where there is a planned DE network within feasible and viable range of future connection and/or within identified DE Opportunity Areas. (Feasible and viable range is considered within 500m of development)
4. Where there is no existing or planned DE network within the feasible or viable range of future connection.

The propose Sutton High St development falls into category 4 as there are no existing or planned DE networks within feasible connection range. In order to future proof the development for connection if a DE scheme becomes live in the future, the scheme will incorporate a communal heating system. This will be in the form of air source heat pumps (ASHPs) and will be detailed in the Be Green section of this report as required by the London Plan.

16. CARBON EMISSIONS SUMMARY

The carbon emissions after the Be Lean stage of the Energy Hierarchy are shown in the following tables.

Table 7 - Carbon emissions after the Be Clean stage of the energy hierarchy

Energy Hierarchy Stage	Carbon Emissions $kgCO_2/yr$	Carbon Reduction $kgCO_2/yr$	Percentage Reduction
Baseline Carbon Emissions	38,300	NA	NA
After Be Lean	36,300	1,900	5%
After Be Clean	36,300	0	0%

Be Green – Use Renewable Energy

This section of the report provides a summary of the potential and viable renewable technologies that could be installed at the Sutton High Street site. In order to meet the requirement of at least a 35% on-site reduction in carbon emissions, a carbon offset of 11,200 kgCO_2/yr will need to be achieved through the use of renewable or low carbon technologies.

17. RENEWABLE AND LOW CARBON TECHNOLOGY OPTIONS

There are a number of renewable and low carbon technologies that could be included within the scheme to reduce carbon emissions. These are summarised in the Table 6 on the following page.

17.1 Proposed Scheme Design

The development will utilise air source heat pumps (ASHPs) to provide low carbon heating and hot water to the development. This will include a fifth-generation heat network powered by air source heat pumps. The communal heat pumps situated externally on the roof are connected to individual heat pumps at the dwelling level via an ambient water loop. This concept is shown in Figure 8.

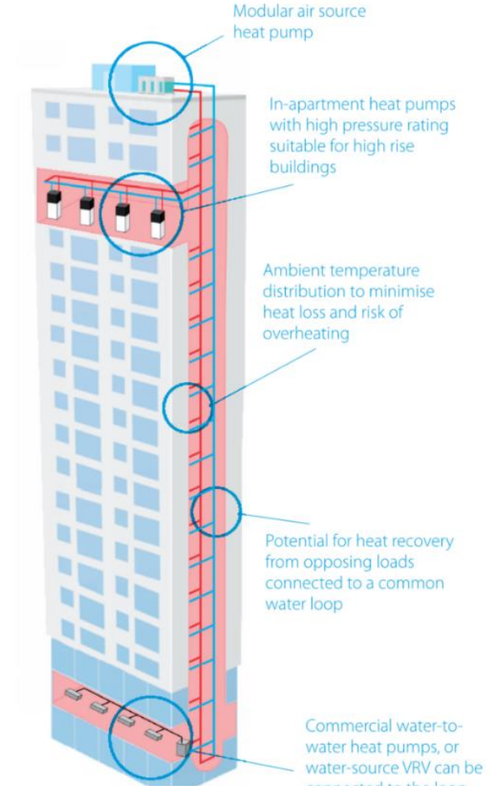

Figure 8 - Fifth generation ASHP system

17.2 Energy and Carbon Emissions Reduction

The energy and carbon emissions reduction from the use of communal ASHPs is shown in the following tables.

Table 8 - Carbon emissions after the Be Green stage of the energy hierarchy

Energy Hierarchy Stage	Carbon Emissions kgCO_2/yr	Carbon Reduction kgCO_2/yr	Percentage Reduction
Baseline Carbon Emissions	38,300	NA	NA
After Be Lean	36,300	1,900	5%
After Be Clean	36,300	0	0%
After Be Green	10,200	26,100	68%

Table 9 - Renewable options for consideration

Technology		Suitable for Residential	Suitable for Commercial
Solar Photovoltaics	Solar photovoltaics can be installed of the roof of the development to provide on-site electricity generation. These have a very low visual impact and when installed at a low pitch cannot be seen from street level.	✓ (if required)	✓(if required)
Solar Thermal Hot Water	Solar thermal systems use collector placed on the roof of the building to pre-heat water use for domestic hot water applications. As for PV, solar collectors could be installed on the roof of the building oriented south to maximise hot water generation.	✓(if required)	✓(if required)
Wind turbines	Small scale building mounted wind turbines could be installed on the roof of the development to generate on-site electricity. It is likely that the wind speed would be sufficient to generate wind via a wind turbine effectively, however, there is unlikely to be suitable space to site the wind turbines. Furthermore, wind turbines have a high visual impact and will easily be seen from street level, which can have a negative impact on the surrounding amenity. There are a number of additional issues that need to be taken into account, such as the high visual impact of roof mounted turbines and the noise levels produced by the turbines. Wind turbines are not deemed to be a viable technology.	X	X
Biomass Boiler	A wood pellet of wood chip boiler could be used to provide low carbon heating and hot water to the development. This is likely to provide a significant CO_2 reduction. Biomass is most efficient when there is a constant and reliable heat demand and is well suited to a communal heating infrastructure. While biomass is a low carbon fuel source, providing it is designed properly and fuel is sourced locally, it produces other greenhouse gasses. These include high nitrogen oxide (NO) emissions, in addition to nitrogen dioxide (NO_2), particulates (PM) and sulphur dioxide (SO_2). Although biomass would be convenient due to the communal heating system proposed, the development is in the Borough of Sutton Air Quality Management Area (AQMA) and follows the Mayor of London's Air Quality Strategy, which states that small biomass boilers are not suitable in AQMA's unless they have no adverse effects on local air quality compared to conventional gas fired boilers.	X	X
Ground Source Heat Pumps (GSHPs)	A vertical or horizontal heat pump could be used to provide low carbon heating to the development. A GSHP would have the potential to reduce the energy consumption and subsequent CO_2 emissions significantly, however, there is unlikely to be sufficient area to lay ground coils to provide a substantial portion of the heating and hot water demand. Vertical boreholes could be used, but these are undesirable due to their high capital cost.	X	X
Air Source Heat Pumps (ASHPs)	ASHP's could be used to provide low carbon heating to the development. While ASHP's have a lesser efficiency than GSHP's, their relatively low cost makes them attractive as an alternative to gas heating. This system would require external heat pump units and could be sited on the roof, with a connection to the central heat network.	✓-Basis of design	✓-Basis of design

Cooling and Overheating

As part of the GLA's guidance on preparing energy assessments, residential developments are required to undertake an analysis of the risk of overheating. At Stage 2 this includes undertaking dynamic thermal modelling in line with the guidance and data set in CIBSE TM59. This section of the report responds to this and will provide an overview of the overheating assessment that has been carried out for the development. The full overheating report is appended to this document in Appendix B.

18. INTRODUCTION

The overheating strategy for the Sutton High St site has been development in line with the Cooling Hierarchy as outlined in the London Plan:

1. Minimise internal heat generation through energy efficient design
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
3. Manage the heat within the building through exposed internal thermal mass and high ceilings
4. Passive ventilation
5. Mechanical ventilation
6. Active cooling systems (ensuring they are the lowest carbon options).

19. CIBSE TM59 ASSESSMENT METHODOLOGY

The dwellings have been tested in line with CIBSE TM59 - *Design methodology for the assessment of overheating risk in homes*. This methodology is a recognised industry standard and outlines a number of criteria depending on how the building is ventilated.

19.1 Predominantly Mechanically Ventilated Dwellings

If the dwellings are predominantly mechanically ventilated then there are the following two criteria for assessing dwellings and one for assessing communal corridors. All criteria need to be satisfied in the dwellings to achieve a pass:

- Criteria 1 - For living rooms, kitchens and bedrooms: sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1°K or more during the occupied hours of a typical non-heating season (1st May to 30th September). This criterion dictates 3% of occupied hours as a threshold.
- Criteria 2 - For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

However, as the acoustic assessment has identified the scheme cannot rely on openable windows, the appropriate overheating test is therefore the fixed temperature test, referenced here as criteria 3.

- Criteria 3 – For homes with restricted window openings, the fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied annual hours.

20. THERMAL MODEL

There are various factors which impact the resilience a building has to overheating including the thermal fabric, air permeability, ventilation strategy, window size, solar gains and shading. In this section, assumptions and inputs relating to these factors are discussed.

All modelling has been carried out using IES Virtual Environment 2019 software, a dynamic thermal modelling software tool in accordance with CIBSE TM59. The software allows the physical form of the building to be constructed, with actual fabric and services strategies applied, to evaluate the performance for various aspects of the building.

20.1 Internal Gains, Occupancy Profiles and Weather Files

All internal gains and occupancy profiles have been selected based on the guidance provided in CIBSE TM59 (for full details see Appendix B).

The London Heathrow DSY1 (Design Summer Year) 2020, high emissions, 50th percentile scenario - weather data was used for the simulations

21. OVERHEATING ASSESSMENT RESULTS

The design team has gone through an iterative design process to ensure the provision of appropriate levels of thermal comfort for residents. The acoustic assessment that has been carried out for the site has indicated that openable windows can not be relied on for ventilation purposes due to the noise levels at the site. Therefore, ventilation for thermal comfort will need to be provided through mechanical ventilation.

The design teams response to the Cooling Hierarchy is shown in Figure 9 opposite. This provides an overview of the iterative design process which has been carried out. In order to provide an acceptable level of thermal comfort, the development will provide cooling in the form of a cooling coil from the micro-heat pumps on the MVHR supply air. This provides thermal comfort without the need for additional plant or equipment at high levels of efficiency keeping energy use and carbon emissions to a minimum.

The full overheating report which details each iteration assessed is attached to this energy strategy in Appendix B.

Minimise internal heat generation through energy efficient design	Heat generation will be minimised through the specification of efficient equipment, all lighting will be LED to reduce internal heat gains. Also, pipework and hot water cylinders will be insulated.
Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls.	The development is oriented north/south with the numbers of direct south facing units balanced carefully to ensure access to sunlight whilst reducing heat gains. Overhangs from balconies on the south façade will provide shading to reduce heat gains. The 4th floor roof terrace will include planting to help with passive cooling via evapotranspiration. The high levels of building fabric efficiency and G-value will also reduce heat transfer through the façade during the summer.
Manage heat within the building through exposed internal thermal mass and high ceilings	The building is proposed to be steel frame construction, the use of exposed thermal mass has been given consideration but is not proposed for the scheme.
Passive ventilation	Passive ventilation via earth tubes or other passive cooling systems is not suitable for the site. Openable windows can also not be relied on due to the high levels of noise at the site (please see Acoustic report for further details).
Mechanical ventilation	As openable windows cannot be used for ventilation purposes, the development will rely on MVHR to provide thermal comfort. The design team have assessed a number of scenarios including MVHR with summer bypass and boost mode. The use of boost mode with ventilation up to 100 l/s results in the apartments meeting the first two CIBSE TM59 criteria, but the majority of apartments are failing to meet criteria 3.
Active cooling	To ensure thermal comfort within the apartments the design team proposed to utilise the existing heat pumps to provide a cooling coil to the MVHR unit. This would provide cooling to the supply air stream. This results in all apartments meeting the thermal comfort requirements without the need for additional plant equipment.

Figure 9 - Sutton High St responses to the Cooling Hierarchy

Conclusions

This report has provided a detailed account of proposals to reduce energy and carbon emissions at the proposed development at 219-227 Sutton High St. This includes the use of passive and active design, and air source heat pumps to reduce site wide carbon emissions.

This report has demonstrated that the development can achieve a 73% reduction in carbon emissions through the implementation of passive design measures, and communal air source heat pumps providing heating and domestic hot water.

The carbon emissions at each stage of the Energy Hierarchy are summarised in the following table and graphics. Table and Figure 10 provides an overview of the buildings current predicted energy performance and associated CO_2 emissions when compared against the current Building Regulations Part L baseline in accordance with GLA guidance.

In order to meet the London Plan requirement of zero carbon via offsetting, a carbon offset payment of approximately **£18,426** will be required. This is based on the rate of £60/tCO_2/yr for a period of 30 years.

The carbon emissions reduction after the application of the energy hierarchy are shown in the final tables and graphics below.

Table 10 - Final carbon emissions reduction after the application of the energy hierarchy

Energy Hierarchy Stage	Carbon Emissions kgCO_2/yr	Carbon Reduction kgCO_2/yr	Percentage Reduction
Baseline Carbon Emissions	38,300	NA	NA
After Be Lean	36,300	1,900	5%
After Be Clean	36,300	0	0%
After Be Green	10,200	26,100	68%
After Offsetting	0	10,200	32%
Total		**38,300**	**100%**

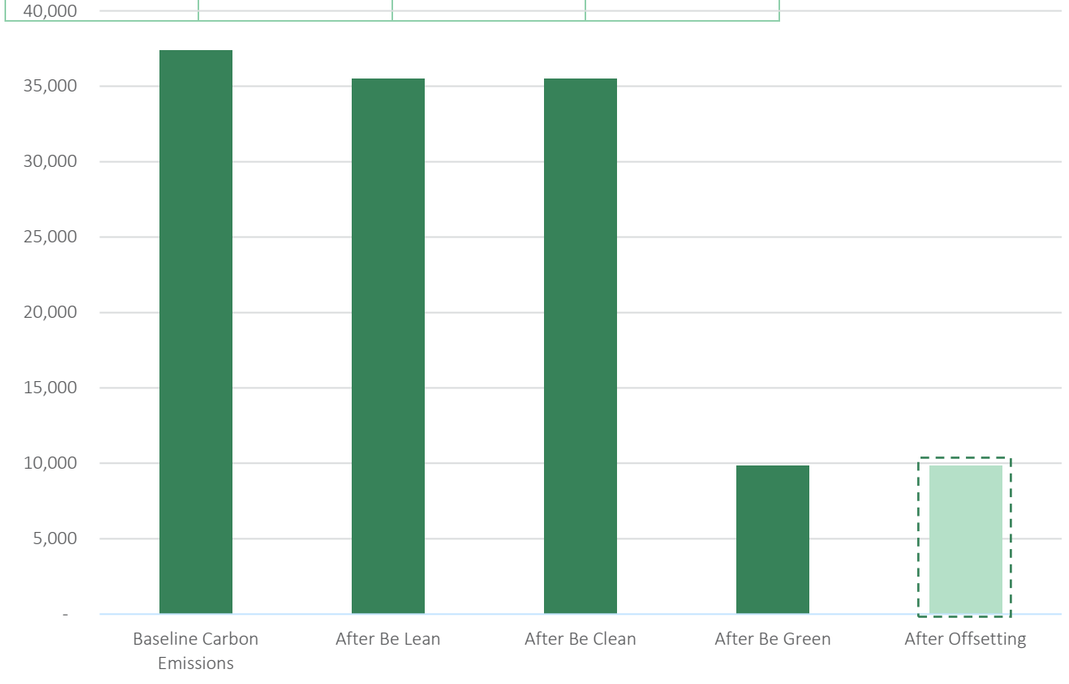

Figure 10 - Carbon emissions reduction for the Sutton High St development

Appendix A DE Protocol

Click here to enter Appendix title.

(1) Where the proposed development is adjacent to an existing DE network, it should:

- **Secure the direct connection of all units to that network; and**
- **Contribute as necessary to the increased capacity of the DE network to support such connection.**

(2) Where there is an existing DE network that requires extension in order to supply the proposed development, proposed developments should:

- **Contribute to such extension;**
- **Secure the direct connection of all units to the extended network; and**
- **Contribute as necessary to the increased capacity of the DE network to support such connection.**

(3) Where there is a planned DE network within feasible and viable range[1] of future connection and/or within identified DE Opportunity Areas, proposed developments should:

- **Commit to connect to any future DE network provided that (i) the reliability of the system has been demonstrated continuously over a period of 6 months, and (ii) the costs in sourcing heating and hot water by the residential and non-residential units will not materially increase;**
- **Incorporate site-wide and/or communal heating systems, and not include in-unit boilers or electrical heating systems, where a future connection to the planned DE network is viable;**
- **Ensure that the proposed site-wide and/or communal heating systems are equipped to connect any future DE network with minimum need for retrofit;**
- **Provide sufficient space within the energy centre or plant room to accommodate additional future heat generation capacity to supply DE connection equipment such as pipes, heat exchangers and pumps etc**
- **Locate the energy centre or plant room to ensure the shortest connection distance to the future network, having regard to the requirements of the network as a whole;**
- **Use the layout, density and mix of development to support identified DE opportunities;**
- **Provide pipe connections as appropriate to the site boundary or safeguard an identified route within the site for future DE connection infrastructure; and**
- **Where the planned DE network requires extension to supply the proposed development, proposed developments should contribute to such extension.**

(4) Where there is no existing or planned DE network within feasible or viable range of future connection, proposed developments should incorporate site-wide and/or communal heating and cooling systems to serve the development where feasible and viable, and not include in-unit boilers or electrical heating systems. Such heating and cooling systems must be designed to run efficiently and be optimally sized to maximise CO_2 savings.

Appendix B Overheating Assessment

Click here to enter Appendix title.

	Results for the proposed building		Active measures to reduce overheating							
	As designed		Enhanced ventilation		Enhanced ventilation with reduced g-value (0.4)		Summer cooling via ventilation		Active cooling for 7th and 8th floors	
Room Name	Criteria 3: Operative temperature with % hours in range (> 26 °C)	Criteria 3 Pass/Fail	Criteria 3: Operative temperature with % hours in range (> 26 °C)	Criteria 3 Pass/Fail	Criteria 3: Operative temperature with % hours in range (> 26 °C)	Criteria 3 Pass/Fail	Criteria 3: Operative temperature with % hours in range (> 26 °C)	Criteria 3 Pass/Fail	Criteria 3: Operative temperature with % hours in range (> 26 °C)	Criteria 3 Pass/Fail
2B4P Flat 1 Bedroom 1	20.6	Fail	9.6	Fail	6.8	Fail	1.6	Pass	n/a	n/a
2B4P Flat 1 Bedroom 2	25.2	Fail	10.8	Fail	7.2	Fail	0.4	Pass	n/a	n/a
2B4P Flat 1 Kitchen/living	10.7	Fail	3.9	Fail	2.2	Pass	0	Pass	n/a	n/a
2B3P Flat 2 Bedroom 2	26.6	Fail	12	Fail	8.4	Fail	0.9	Pass	n/a	n/a
2B3P Flat 2 Bedroom 1	7.9	Fail	3.2	Fail	1.8	Pass	0	Pass	n/a	n/a
2B3P Flat 2 Kitchen/living	16.1	Fail	5.6	Fail	3.3	Fail	0	Pass	n/a	n/a
1B2P Flat 3 Bedroom	29.2	Fail	12.2	Fail	8.6	Fail	0	Pass	n/a	n/a
1B2P Flat 3 Kitchen/living	14.6	Fail	4.2	Fail	2.9	Pass	0	Pass	n/a	n/a
2B3P Flat 4 Bedroom 2	25.2	Fail	9.1	Fail	6.6	Fail	0	Pass	n/a	n/a
2B3P Flat 4 Kitchen/living	25.8	Fail	12.2	Fail	8.5	Fail	1.2	Pass	n/a	n/a
2B3P Flat 4 Bedroom 1	12.1	Fail	4.5	Fail	2.9	Pass	0	Pass	n/a	n/a
1B1P Flat 5 Kitchen/living	5.2	Fail	1.9	Pass	1.3	Pass	0	Pass	n/a	n/a
1B2P Flat 5 Bedroom	5.2	Fail	2.0	Pass	1.4	Pass	0	Pass	n/a	n/a
1B2P Flat 6 Bedroom 2	6.6	Fail	3.0	Pass	2.2	Pass	0	Pass	n/a	n/a
1B1P Flat 6 Kitchen/living	11.7	Fail	4.1	Fail	2.7	Pass	0	Pass	n/a	n/a
1B2P Flat 6 Bedroom 1	21.4	Fail	7.9	Fail	5.4	Fail	0	Pass	n/a	n/a
1B2P Flat 7 Kitchen/living	13.2	Fail	5.0	Fail	3.2	Fail	0.1	Pass	n/a	n/a
1B2P Flat 7 Bedroom	11.1	Fail	5.0	Fail	3.1	Fail	0	Pass	0	Pass
2B4P Flat 8 Kitchen/living	30.3	Fail	13.7	Fail	8.7	Fail	7.1	Pass	0	Pass
2B4P Flat 8 Bedroom 2	15.5	Fail	4.5	Fail	3.2	Fail	0	Pass	0	Pass
2B4P Flat 8 Bedroom 1	51.4	Fail	27.7	Fail	18.3	Fail	12.9	Pass	0	Pass
2B4P Flat 9 Kitchen/living	35.3	Fail	16.1	Fail	10.7	Fail	10.1	Pass	0	Pass
2B4P Flat 9 Bedroom 2	16.8	Fail	4.7	Fail	3.5	Fail	0	Pass	0	Pass
2B4P Flat 9 Bedroom 1	52.9	Fail	28.1	Fail	18.5	Fail	13.6	Pass	0	Pass
2B4P Flat 10 Kitchen/living	36.3	Fail	16.2	Fail	10.4	Fail	10.1	Pass	0	Pass
2B4P Flat 10 Bedroom 2	10.9	Fail	3.5	Fail	2.2	Pass	0	Pass	0	Pass
2B4P Flat 10 Bedroom 1	52.9	Fail	28.2	Fail	18.5	Fail	13.5	Pass	0.5	Pass
2B4P Flat 11 Kitchen/living	37.8	Fail	18.4	Fail	11.7	Fail	10.1	Pass	0	Pass
2B4P Flat 11 Bedroom 2	25.5	Fail	6.8	Fail	4.9	Fail	0	Pass	0	Pass
2B4P Flat 11 Bedroom 1	52.4	Fail	28.9	Fail	19	Fail	10.0	Pass	0	Pass

Appendix C Be Lean SAP Calculations

Modelled Unit	Number of Units	GIFA (m2)	TER (kgCO2/m2)	TER kgCO2/yr	Be Lean DER (kgCO2/m2)	Be Lean DER kgCO2/yr
Flat 101	1	50.2	20.6	1034.12	20.9	1049.18
Flat 103	2	50.4	20.1	2026.08	19.5	1965.6
Flat 105	4	61.8	17.5	4326	17.1	4227.12
Flat 107	4	70.9	17.1	4849.56	16.7	4736.12
Flat 201	5	50.2	18.4	4618.4	17.9	4492.9
Flat 203	13	50.4	17.8	11662.56	16.5	10810.8
Flat 205	2	61.8	15.2	1878.72	14	1730.4
Flat 207	2	70.9	14.8	2098.64	13.5	1914.3
Flat 701	1	50.2	20.6	1034.12	20.6	1034.12
Flat 703	2	50.4	20.1	2026.08	19.5	1965.6

Appendix D Be Green SAPs Calculations

Modelled Unit	Number of Units	GIFA (m2)	TER (kgCO2/m2)	TER kgCO2/yr	Be Green DER (kgCO2/m2)	Be Green DER kgCO2/yr
Flat 101	1	50.2	20.6	1034.12	5.4	271.08
Flat 103	2	50.4	20.1	2026.08	4.9	493.92
Flat 105	4	61.8	17.5	4326	4.3	1062.96
Flat 107	4	70.9	17.1	4849.56	4.4	1247.84
Flat 201	5	50.2	18.4	4618.4	4.5	1129.5
Flat 203	13	50.4	17.8	11662.56	3.9	2555.28
Flat 205	2	61.8	15.2	1878.72	3.3	407.88
Flat 207	2	70.9	14.8	2098.64	3.3	467.94
Flat 701	1	50.2	20.6	1034.12	5.4	271.08
Flat 703	2	50.4	20.1	2026.08	4.9	493.92