CAMBRIDGE NORTH

ENERGY STATEMENT

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PREPARED BY

Hilson Moran

HOARE LEA

Cambridge North.
Cambridge.
Brookgate.

SUSTAINABILITY
ENERGY STATEMENT
1 MILTON AVENUE & 1-3 STATION ROW
REVISION 02 – 23 MAY 2022

Audit sheet.

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Contents.

Executive summary.

This Energy Statement has been prepared by Hoare Lea on behalf of Brookgate (hereafter referred to as 'the Applicant') in support of the full application for 1 Milton Avenue and 1-3 Station Row (hereafter the 'Proposed Development'), which forms part of the hybrid application for Cambridge North.

Drivers.

This document summarises the pertinent policies and requirements applicable to the Proposed Development. The principal targets are to achieve a 10% carbon reduction through the provision of LZC technologies, contribute to a 31% sitewide carbon reduction over a baseline development and achieve a minimum of 4 Ene 01 energy performance credits under BREEAM New Construction (NC) 2018 as required by the target for an 'Excellent' rating. A summary of the policy context is provided in Appendix A.

National drivers; Approved Document Part L of the Building Regulations

Part L of the Building Regulations is the mechanism by which the Government is driving reductions in regulated CO_2 emissions from new buildings.

However, carbon factors set within this legislation are now known to be outdated, especially with regards to grid electricity: The carbon factor for electricity is known to have reduced compared to that set in Part L 2013. The consequence of this is a discrepancy between emissions calculated using current building regulations methodology from electrical plant and any technologies which offset grid electricity – refer to Appendix B.

Local drivers; South Cambridgeshire Local Plan and the Greater Cambridge Sustainable Design Construction SPD 2018

South Cambridge Local Plan 2018

The following summarises the adopted South Cambridgeshire District Council policy for energy and CO_2 emissions:

- Design and construct developments that are extremely energy efficient.
- Reduce carbon emissions by a minimum of 10% using on-site renewable energy and low carbon technologies.

North East Cambridge Area Action Plan (NEC AAP)

NEC AAP is currently a draft planning document. It consists of 30 proposed policies ranging in scope including topics such as the climate emergency, water supply and quality, energy infrastructure, new build developments and affordable housing, sustainable transport, landscaping, biodiversity, waste management, digital infrastructure and other broad sustainability aspects.

NEC AAP remains at an early stage in its preparation and can only be afforded negligible weight in the determination of planning applications.

Sitewide drivers

This Energy Statement for the Proposed Development should be read alongside the sitewide energy strategy for Cambridge North prepared by Hilson Moran.

Applicant drivers; Brookgate

The Proposed Development has been informed by the Applicant's vision and sustainable design and development guidance and frameworks. Relevant to Energy Statement, the Proposed Development is aiming to achieve a minimum of 4 Ene 01 energy performance credits under BREEAM New Construction 2018, as required by the Applicant's target of an 'Excellent' rating. The possibility to achieve 6 credits will be reviewed as part of the Applicant's aspiration to target an 'Outstanding' rating.

Assessment methodologies

The baseline against which the proposed energy strategy is compared is a baseline development – a development calculated using benchmark data from similar building uses as served by a gas boiler. This baseline development is appropriate as represents a common servicing strategy against which improvements to building fabric, system efficiency, and deployment of renewable technologies can be effectively assessed. As such, the three developments that comprise 1 Milton Avenue and 1-3 Station Row have been grouped for the purposes of reporting.

To reflect progress made in decarbonising the UK's electricity grid since Part L 2013 was released, the proposed update to the SAP methodology, SAP 10.1, includes a 74% reduction in the carbon factor of electricity used to calculate regulated CO_2 emissions. In line with current trends and the imminent adoption of Part L 2021, carbon emission reductions have been calculated using the carbon factors set out in the draft SAP10.1 guidance.

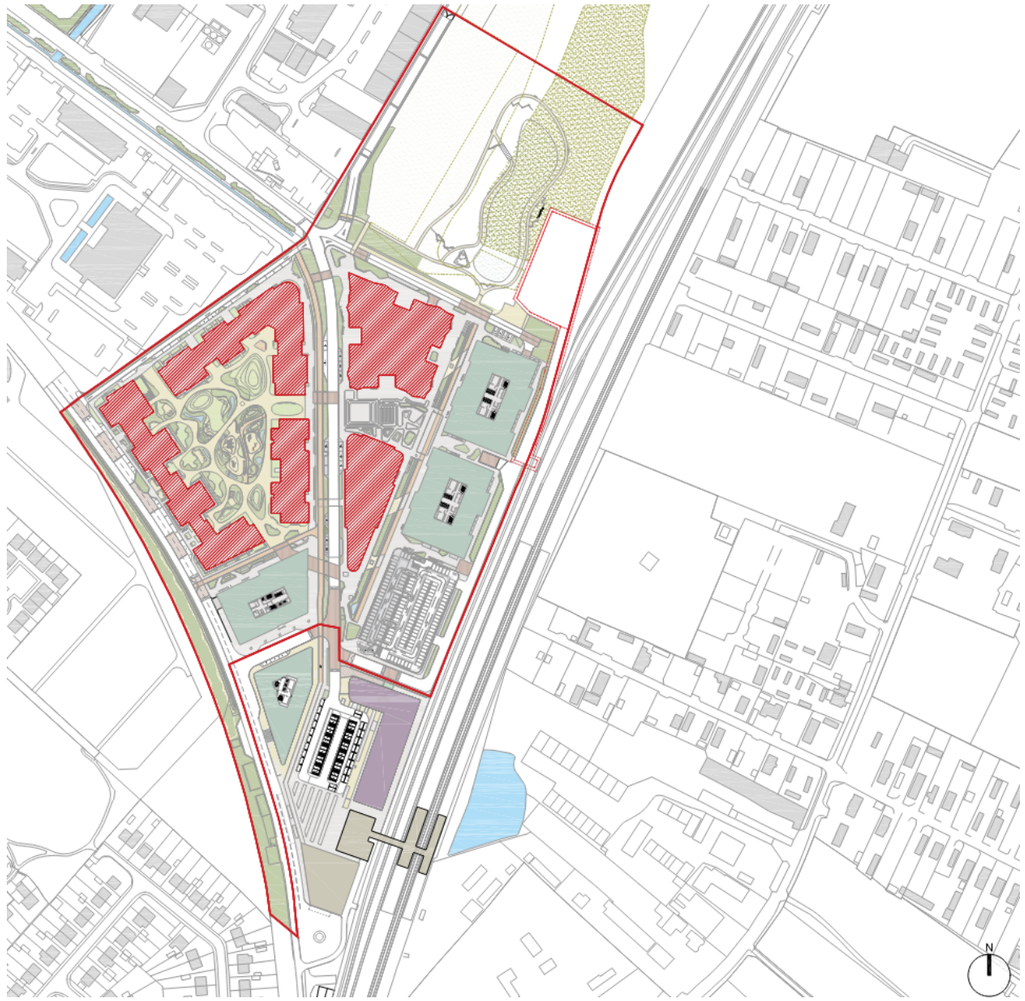


Figure 1: Planning boundary (red line) and outline planning area (red hatch) and shown. The buildings within the planning boundary that are not outline are the focus of this development.

Proposed energy strategy summary.

The approach to the energy strategy for the Proposed Development has been to ensure that a robust and future-proofed building fabric and services strategy is implemented. The strategy has been developed using the 'Be Lean, Clean and Green' energy hierarchy which utilises a fabric first approach to maximise the reduction in energy through passive design measures. The following table provides a summary of the energy strategy for the Proposed Development.

Table 1: Energy strategy summary.

Be lean	10% regulated CO_2 emissions at Be lean stage. Through passive design and energy efficiency, the Proposed Development will seek to generate a 10% reduction in regulated CO_2 as a minimum to the SAP 10.1 baseline development at the Be lean stage.
Be clean	'Be clean' measures have been deemed unfeasible. The incorporation of an onsite district heating and a CHP system has been deemed to be unsuitable as it would offer little to no benefit to the Proposed Development. There are no existing district heating networks within the vicinity of the site. Therefore, no emissions reductions are anticipated at this stage.
Be green	A 32.1% sitewide betterment achieved through LZC technologies. The inclusion of on-site renewable energy generation has been assessed, and it is proposed to implement a combination of air source heat pumps to provide the heating and domestic hot water and roof mounted solar photovoltaics Utilisation of these LZC technologies is expected to lead to an approximate to a 32.1% reduction in regulated CO_2 emissions.

Through the measures outlined in the energy strategy, it is anticipated that overall a 42.1% reduction in CO_2 emissions could be achieved beyond the SAP 10.1 baseline development.

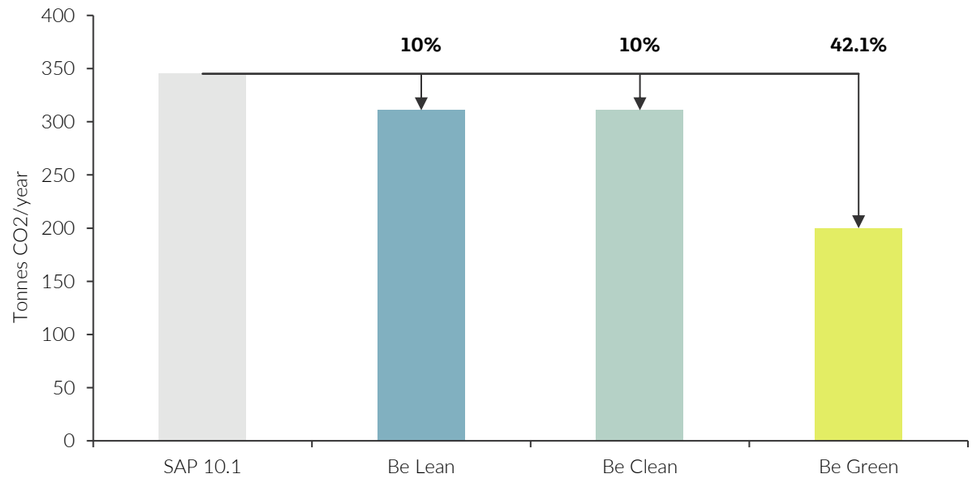


Figure 2: Regulated carbon reduction per each stage of the energy hierarchy.

Alignment with policy.

This energy statement has aligned with the planning policy requirements outlined in the South Cambridgeshire Local Plan 2018 and the Greater Cambridge Sustainable Design Construction SPD 2018. The energy assessment has been undertaken in line with the energy assessment guidance following a Be Lean, Be Clean and Be Green hierarchy.

The BREEAM NC 2018 pre-assessments appended to the sitewide Sustainability Strategy (*REP-2323544-GZ-TPS-20211215- One Milton Avenue - BREEAM 2018 Pre-Assessment-Rev02* and *REP-2323544-GZ-TPS-20211207-1-3 Station Row - BREEAM 2018 Pre-Assessment-Rev02*) confirm that a minimum of 4 Ene 01 energy performance credits are targeted; as the building's design develops, compliance against this target will be monitored to ensure that it can be achieved post-construction. The Proposed Development is also anticipated to achieve in excess of a 10% on site carbon reduction through LZC technologies. No on-site combustion is proposed, instead, the project will utilise an all-electric heating strategy supplemented with on-site renewable energy (roof level solar photovoltaics). In addition, the Proposed Development will be built to meet CIBSE's latest overheating standards (CIBSE Guide A is most relevant) for current (2020) and future (2050 and 2080) weather files.

1. Introduction.

This Energy Statement has been prepared by Hoare Lea on behalf of Brookgate (hereafter referred to as 'the Applicant') in support of the full planning application for 1 Milton Avenue and 1-3 Station Row (hereafter the 'Proposed Development'), which forms part of the hybrid application for Cambridge North.

1.1 The proposed development.

A hybrid planning application comprising;

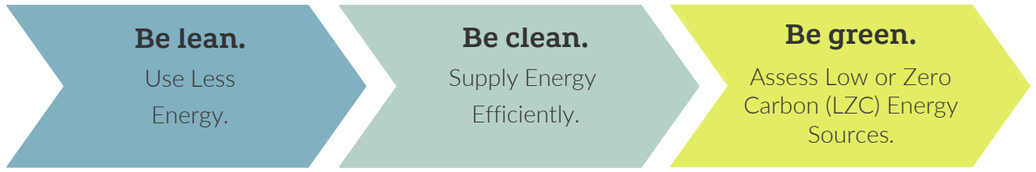
a. a) an Outline Application with all matters reserved (except for access and landscaping) for the construction of three new residential buildings of four to eight storeys, providing flexible Class E and Class F uses on the ground floor, and two commercial buildings of five storeys for Use Classes E(g) i (offices), ii (research and development), providing flexible Class E and Class F uses on the ground floor, with associated car and cycle parking and infrastructure works; and

b. b) a Full Application for the construction of three commercial buildings of four and seven storeys for Use Classes E(g) i (offices), ii (research and development), providing flexible Class E and Class F uses on the ground floor, with associated car and cycle parking, a multi-storey car and cycle park and associated landscaping and infrastructure works

1.2 Approach to the statement.

This Energy Statement proposes recommendations regarding the approach to reducing carbon dioxide (CO_2) emissions and optimising energy efficiency within the development. This statement summarises the pertinent regulatory and planning policies applicable to the Proposed Development, and sets targets commensurate with these policies, which the Proposed Development will seek to achieve.

The Energy Statement has been developed using a 'fabric first' approach through the 'Be Lean', 'Be Clean' and 'Be Green' energy hierarchy.



Area schedule

Table 2 is a copy of an area schedule for the Site that has been used to inform the energy strategy (Note: Part L assessments exclude voids, lifts, risers and spaces outside of the thermal line – these have been excluded in the energy calculations). The assumed split between retail, office and laboratory type fit-outs of the tenant spaces is also noted.

Table 2: Area schedule for energy statement.

Building	Percentage split of tenanted areas			Total Gross Internal Area (GIA) m^2
	Retail	Office	Laboratory	
1 Milton Avenue (S4)	7%	93%	0%	17,311
1-3 Station Row (S6)	13%	61%	26%	10,720
1-3 Station Row (S7)	13%	61%	26%	11,345
Total				39,376

1.3 Definitions and limitations.

Definitions:

The following definitions should be understood throughout this statement:

- **Energy demand:** the 'room-side' amount of energy that must be input into a space to achieve comfortable conditions. In the context of space heating, this is the amount of heat that is emitted by a radiator, or other heat delivery mechanism.
- **Energy requirement:** the 'system-side' requirement for energy (fuel). In the context of a space heating system using a gas boiler, this is the amount of energy combusted (e.g. gas) to generate useful heat (i.e. the energy demand).
- **Regulated CO_2 emissions:** the CO_2 emissions emitted as a result of the combustion of fuel, or 'consumption' of electricity from the grid, associated with regulated sources (those controlled by Part L of the Building Regulations).

Limitations:

The appraisals within this statement are based on benchmark Part L data from similar developments and should not be understood as a predictive assessment of likely future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by Part L approved calculation methods, leading to differing energy requirements.

As the design develops, a full Part L and operational energy assessment will be undertaken for each building.

The gas boiler baseline and Part L 2013

It is important to note that, for non-domestic buildings, the servicing strategy applied to the notional building from which the Target Emission Rate (TER) is derived, varies based on the servicing strategy applied to the actual building being assessed. For any building in which a gas system is included, the notional building also deploys a notional gas boiler. However, if the building assessed is all-electric, the notional building uses a notional system similar to that applied to the actual building, albeit with fixed notional efficiencies as per the National Calculation Methodology (NCM).To assess the benefit of passive design and energy efficiency at the 'Be Lean' stage, the Proposed Development was modelled as if served by a gas boiler. This means that the emissions reductions presented were therefore calculated against a gas boiler baseline which, in this case, also represents a true Part L 2013 baseline.

However, when assessing the performance of an all-electric building deploying a heat pump at Be Green stage, the notional building also deploys a heat pump, meaning the notional building at the Be Lean stage has different annual CO_2 emissions from the notional building at the Be Green stage i.e. the Target Emission Rates (TERs) are not equivalent. Throughout this report, the performance of the Proposed Development is compared to a notional, Part L 2013-compliant development as served by a gas boiler. When the Proposed Development is assessed when the design develops, it will be using the National Calculation Methodology so that the performance against the true Part L baseline can be determined.

2. Key drivers.

2.1 Global challenges.

People over the world face three universal challenges to which any sustainable development must respond effectively to be successful.

These are as follows:

Climate change

In 2019, the Intergovernmental Panel on Climate Change (IPCC) confirmed via publication that, in order to mitigate the most devastating impacts of climate change, the world must demonstrate net zero carbon emissions by 2050. Reflecting this urgent call for action, the Committee on Climate Change published *Net Zero – The UK's contribution to stopping global warming*, identifying a route for the UK to achieve the net zero target. The UK government then joined a number of other nations in declaring a Climate Emergency and the target was ratified into law, meaning the UK has a legally binding obligation to reduce its emissions to zero by 2050 at the latest.

The built environment contributes around 40% (UKGBC) of our national greenhouse gas emissions footprint, so any new development must minimise its footprint on day 1 and demonstrate a realistic route to achieving net zero carbon in the future in order to align with our commitments to national decarbonisation.

Biodiversity

As a consequence of the warming climate, deforestation and habitat destruction, pollution, and other human processes, the world is experiencing a biodiversity crisis. It is estimated that human activity is causing the rate of extinction to be around 1,000 times what could be considered a natural background rate and future projections estimate that 30% to 50% of all current species could be extinct by the middle of the century.

Whilst the situation in the UK is less severe than in some parts of the world, the need to provide buildings and amenities for an ever-growing population is putting strain on our local ecosystems. Sustainable development must therefore mitigate its impact on local habitats, plants, and wildlife and contribute to a net gain in local biodiversity.

Health and wellbeing

Less of a crisis and more of a revolution, the understanding of the importance of health and wellbeing to happiness, productivity, community, and prosperity has become increasingly well-founded in recent years. Where someone lives and works is the primary influence on whether they are healthy and well and through the design of new development, people can be motivated to embrace active, healthy lifestyles and facilitated to be sociable, community-driven, and content.

2.2 National drivers.

Decarbonisation of the electricity grid

The UK has seen substantial progress transitioning from an energy supply sector served primarily by burning coal to a wide scale uptake of both grid- and local-scale renewable energy. The Future Energy Scenarios are produced annually by the National Grid and discuss how the UK's energy landscape is likely to change between now and 2050. These scenarios are shown in the figure below. As shown, the carbon factor for electricity has reduced by two thirds since 2012, reflecting the significant uptake of renewable energy on the UK electricity grid. As a consequence of decarbonisation to date, and further expected in the future, there is typically a shift away from traditional means of servicing buildings (such as gas boilers and CHP) to all electric solutions such as air source heat pumps.

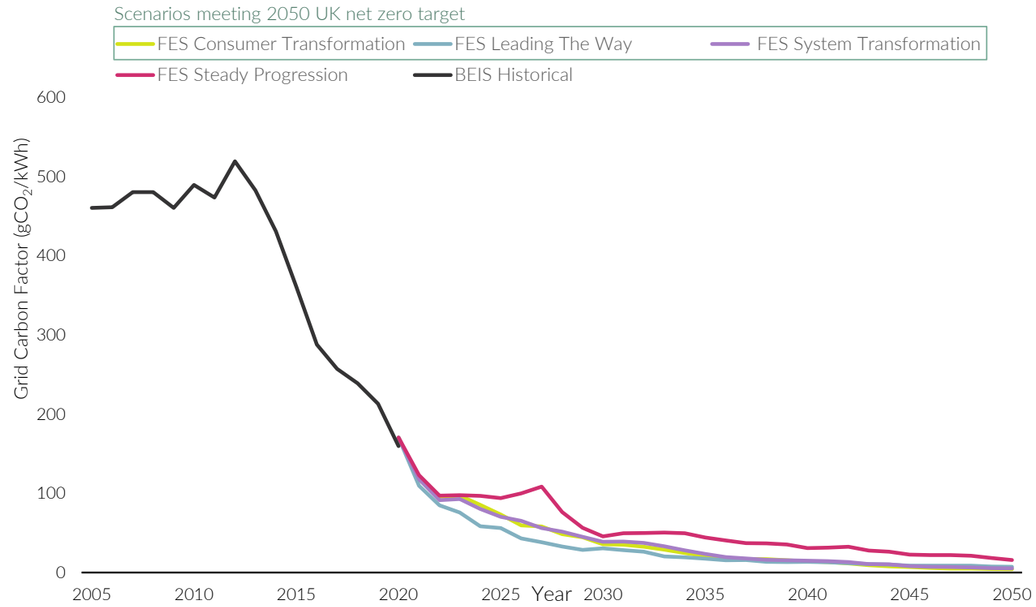


Figure 3: Historic and future projected carbon factor for the National Grid. Sources: *BEIS Green Book* (historic carbon factors); *National Grid Future Energy Scenarios (FES) 2021* (future projected carbon factors). BECCS has been excluded.

Building Regulations: Approved Document Part L 2013

Approved Document Part L (2013, England edition) is the current adopted Building Regulation relating to the conservation of fuel and power in buildings. Part L of the Building Regulations is the mechanism by which the Government is driving reductions in the regulated CO_2 emissions from new buildings.

Building Regulations Part L 2021 and beyond

Future Buildings Standard
The Future Building Standard (FBS) comprises a newly-launched consultation principally focused on delivering improved energy and carbon performance of non-domestic buildings.

The FBS proposes that:

- This new standard will apply to non-domestic buildings from 2025.
- There will be improvements to the non-domestic energy modelling methodologies.
- Improvements to standards when work is carried out in existing non-domestic properties.
- Ensure the transition of non-domestic buildings to use low-carbon heat sources for heating and hot water and become zero carbon over time (i.e. be zero carbon ready) as the electricity grid and heat networks decarbonise.
- Uplift in minimum energy efficiency and building services standards.

Building Regulations Part L 2021
To act as a step change toward the FBS in 2025, the Approved Document's Part L1 2021 and Part L2 2021 were publicly released on the 15th December 2021 and will come into force on the 15th June 2022. Due to the magnitude of the changes, this is likely to stimulate one of the most significant changes in non-domestic construction strategy that has ever occurred. England's Building Regulations were last updated eight years ago. With the substantive changes to the UK energy landscape, Part L 2013 is misrepresentative and no longer fit-for-purpose. Part L 2021 will act as an interim update to the Future Home Standard and Future Building Standards which are expected to come into full application by 2025.

The main updates to Part L 2021 are as follows:

- No gas boiler 'ban' in 2025, but regulations such that fossil fuel heating will not achieve compliance.
- Local planning authorities will retain powers to set higher energy efficiency targets than building regulations.
- A new non-domestic building built to Part L 2021 standards (NCM 2021) will deliver a 27% reduction in CO_2 emissions on average across the new non-domestic building mix relative to Part L 2013.
- Primary energy target introduced. Fabric Energy Efficiency target retained.
- A varying carbon factor is associated with grid electricity. It is 73% lower on average than Part L 2013.
- A transitional arrangement will be valid for 12 months from the adoption of Part L 2021 but apply to individual buildings, rather than development sites.

Part L 2021 comes into force on 15th June 2022. However, the guidance states "the changes will not apply in relation to building work where a building notice or an initial notice has been given to, or full plans deposited with, a local authority before 15 June 2022 provided that the building work is started before 15 June 2023".

2.3 Local policy drivers.

South Cambridge Local Plan 2018
The Local Plan sets out the planning policies and land allocations to guide the future development of the district up to 2031. It includes policies on a wide range of topics such as housing, employment, services and facilities, and the natural environment.

The following summarises the adopted South Cambridgeshire District Council policy for energy and CO_2 emissions:

- Design and construct developments that are extremely energy efficient.
- Reduce carbon emissions by a minimum of 10% using on-site renewable energy and low carbon technologies.

Greater Cambridge Sustainable Design Construction SPD 2018
The Greater Cambridge Sustainable Design and Construction Supplementary Planning Document (SPD) has been prepared to provide additional technical guidance on the implementation of these policies, setting out the information that should be submitted with planning applications to demonstrate how schemes meet the Councils' requirements.

North East Cambridge Area Action Plan (NEC AAP)
NEC AAP is currently a draft planning document. It consists of 30 proposed policies ranging in scope including topics such as the climate emergency, water supply and quality, energy infrastructure, new build developments and affordable housing, sustainable transport, landscaping, biodiversity, waste management, digital infrastructure and other broad sustainability aspects.

NEC AAP remains at an early stage in its preparation and can only be afforded negligible weight in the determination of planning applications.

2.4 Cambridge North.

Development specific drivers have also influenced the design proposals for Cambridge North, including the sitewide energy strategy and the Applicant's vision with the latter encapsulated by the sitewide sustainability strategy.

2.4.1 Sitewide

This Energy Statement for the Proposed Development should be read alongside the sitewide energy strategy for Cambridge North prepared by Hilson Moran.

The site is located with South Cambridge, and the key driver is to promote a low carbon development, which optimises building fabric performance, and energy efficient design, before introducing low carbon and renewable technology. The masterplan at Cambridge North as a whole is targeting 10-15% through passive design, in the commercial and residential respectively and 31% improvement over Part L 2013 as a whole.

2.4.2 Applicant

Working with all key stakeholders, an overall vision for the development has been defined. Workshops have been held in collaboration with the client and project team to help create a charter including innovative initiatives and key objectives to be delivered as a result of the project. The charter and overarching strategy respond to the elements of the five capitals framework:

- Physical capital
- Social capital
- Economic capital
- Human capital
- Natural capital

It is intended that the agreed objectives are tracked and monitored throughout project delivery and operational phases.

Relevant to Energy Statement, the Proposed Development is aiming to achieve a minimum of 4 Ene 01 energy performance credits under BREEAM New Construction 2018, as required by the Applicant's target of an 'Excellent' rating. The possibility to achieve 6 credits will be reviewed as part of the Applicant's aspiration to target an 'Outstanding' rating.

3. Cooling and overheating.

3.1 Cooling hierarchy.

The Council state that developments should reduce potential overheating risk and reliance on air conditioning systems. A 'cooling hierarchy' is provided and the Proposed Development has sought to follow this hierarchy.

The following cooling hierarchy has been followed to limit the effects of heat gains in summer:

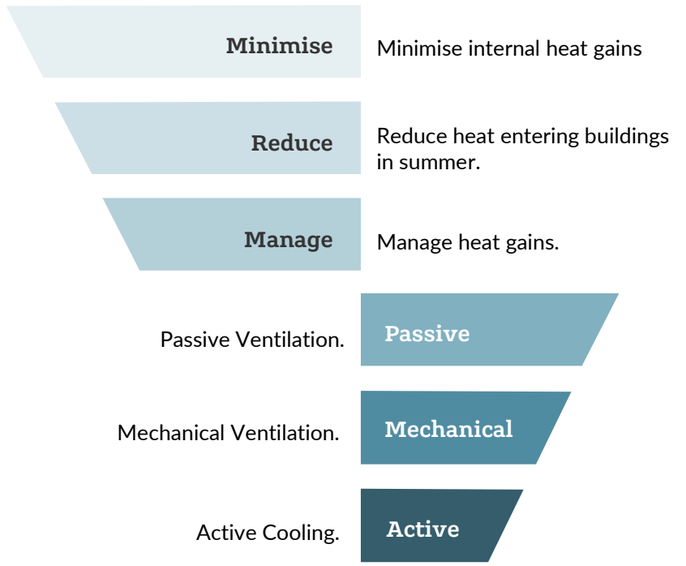


Figure 4: Cooling hierarchy.

3.2 Mitigation strategy.

The following mitigation methods will be implemented in the Proposed Development.

Minimising internal heat generation through energy efficient design

The following mitigation methods will be implemented to minimise the internal heat generation through energy efficient design at the Proposed Development:

- Energy efficient lighting (such as LED or CFL) with low heat output.
- Insulation to heating and hot water pipework and minimisation of dead legs to avoid standing heat loss (from pipework to dwellings).
- Energy efficient equipment with low heat output.

Reducing the amount of heat entering the building in summer

The following mitigation methods will be implemented to reduce the amount of heat entering the building in summer at the Proposed Development:

- Suitable glazing ratio responding to orientation and space use.
- Enhanced solar shading for areas at particular risk of overheating.
- Glazing with a suitable g-value to limit solar heat gains (where appropriate).
- High levels of insulation and low fabric air permeability will retain cool air during the summer months.

Mechanical ventilation

All spaces, as a minimum will be provided with a ventilation rate in accordance with Part F through the central provision of ventilation also taking advantage of heat recovery.

Air handling units are an important addition to the building services to maintain good indoor air quality, by providing fresh air to occupied areas and extracting vitiated air from areas such as toilets and tea points. Providing fresh air minimises the risk of stale and stagnant air.

Active cooling

As a final step, active cooling is specified, in order to maintain internal temperatures within acceptable limits.

3.3 Overheating assessment.

To inform occupant comfort and satisfy the Councils' requirement, an overheating risk analysis will be undertaken for the Proposed Development once the design is suitability developed to do so.

The Proposed Development will be built to meet CIBSE's latest overheating standards (CIBSE Guide A is most relevant) for current (2020) and future (2050 and 2080) weather files.

In addition, the BREEAM pre-assessment confirms that all three Hea 04 Thermal comfort credits are targeted, ensuring that the Proposed Development will be futureproofed against a warming climate.

4. Be lean.

Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the Proposed Development. This energy statement aims to reduce the energy demand initially by optimising the envelope and building services within the development.

4.1 Passive design and energy efficiency features.

Passive Design measures are those which reduce the demand for energy within buildings, without consuming energy in the process. These are the most robust and effective measures for reducing CO_2 emissions as the performance of the solutions, such as wall insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is safe to assume that the benefits these measures have will continue at a similar level for the duration of their installation.

Fabric performance
A 'fabric first' approach has been taken in order to reduce the energy demand and CO_2 emissions from the Proposed Development. The overriding objective for the façade design of each building will be to achieve the optimum balance between providing natural daylighting benefits 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 cooling demands.

Thermal Insulation
The Proposed Development will benefit from an efficient thermal envelope. Heat losses and gains will be controlled by the optimisation of the fabric of each building, i.e. ensuring appropriate levels of glazing to control winter heat loss and summer heat gain. Reducing the thermal transmittance of the building envelope where appropriate will help to reduce both heating and cooling requirements and result in lower energy requirements. The table below details the fabric performance targets for the Proposed Development:

Table 3: Fabric performance targets.

Thermal Element	Proposal
External Wall (W/m^2.K)	0.18
Spandrel panel – typical (W/m^2.K)	0.60
Spandrel panel – increased depth (W/m^2.K)	0.40
Ground Floor (W/m^2.K)	0.15
Roof (W/m^2.K)	0.15
Windows (W/m^2.K) (g-value)	1.30 (frame & glass) (0.35)
Air Permeability (m^3/hr.m^2 @50Pa)	3.0

Glazing Energy & Light Transmittance
In designing the elevations with close attention to fenestration, the design team has focused to ensure a balance between the benefits of passive solar heating in winter months whilst limiting the likelihood of high internal temperatures in summer. For example, the design incorporates deep recesses and brise soleil on exposed top floor areas.

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 drafts and dramatically increase the demand for space heating in winter, and space cooling in summer, when the airflow works in reverse i.e. cool air escaping from the building. The Proposed Development will target an air permeability of 3m^3/(m^2.h) at 50 Pa.

Space heating
In order to establish a 'business as usual' case against which to compare technologies, a 'baseline' of energy demand and CO_2 emissions for the development was calculated using benchmark demands for the building type, as served by a typical gas boiler. This is presented on the following pages.

Space cooling
First having incorporated passive design measures, refined solar shading and targeted high performance building fabric, it is anticipated that the building will utilise cooling provided by high efficiency fan coil units fed by air source heat pump systems.

Mechanical ventilation
All spaces, as a minimum will be provided with a ventilation rate under Part F. Mechanical ventilation is an important addition to the building services strategy to maintain good indoor air quality, by providing fresh air and extracting vitiated air. Providing fresh air minimises the risk of stale and stagnant air and limits the risk of condensation and mould growth. Coupled with a heat exchanger, the warmth in extracted air can be recovered and delivered to the supply air. In this mode, the mechanical ventilation reduces space heating demand. The heat recovery mechanism will be provided with a bypass to avoid returning hot air to spaces within the summer months. Ventilation to each of the key spaces uses on site will be delivered as follows:

- Offices and labs will be served by high efficiency central air handling units (AHUs) which include plate exchangers for heat recovery.
- Any retail fit out will be the responsibility of the tenants and they will be encouraged to install MVHR.

Domestic hot water (DHW) system
To limit the demand for hot water, all relevant spaces will include the use of water-efficient fixtures and fittings including flow reducers in the taps of wash hand basins and aerated showerheads and also WCs with low flush volume to limit overall water consumption in line with Building Regulations Part G.

Natural daylight and lighting strategy
All spaces will be provided with low-energy, efficient light fittings throughout, External lighting for amenity and communal areas will also be low-energy efficient fittings and will be linked to daylight sensors and / or presence detectors to prevent unnecessary use. It is anticipated that the Proposed Development will be supplied with efficient electric lighting that will include 'Light Emitting Diodes' (LED) or similar low energy lamps. The lighting specification for the Proposed Development will be carried out in conjunction with lighting control systems incorporating daylight linkage and presence detection in suitable areas. As well as reduced energy requirement that will be achieved by implementing these strategies, the contribution to the cooling requirements and internal heat gains will be reduced. This will further reduce the total energy requirements and CO_2 emissions.

4.2 Be lean results.

The following is an appraisal of the anticipated energy requirements and resultant CO_2 emissions that could arise as a result of the Proposed Development, after the inclusion of the passive design and energy efficiency measures described above. It is intended that overall, the Proposed Development will achieve a minimum 10% reduction in annual regulated CO_2 emissions beyond the baseline development via passive design and energy efficiency measures (i.e. before any benefit from low or zero carbon technologies). Therefore, a 10% emissions reduction is shown at the Be Lean stage to represent this aim.

Energy performance
The table below outlines the anticipated annual energy requirement and associated CO_2 emissions for the Proposed Development by regulated end use. Note that these figures represent the total energy demand for each use. The total energy consumed by plant and systems includes additional factors for system efficiencies and losses and is outlined in the figure below.

Table 4: Total energy demand.

Space Use	Space heating MWh/year	Hot water MWh/year	Lighting MWh/year	Auxiliary MWh/year	Cooling MWh/year	Unregulated electricity MWh/year
Proposed Development	208	192	758	735	156	1,489

Energy and carbon breakdown

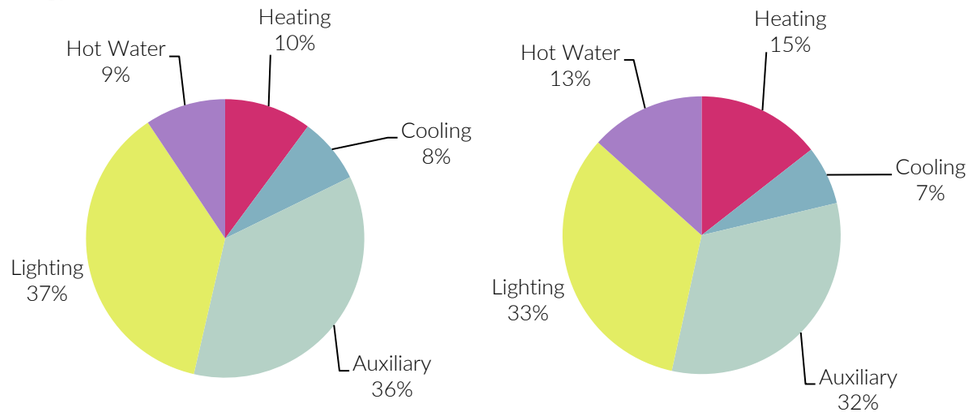


Figure 5: Energy breakdown chart (left) and carbon emissions breakdown chart (right).

4.3 Be lean summary.

The results show that at this stage, the Proposed Development demonstrates a 10% improvement on the baseline carbon dioxide emissions. The graph below illustrates the 'Be Lean' regulated carbon results against the Part L 2013 baseline (SAP 10.1 carbon factors).

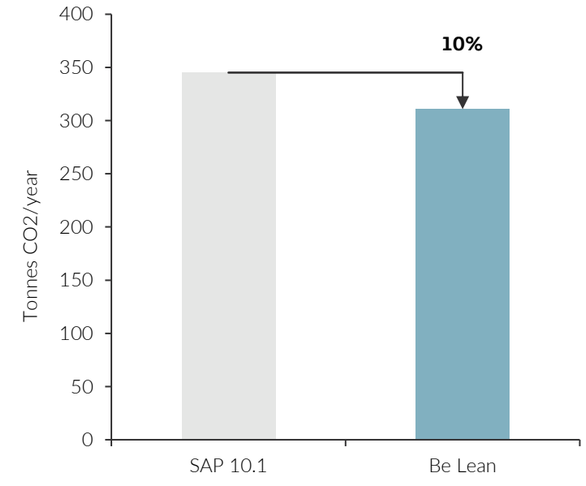
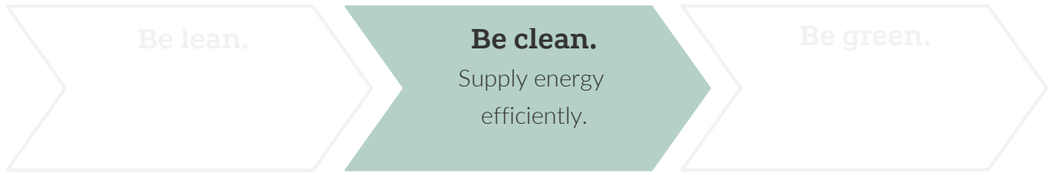


Figure 6: Be lean results summary.

5. Be clean.

This stage of the energy hierarchy refers to the use of heat networks or on-site Combined Heat and Power (CHP) to provide energy and reduce consumption from the national grid and gas networks, through the generation of electricity, heating and cooling on-site.



Development demand

The Proposed Development's anticipated non-thermal energy demand has been calculated to be 65% compared to 35% for thermal demand.

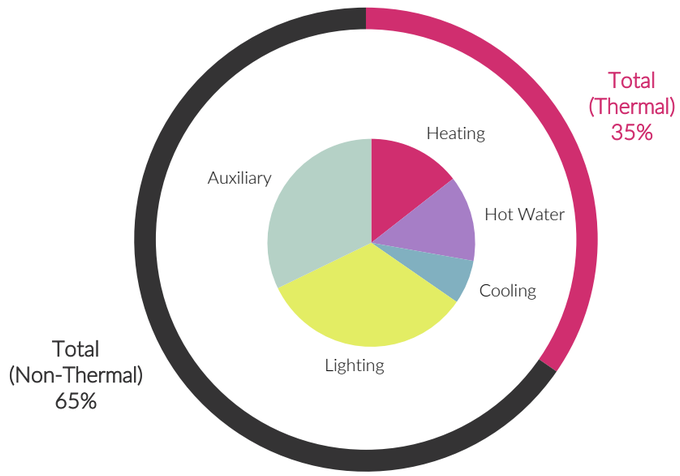


Figure 7: Site wide energy demand.

In line with policy aspirations, the following sections summarise the considerations of the low-carbon energy supply measures that have been considered and those which will be implemented in the Proposed Development. the following options are considered:

- Connection to an existing heat network
- Provision of an on-site heat network
- Combined Heat and Power (CHP).

Connection to an existing network

There are no existing networks within the vicinity of the Proposed Development to connect to, and a sitewide network is not proposed for the Proposed Development (refer to sitewide energy strategy).

Combined heat and power (CHP)

In the context of the decarbonising electricity grid, CHP will offer lower emissions savings and will result in a net emission increase over the coming years. Considering the CO_2 emissions increase in addition to the additional plant space that would be required, as well as the potential impact on local air quality from the likely increase in NOx emissions as a result of the engine, CHP is discounted for the Proposed Development.

5.1 Be Clean summary.

Due to the carbon intensity of CHP engines and the lack of an existing network, neither is proposed.

Therefore, no additional savings can be seen from this stage of the energy strategy.

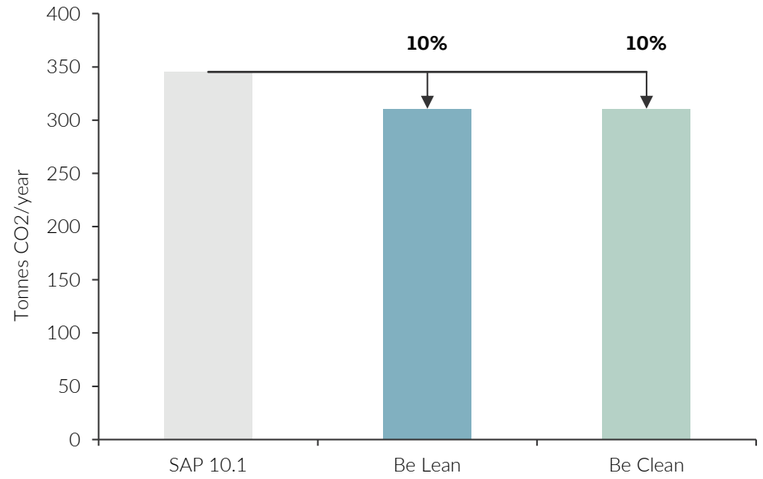
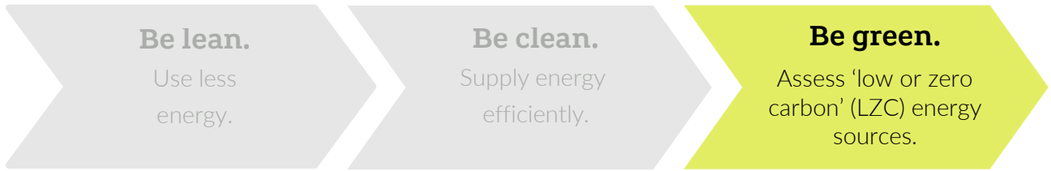


Figure 8: Regulated CO_2 savings demonstrated at the Be Clean stage.

6. Be green.

This step of the energy hierarchy explores the feasibility of Low and Zero Carbon (LZC) technologies to allow for the production of renewable energy onsite to offer a further reduction in carbon emissions.

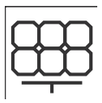


6.1 Low and zero carbon (LZC) technology assessment.

Renewable or zero carbon technologies harness energy from the environment and convert this to a useful form. Many renewable technologies are available, however, not all of these are commercially viable or suitable for city centre locations.

The following low and zero carbon technologies have been discounted for the scheme:

- Solar thermal – these panels are similar to PV in that they harness energy from solar. This technology however converts solar into thermal energy that can offset the demand for hot water generation systems. However, given the balance in electrical vs thermal requirements on site, solar thermal is discounted in favour of PV.
- Vertical wind turbines – for efficient operation and to yield high energy output, wind turbines require smooth laminar / constant flow of air. Urban environments often have turbulent wind flow patterns and as such, given the Site location, wind turbines are not considered appropriate for the Proposed Development.
- Ground source heat pumps – these systems work to extract heat or cooling energy from the ground taking benefit from stable ground temperatures across the year. Heating extraction and rejection need to be balanced so as to not cause issues such as permafrost. All ground source heat pumps would require extensive below groundworks to bury and install the system on the site and given the proximity to the tube line, this technology is not considered suitable.



Photovoltaics
The potential areas suitable for PVs at the Proposed Development are limited given its location and plant requirements. However, an appraisal of roof space available for PV has been undertaken, taking into consideration the following:
– Overshading
– Area allocated for plant space and roof-top amenities
– Area required for access

Suitability to Proposed Development:
An initial appraisal of PV suitability has been undertaken considering the relevant site constraints such as rooftop plant space requirement, amenity provision and access routes required.

It is proposed that a rooftop PV array be provided, covering 20% of the roof area (based on a typical floor) and sited on a deck above the rooftop plant to limit solar shading as required. The total output of the PV array is estimated to be approximately 180,000 kWh/year, equivalent to a 7.2% reduction in regulated CO_2 compared to the baseline development.

Heat pumps
Air Source Heat Pumps (ASHP) work to extract heat from the air. They also have the added benefit of leveraging continued grid decarbonisation of the UK electricity grid.

Suitability to Proposed Development:
Based on supplying 100% of the heating, domestic hot water, and cooling of the Baseline Development using ASHPs with minimum seasonal coefficients of performance (SCoPs) of 3.5 for heating and domestic hot water and 4.5 for cooling, it is anticipated that this could achieve up to a 25.0% reduction in regulated CO_2 compared to the baseline development.

6.2 Be green summary.

Overall, it is anticipated that the Proposed Development will achieve up to a 42.1% reduction in CO_2 emissions beyond the Building Regulations Part L 2013 'baseline'. The combined saving from LZC technologies, 32.1%, exceeds the 10% requirement set in the South Cambridgeshire Local Plan.

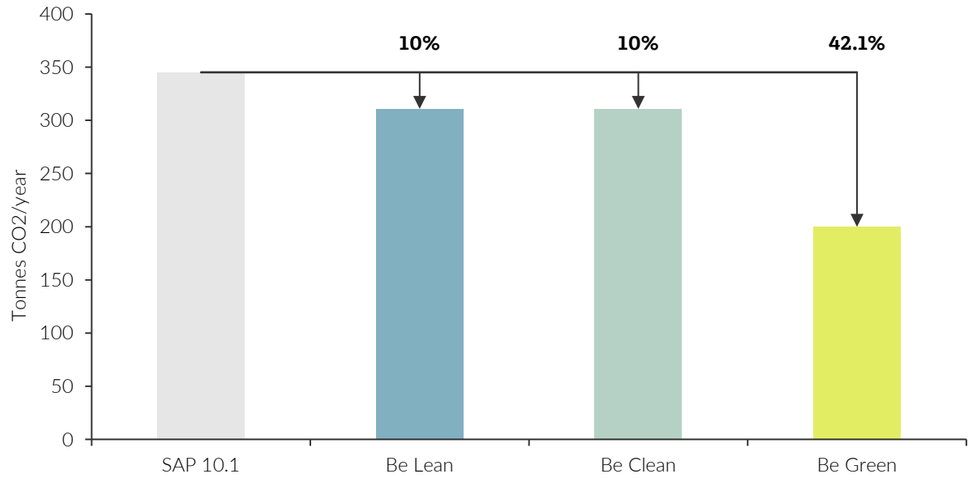


Figure 9: Be green results summary.

6.3 BREEAM Ene 01 Energy performance.

The Applicant's target of Excellent rating requires that 4 credits are achieved under BREEAM NC Ene 01 Energy performance as a minimum. The possibility to achieve 6 credits will be reviewed as part of the Applicant's aspiration to target an 'Outstanding' rating.

In order to calculate the number of Ene 01 credits obtained, BREEAM uses an overall energy performance ratio (EPR_{NC}). This energy performance ratio is based on Part L calculations, and is the sum of:

- The heating & cooling demand energy performance ratio (EPR_{ED}) is associated with the fabric performance.
- The primary consumption energy performance ratio (EPR_{PC}) incorporates the benefits of using efficient systems.
- The CO_2 energy performance ratio (EPR_{CO2}) also takes into account renewable energy.

It is intended that through the energy hierarchy, as outlined in the preceding sections, 4 credits will be achieved as a minimum. The BREEAM NC 2018 pre-assessments appended to the sitewide Sustainability confirm that a minimum of 4 Ene 01 energy performance credits are targeted; as the building's design develops, compliance against this target will be monitored to ensure that it can be achieved post-construction. The Proposed Development will also be assessed against the client's aspiration for an 'Outstanding' rating.

6.4 Carbon Reduction Proformas for applications in South Cambridgeshire.

The Energy Statement form provided in Appendix 5 of the Greater Cambridge Sustainable Design Construction SPD 2018 has been completed below using SAP 10.1 carbon factors.

Applicant name: Brookgate

Application type: Full

Use Class: E(g) i (offices), ii (research and development), providing flexible Class E and Class F uses on the ground floor, with associated car and cycle parking, a multi-storey car and cycle park and associated landscaping and infrastructure works

Proposed floor area: 39,376 m^2 (approximate BRUKL area: 34,240 m^2)

Development type	SAP / SBEM ($kgCO_2/m^2$)	Proposed area (m^2)	Total ($kgCO_2$/annum)	10% minimum ($kgCO_2$/annum)
Three commercial buildings	5.83 (Be Green case)	39,376 (approximate BRUKL area: 34,240)	199,796 (Be Green case)	34,522 (10% of the gas boiler baseline)

Level of carbon reduction associated with proposed renewable/low carbon energy technology (ies) ($kgCO_2$/annum)	
Technology 1: ASHP	86,148 $kgCO_2$/annum
Technology 2: Solar PV	24,752 $kgCO_2$/annum

7. Conclusion.

This document has been prepared in support of the application for planning permission for the Proposed Development.

This Energy Statement summarises the pertinent regulatory and planning policies applicable to the Proposed Development and sets out how the Proposed Development addresses the relevant policy requirements.

7.1 The energy statement.

The statement has been developed using the 'Be Lean', 'Be Clean' and 'Be Green' energy hierarchy which utilises a fabric first approach to maximise the reduction in energy through passive design measures. Calculations have utilised SAP 10.1 carbon factors.

Table 5: Energy statement summary.

Be lean	10% regulated CO_2 emissions at Be lean stage. Through passive design and energy efficiency, the Proposed Development will seek to generate a 10% reduction in regulated CO_2 as a minimum to the SAP 10.1 baseline development at the Be lean stage.
Be clean	'Be clean' measures have been deemed unfeasible. The incorporation of an onsite district heating and a CHP system has been deemed to be unsuitable as it would offer little to no benefit to the Proposed Development. There are no existing district heating networks within the vicinity of the site. Therefore, no emissions reductions are anticipated at this stage.
Be green	A 32.1% sitewide betterment achieved through LZC technologies. The inclusion of on-site renewable energy generation has been assessed, and it is proposed to implement a combination of air source heat pumps to provide the heating and domestic hot water and roof mounted solar photovoltaics Utilisation of these LZC technologies is expected to lead to an approximate to a 32.1% reduction in regulated CO_2 emissions.

Results

The following provides details on the carbon reduction percentage seen from the baseline case.

Table 6: Carbon reduction breakdown.

Table 7: Summary of site wide energy strategy for the Proposed Development, using SAP10.1 carbon factors.

	Regulated CO_2 emissions (tCO_2/yr.)	Regulated CO_2 savings (tCO_2/yr.)	Savings (%)
SAP 10.1 gas boiler baseline	345		
Be Lean	311	35	10.0%
Be Clean	311	0	0.0%
Be Green	200	111	32.1%
	Total	**159**	**42.1%**

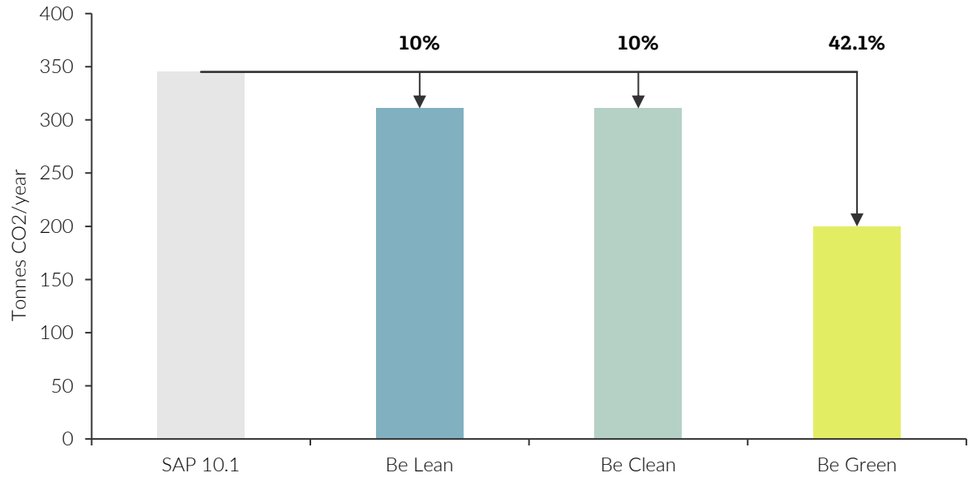


Figure 10: Regulated carbon reduction per stage of the energy hierarchy for the Proposed Development using SAP10.1 carbon factors.

BREEAM ENE01 Energy Performance

The Proposed Development is targeting a BREEAM 'Excellent' rating with an aspiration for 'Oustanding'. For an 'Excellent' rating, a minimum of 4 energy credit credits must be achieved and this target has been included within the BREEAM pre-assessment.

7.2 Outcomes.

It is anticipated that up to a 42.1% reduction in CO_2 emissions will be achieved beyond the Building Regulations Part L 2013 'baseline' (using SAP 10.1 carbon factors). The table below demonstrates how the Proposed Development aligns with pertinent development drivers.

Table 8: Summary of alignment to planning policy requirements and development aspirations.

Drivers	Applicant response
South Cambridgeshire Local Plan 2018 – Design and construct developments that are extremely energy efficient. – Reduce carbon emissions by a minimum of 10% using on-site renewable energy and low carbon technologies. Greater Cambridge Sustainable Design Construction SPD 2018 – Buildings should be designed and built to meet CIBSE's latest overheating standards Sitewide – Cambridge North is to achieve a 31% CO_2 reduction as a whole.	– The Proposed Development will be targeting a 42.1% reduction in carbon on-site using SAP 10.1 carbon factors. – Reduction in carbon emissions has been achieved over the gas boiler baseline as per the Councils' guidance. – This reduction contributes to the sitewide carbon reduction target of 32.1%. – The heat hierarchy has been followed – there are no heat networks available, instead servicing will be provided on site via air source heat pumps. – On site distribution of heating and cooling will be provided to serve each of the end uses. – There will be no on-site combustion of fossil fuels, benefitting local air quality.

Drivers	Applicant response
Applicant	– Low and zero carbon technologies will be specified in the form of heat pumps and PV. Combined, these deliver a 32.1% carbon reduction. – The BREEAM pre-assessment targets 4 credits under Ene 01 energy performance; this is the minimum standard for a BREEAM Excellent rating. – To inform occupant comfort and satisfy BREEAM / local policy, an overheating risk analysis will be undertaken for the Proposed Development against CIBSE Guide A requirements for current and future weather files (2020, 2050 and 2080 respectively).
– 4 Ene 01 energy performance credits under BREEAM New Construction 2018, as required by the Applicant for an 'Excellent' rating	

Appendix A: Policy context.

National policy .

Building Regulations Part L

Part L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO_2 emissions from new buildings.

Current Requirements: Part L2A 2013

The Building Regulations Part L covers the conservation of fuel and power. Alterations to new non-domestic buildings fall under the Building Regulations Part L2A 2013.

Criterion 1 - Achieving the Target Emission Rate (TER)
Criterion 2 - Limits on design flexibility
Criterion 3 - Limiting the effects of solar gains in summer
Criterion 4 - Building performance consistent with the Building Emission Rate (BER)
Criterion 5 - Provision for energy efficient operation of the building.

Proposed changes to Part L

On 1st October 2019, the BRE released an update to SAP (calculation methodology for domestic buildings) for consultation, called SAP10.1. The important proposed change to the SAP methodology is the carbon factors to be used to calculate CO_2 emissions which are likely to also be translated into the NCM methodology and Building Regulations Part L2A 2013.

The key changes to carbon factors are those for natural gas and grid supplied electricity. Furthermore, annual carbon emissions from electrical sources will be calculated using a monthly variation. Table 9below demonstrates the comparison between the current and proposed Part L carbon emission factors. For the proposed electricity factor, the annual average has been provided for comparison purposes.

Table 9: Current and proposed carbon factors for natural gas and grid supplied electricity.

Fuel	Part L 2013 Carbon Factor ($kgCO_2/kWh$)	Proposed SAP10.1 Carbon Factor ($kgCO_2/kWh$)
Mains Gas	0.216	0.210
Electricity (average)	0.519	0.136

Nevertheless, if the proposed amendments to Part L are implemented, this will impact on the future Energy Performance Certificates (EPCs).

Part L 2021 regulation changes

Updated Part L Building Regulations published in October 2021 are set to come into force June 2022. The Proposed development may need to be assessed under these new regulations where meaningful progress has not commenced on site by implementation date.

The full formal calculation methodology and associated software for this version of building regulations is not being released until June 2021, thus implications for the project's performance against building regulations compliance cannot be fully appraised as of yet.

Further improvements to the fabric and system efficiencies of the Proposed Development may need to be made to the design retrospectively in order to achieve compliance during construction at a cost to the client if re-assessment is required as the new regulations are enforced. Clarification from legal and Building Control teams should be sought to confirm.

Confirmed regulation updates include:

- Homes and non-domestic buildings built to Part L 2021 standards will emit 31% and 27% less CO2 on average respectively than one built to current standards (Part L 2013).
- A Primary energy target was introduced with the fabric Energy Efficiency target retained.
- varying carbon factor associated with grid electricity is included (73% lower on average than Part L 2013).

National Planning Policy Framework (July 2021)

The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

The purpose of the framework is to aid in the achievement of a sustainable development by providing guidance towards policy building that would meet the economic, social and environmental objectives.

Relevant key information to note:

- Local planning policies and decisions should exploit any opportunity to make the location sustainable, Potential actions are:
    a. Improving quality of building designs to enable sustainable use of resources such as energy and water
    b. Design of development should also reflect the local aspirations
    c. Improving quality of building designs to enable sustainable use of resources such as energy and water
    d. Design of development should also reflect the local aspirations
    e. Create an environment that promotes health and well-being
    e.g. improve access for walking or cycling
- Policies should plan for future challenges such as climate change, flooding and coastal change:
    a. Reduce vulnerability by incorporating resistant and resilient designs
    b. Implementing designs that would reduce overall greenhouse gas emissions throughout lifecycle of building
    c. Increase use of renewable energy and low carbon energy sources.
- Policies and decisions should prioritise the conservation and enhancement of natural environment:
    a. Protect and enhance valued landscape, biodiversity sites and geological value and soils
    b. Protect the intrinsic character and beauty of the countryside and their accompanying ecosystem
    c. Maintain character of undeveloped coast
    d. Minimise impacts on and provide net gains for biodiversity
    e. Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.
- Promote the use of sustainable materials all stages of development.

Local policy.

South Cambridgeshire Local plan

Table 10 outlines the key policy elements that are included within the South Cambridgeshire local plan. Many elements of this plan have been used to inform the sustainability strategy for Cambridge North.

Table 10: South Cambridgeshire policy summary

Theme	South Cambridgeshire Local Plan
Sustainable design & energy efficiency 	Policy CC/1: Mitigation and Adaptation to Climate Change Planning permission will only be granted for proposals that demonstrate and embed the principles of climate change mitigation adaptation into the development. Applicants must submit a Sustainability Statement to demonstrate how these principles have been embedded into the development proposal. Policy CC/3: Renewable and Low Carbon Energy in New Developments Proposals for new dwellings and new non-residential buildings of 1000m^2 or more will be required to reduce carbon emissions by a minimum of 10% through the use of on-site renewable energy and low carbon technologies. Policy HQ/1: Design Principles All new development must be of high quality design, with a clear vision as to the positive contribution the development will make to its local and wider context. Policy HQ/2: Public Art and New Development The council will encourage the provision or commissioning of public art that is integrated into the design of development as a means of enhancing the quality of development proposals in particular from: – Other developments where the floor area to be built is 1000m^2 gross or more, including office, manufacturing, warehousing and retail developments.
Flood risk and water resources 	Policy CC/4: Water Efficiency Development must be accompanied by a water conservation strategy, which demonstrates a minimum water efficiency standard equivalent to the BREEAM standard for 2 credits for water use levels unless demonstrated not practicable. Policy CC/7: Water Quality In order to protect and enhance water quality, all development proposals must demonstrate that: – There are adequate water supply, sewerage and land drainage systems (including water sources, water and waste water infrastructure) to serve the whole development, or an agreement with the relevant service provider to ensure the provision of the necessary infrastructure prior to the occupation development. Where development is being phased, each phase must demonstrate sufficient water supply and waste water conveyance, treatment and discharge capacity. – The quality of ground, surface or water bodies will not be harmed, and opportunities have been explored and taken for improvements to water quality, including re naturalisation of river morphology, and ecology. – Appropriate consideration is given to sources of pollution, and appropriate Sustainable Drainage System (SuDS) measures incorporated to protect water quality from polluted surface water runoff. Foul drainage to a public sewer should be provided wherever possible, but where it is demonstrated that it is not feasible, alternative suited must not pose unacceptable risks to water quality or quantity. Policy CC/8: Sustainable Drainage Systems Development proposals must incorporate appropriate Sustainable Drainage System (SuDS) appropriate to the nature of the site. Policy CC/9: Managing Flood Risk In order to minimise flood risk, development will only be permitted where: – The sequential test and exception tests established by the National Planning Policy Framework demonstrate the development is acceptable (where required). – Floor levels are 300mm above the 1 in 100 year flood level plus an allowance for climate change where appropriate and where appropriate and practical also 300mm above adjacent highway levels. – suitable flood protection mitigation measures are incorporated as appropriate to the level and nature of flood risk, which can be satisfactorily implemented to ensure safe occupation, access and egress – There would be no increase to flood risk elsewhere, and opportunities to reduce flood risk elsewhere have been explored and taken. – The destination of the discharge obeys the following priority order: – Firstly, to the ground via infiltration – Then, to a water body – Then, to a surface water sewer – Discharge to a foul water or combined sewer is unacceptable – Site specific Flood Risk Assessments (FRAs) appropriate to the scale and nature of the development and the risks involved and which takes account of the future climate change will be required. – FRAs will need to meet national standards and local guidance (including recommendations of the South Cambridgeshire and Cambridge City Strategic Flood Risk Assessment (2010) and the Phase 1 and 2 Water Cycle Strategy or successor documents).
Biodiversity 	Policy NH/2: Protecting and Enhancing Landscape Character Development will only be permitted where respects and retains or enhances local character and distinctiveness of the local landscape and of the individual National Character Area in which it is located. Policy NH/4: Biodiversity

Theme	South Cambridgeshire Local Plan
	New development must aim to maintain, enhance, restore or add to biodiversity. opportunities should be taken to achieve positive gain through the form and design of development. measures may include creating, enhancing and managing wildlife habitats on networks, and natural landscape. The built environment should be viewed as an opportunity to fully integrate by diversity within new development through innovation. priority for habitat creation should be given to sites which assist in the achievement of targets in the Biodiversity Action Plans (BAPs) and a delivery of the Cambridgeshire Green Infrastructure Strategy. Policy NH/6: Green Infrastructure The Council will encourage proposals which: – Reinforce, link, buffer and create new green infrastructure. – Promote, manage and interpret green infrastructure and enhance public enjoyment of it. All new developments will be required to contribute towards the enhancement of the green infrastructure network within the district. these contributions will include the establishment, enhancement and the ongoing management of costs.
Pollution	Policy CC/6: Construction Methods Development which by its nature or extent is likely to have some adverse impact on local environment and immunity during construction and slash or generate construction waste must: – Carefully manage materials already on site (including soils), or brought to the site, to reduce the amount of waste produced and maximise the reuse or recycling of materials either on site or locally. Any construction spoil reused within the development should take account of the landscape character and avoid the creation of features alien to the topography. – Ensure the constructors are considerate to neighbouring occupiers by restricting the hours of noisy operations and by locating storage compounds and using plant or machinery to avoid noise, smells, dust, visual or other adverse impacts. Policy SC/10: Light Pollution. All development proposals including external lighting or changes to existing lighting should reduce the potential impact of that lighting. Policy SC/11: Noise Pollution Planning permission will not be granted for a development which: – Has an unacceptable adverse impact on the indoor and outdoor acoustic environment of existing or planned development – Has an unacceptable adverse impact on countryside areas of tranquillity which are important for wildlife and countryside recreation. – Would be subject to unacceptable noise levels from existing noise sources, both ambient levels and having regard to noise characteristics such as impulses whether irregular or tonal. Policy SC/12: Air Quality Where development proposals would be subject to unacceptable air quality standards or would have an unacceptable impact on air quality standards they will be refused.

Theme	South Cambridgeshire Local Plan
Health and wellbeing & community	Policy SC/2: Health Impact Assessment New development will have a positive impact on the health and wellbeing of new and existing residents. Planning applications for developments of 1000m^2 or more floorspace will be accompanied by a Health Impact Assessment. Policy TI/10: Broadband New development (residential, employment and commercial) will be expected to contribute towards the provision of infrastructure suitable to enable the delivery of high speed broadband services across the district.
Transport	Policy TI/2: Planning for Sustainable Travel Development must be located and designed to reduce the need to travel, particularly by car, and promote sustainable travel appropriate to its location. Planning permission will only be granted for development likely to give rise to increased travel demands where the site has (or will attain) sufficient integration and accessibility by walking, cycling or public and community transport. Developers of large developments (of over 1000m^2) will be required to demonstrate they have maximised opportunities for sustainable travel and will make adequate provision to mitigate the likely impacts through provision of a Transport Assessment and Travel Plan. Policy TI/3: Parking Provision Car parking provision should be provided through a design led approach (1 space per 25m^2 (under 2500m^2), 1 space per 30m^2 (over 2500m^2)). Cycle parking should be provided to at least the minimum standards (1 space per 30m^2). Car parking provision will take into consideration the site location, type and mix of uses, car ownership levels, availability of local services, facilities and public transport, and high weight and user safety issues, as well as ensuring appropriate parking for people with impaired mobility.

Greater Cambridge Sustainable Design and Construction SPD

The Sustainability Statement should take the form of a report with accompanying plans and drawings to illustrate and expand upon the information contained in the Sustainability Checklist.

The Sustainability Checklist provides the questions that Applicants need to respond to in their Sustainability Statement and other relevant documents. For developments in Cambridge, the Sustainability Statement should be integrated into the Design and Access Statement for all major developments. For developments in South Cambridgeshire, the Sustainability Statement should form a stand-alone document.

Part 1a of the Sustainability Checklist applies to applications in Cambridge, while Part 1b applies to South Cambridgeshire. Policies have been colour coordinated as follows:

Key:

- Cambridge Local Plan (2018) / Applications in Cambridge
- South Cambridgeshire Local Plan (2018) / Applications in South Cambridgeshire
- Both the above

Energy & Carbon Reduction

As specified in the Sustainability Checklist Policies En.1 - En.3:

- All Residential development – 44% reduction on Part L 2006 (19% reduction on Part L 2013)
- All Non-residential – mandatory requirements for Ene01 associated with BREEAM 'excellent'
- 10% onsite renewable or low carbon energy for all new residential development and major non-residential development
- For large residential developments, BREEAM Communities assessment could be considered

Energy sources:

- Encourage the installation of zero-emission heating sources, such as electric heating, ground-source and air-source heat pumps
- All gas boilers to have low NOx emissions (boilers that meet a dry NOx emission rating of 40mg/kWh)
- Minimum emission standards for CHP emissions (Spark ignition engine: less than 150 mgNOx/Nm3, Compression ignition engine: less than 400 mgNOx/Nm3, Gas turbine: less than 50 mgNOx/Nm3)
- Considerations should be made in reference to decarbonisation of grid to determine CHP feasibility.

Carbon Reduction Template:

- To demonstrate compliance, Applicants should submit a Carbon Reduction Statement - Alongside the table below, the main body of the Statement should include a summary of the measures proposed to reduce carbon emissions following the energy hierarchy (be lean, be clean and be green).
- Applicants will need to be mindful of the Government's intention to ban gas boilers in new homes from 2025 in a bid to tackle climate change. Coupled with the proposed changes to the carbon intensity of electricity in SAP 10, which takes into account the decarbonisation of electricity, a long-term view of the carbon emissions associated with gas forms of heating should be taken into consideration. Where possible SAP 10 carbon factors are recommended.

Unit Number/Address	Target Emission Rate (TER)	Dwelling Emission Rate (DER)	% Improvement on Part L 2013

Biodiversity

As specified in the Sustainability Checklist Policies Bio.1 – Bio.9:

- All development proposals should seek to conserve and enhance biodiversity
- A Preliminary Ecological Assessment and Protected Species Scoping Survey61 must be conducted
- Mitigation hierarchy must be followed, demonstrating how existing habitats and species have been protected in the proposed ecological and landscape strategy
- It must be demonstrated that the proposals will deliver biodiversity net gain, with use of the DEFRA Biodiversity Offsetting metric.
- For major developments, the Natural Cambridgeshire Local Nature Partnership (LNP) Developing with Nature Toolkit must be adopted.

As specified in the Sustainability Checklist Policies Osc.2 – Osc.5:

- Consideration must be given to the provision of food growing opportunities.
- Measures must be integrated into the design to create healthy indoor environments.

Transport

The council has offered the following guidance on sustainable transport measures:

- Incentivise behavioural change towards greater car sharing, increased bus and rail use, and improved cycling/pedestrian infrastructure.
- Support sustainable and low emission public transport
- Improve parking allocation and facilities through non-idling policies, priority parking for low emission vehicles (with charging points) and for car share schemes, bicycle parking, electric bike charging points.

Electric Vehicles:

- At least one rapid EV Charge Point for every 1,000m2 non-residential floor space (as per Institute of Air Quality Management guidance) or one fast EV Charge Point for every 1,000m2 non-residential floor space (if the installation of a rapid charge point is technically Impossible due to grid supply constraints (evidence must be provided)
- At least one rapid EV Charge Point for large-scale Major developments
- Installation of passive charge points - electric vehicle charging infrastructure for future activation - at all vehicle parking spaces without active charge points (to provide 100% coverage)
- A minimum of one car club vehicle per 500 parking spaces in new residential developments; a minimum of one vehicle per 10,000 m2 in non-residential developments

Electric and Low Emission Vehicle requirements:

- Residential developments
  1. One Rapid Charging Point/station Per 1000m2 of floorspace or per 20 parking spaces or
  2. Allocated fast Charging Point for 50% of proposed parking spaces
- Commercial developments
  1. One Rapid Charging Point/station Per 1000m2 of floorspace or per 20 parking spaces or
  2. Allocated fast Charging Point for 50% of proposed parking spaces
- Supporting infrastructure
  1. Provision of infrastructure to facilitate additional charging points
  2. Support for other Low Emission technologies is welcome and considered on site-by-site basis

As specified in the Sustainability Checklist Policies T.1 – T.6:

- You must demonstrate how the development proposals give priority for walking and cycling over cars, linking the development with the surrounding walking and cycling network including planned projects
- Electric vehicle charging should be provided where there is car parking

Materials

As specified in the Sustainability Checklist Policy Osc.1:

- A target must be set for improving the environmental impact of materials used in constructing the development, with consideration given to the embodied carbon of materials. Non-residential schemes should refer to the BREEAM assessment. Residential schemes should give consideration to use of the Green Guide to Specification, certification schemes for specific materials with further information available at: http://www.greenbooklive.com/

Recycling and Waste

All new development should include measures to reduce construction waste and ensure that provision is made for storage capacity for waste, both internal and external.

WRAP (Waste and Resources Action Programme) have identified five key principles that design teams can use during the design process to reduce waste:

- Design for reuse and recovery;
- Design for off-site construction;
- Design for materials optimisation;
- Design for waste efficient procurement; and
- Design for deconstruction and flexibility

As specified in the Sustainability Checklist Policies Wr.1 – Wr.3:

- The size and location of recycling and waste facilities, both for storage and collection, should be factored into the design of the proposals using the requirements set out in the RECAP Waste Management Design Guide SPD and associated Toolkit.
- Complete Cambridge City Council's Waste and recycling checklist for developers.
- Measures should be put in place to reduce the amount of construction waste generated by the proposals, including the use of single-use plastics where alternative options exist; and re-use and recycle remaining construction waste (Non-residential schemes should refer to the BREEAM assessment)

Construction Standards (BREEAM)

As specified in the Sustainability Checklist Policies Cs.1 – Cs.2:

- All new non-residential development to achieve BREEAM 'excellent'
- Where BREEAM has been used, a BREEAM pre-assessment must be prepared for submission with your planning application

Climate Change Adaptation

All development should integrate measures into the design of developments to enable adaptation to climate risks including overheating and flood risk.

As specified in the Sustainability Checklist Policies Ca.1 – Ca.7:

- Overheating analysis must be undertaken following the CIBSE methodology and utilising future climate scenarios
- Where the proposal has flat roofs, these should be designed as green or brown roofs in line with the requirements of policy 31
- Where there are existing trees on site, including ancient and veteran trees, the retention of these trees should inform the development layout. This is alongside the integration of new tree planting.

Pollution

- All development proposals including external lighting or changes to existing lighting should reduce the potential impacts of that lighting
- All major development and any development proposals on land subject to contamination or land that is suspected to be contaminated.
- Developers are responsible for ensuring that a proposed development will be safe and 'suitable for use' for the purposes for which it is intended.
- Development must ensure that it does not adversely impact on air quality or expose sensitive users to poor air quality and does not lead to significant adverse effects on health, amenity and the environment from polluting or malodorous emissions, or dust or smoke emissions to air.

Development will be permitted where it is demonstrated that:

a) It will not lead to significant adverse effects and impacts, including cumulative effects and construction phase impacts wherever applicable, on health and quality of life/amenity from noise and vibration; and
b) Adverse noise effects/impacts can be minimised by appropriate reduction and/or mitigation measures secured through the use of conditions or planning obligations, as appropriate (prevention through high quality acoustic design is preferable to mitigation).

Health and Wellbeing

Further guidance will be contained in an update to the South Cambridgeshire Health Impact Assessment SPD and updates to both Councils Affordable Housing SPDs.

- Submission of a Health Impact Assessment required for proposals of 20 or more dwellings, or 1,000m2 or more of new floorspace.

Water Efficiency

As specified in the Sustainability Checklist Policies Wat.1 – Wat.3:

- All Residential development – requirement for potable water use of no more than 110 litres/person/day
- All Non-residential development – maximum BREEAM credits for Wat01
- All Non-residential development – 2 BREEAM credits for Wat01

Sustainable Drainage Systems:

- All scales of new development need to utilise SuDS in order to reduce the rate of discharge into watercourses and mitigate the risk of surface water flooding.
- Consideration must be given to water re-use as part of the site sustainable drainage strategy

A site-specific Flood Risk Assessment is required:

- For proposals of 1 ha or greater in Flood Zone 1
- For all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3; or
- In an area within Flood Zone 1 which has critical drainage problems; or
- Where a proposed development, or a change of use to a more vulnerable class, may be subject to other forms of flooding

Heritage Assets

Where works to improve the environmental performance of a heritage asset are proposed, evidence is required to demonstrate that the works will not harm the building's integrity or significance.

CIBSE guidance on building services in historic buildings sets out four principal aims when seeking to enhance the sustainability of heritage assets:

- Aim 1 – preserve historic fabric;
- Aim 2 – extend the beneficial use of older buildings;
- Aim 3 – reduce carbon emissions, using the hierarchical approach; and
- Aim 4 – specify environmentally conscious materials.

Applications for works to heritage assets will need to demonstrate a thorough understanding of the building in question via the submission of the following information:

- surveys of existing construction, to include walls, floors, ceilings and roofs;
- submission of baseline energy consumption data before and after improvements have taken place (submission of data post improvement would be secured via a planning condition);
- measured data of existing environmental performance of the building's fabric;
- an indication of any national performance standards being targeted as a result of works; and
- recommendations on the environmental performance measures to be implemented in order to achieve the standard.

This information can be submitted as part of a Design and Access Statement for the proposal or as part of a Heritage Statement.

North East Cambridge Area Action Plan (NEC AAP)

NEC AAP is currently a draft planning document. It consists of 30 proposed policies ranging in scope including topics such as the climate emergency, water supply and quality, energy infrastructure, new build developments and affordable housing, sustainable transport, landscaping, biodiversity, waste management, digital infrastructure and other broad sustainability aspects.

NEC AAP remains at an early stage in its preparation and can only be afforded negligible weight in the determination of planning applications.

Appendix B: Grid decarbonisation.

Historic progress

The carbon factor of the National Grid – the amount of carbon dioxide released per kilowatt hour of electricity generated and distributed – is recognised in current Building Regulations as being 0.519 $kgCO_2/kWh$. However, the national mix of electricity generation methods is progressing towards greener solutions with renewable sources accounting for 33.4% of the electricity generated in the UK in 2018; up from 24.4% in 2016 (Ofgem).

As a consequence, the Building Regulations Part L 2013 value of the National Grid carbon factor has been shown to be substantially higher than how the grid is performing in reality. This severely impacts the calculated emissions produced by all heat raising plant that use electricity directly or generate it to offset other emissions. Figure 11 shows how the mix of generation techniques serving the National Grid, as well as the associated carbon factor, has varied over the past seven years – encouragingly, the carbon intensity of the grid has reduced to almost a third of its value in 2012 – just 0.177 $kgCO_2/kWh$ (BEIS). The carbon emissions associated with electricity consumption are therefore much lower than reported in Building Regulations. This means that under the Part L 2013 methodology the CO_2 emissions associated with electrically-driven plant are being overestimated by over 200%.

Future projections

The Future Energy Scenarios (FES) document, produced by the National Grid, discusses how the UK's energy landscape is changing. This year's report, FES 2019, makes projections of how the mix of generation in the grid is likely to change between now and 2050 – the year by which the Climate Change Act 2008 set the target of reducing the UK's CO_2 emissions by 80% from 1990 levels. This target has now been revised to be Net Zero in light of the Committee on Climate Change's recent report and the declaration of a Climate Emergency.

FES discusses these projections in one of four scenarios and Figure 11 combines these future trajectories with the actual carbon intensity of the National Grid. The reported emissions associated with electricity generation have fallen steeply since 2012 and in all cases, the FES 2021 scenarios see the carbon factor of electricity fall below 100 gCO_2/kWh by 2035.

FES produce scenarios with and without Bio-Energy Carbon Capture and Storage (BECCS), which allows the carbon factor to go negative, and one with the negative emissions benefits removed.

Buildings should not claim the negative emissions benefit of BECCS, as these negative emissions will be needed to offset hard-to-abate sectors such as aviation, shipping, and agriculture in future. As such, FES without BECCS should be used to calculate future projected emissions for buildings.

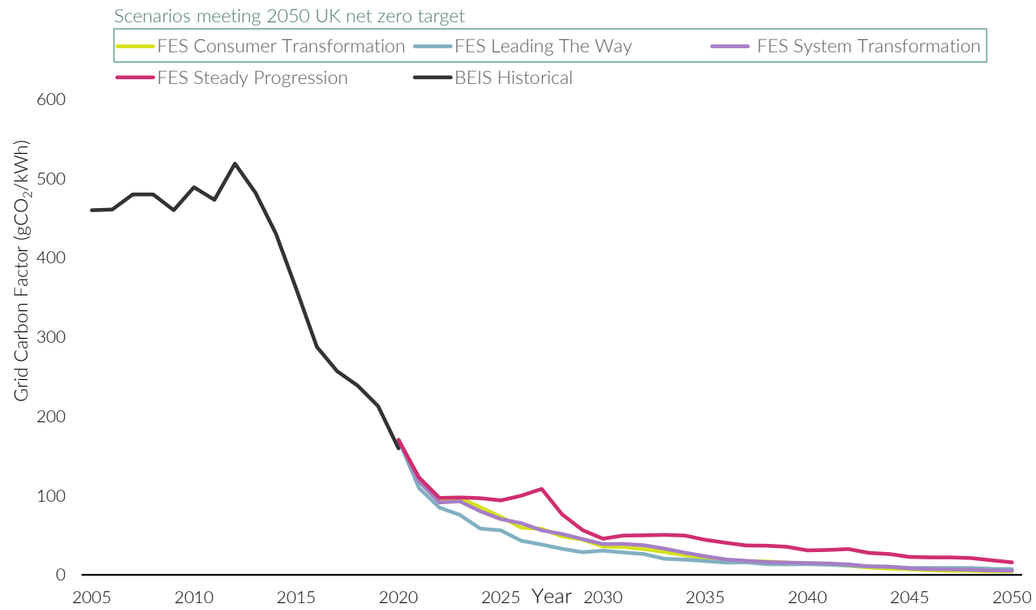


Figure 11: Historic and future projected carbon factor for the National Grid. Transmission and distribution losses are included. Sources: *BEIS Green Book* (historic carbon factors); *National Grid Future Energy Scenarios (FES) 2021* (future projected carbon factors).

Consequences for servicing

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 all scenarios in the long term.

As noted, however, misrepresentative building regulations mean that even today, electrical plant performs far better from an emissions perspective than calculated using the Part L 2013 methodology. The following graph shows the net annual emissions of four different servicing strategies for a recent large scale, mixed use development. Whilst different in scope and scale to the development, the impact incorrect carbon factor has on the calculated emissions is obvious. For these reasons, an electrical servicing strategy is beneficial both today and in the future.

Shifting focus

As the carbon emissions associated with the generation of electricity continue to reduce, the proportion of the UK's overall greenhouse gas emissions for which the electricity sector is responsible will fall. In fact, transport has now replaced energy supply as the greatest single contributor, responsible for 26% of national greenhouse gas emissions (BEIS).

The carbon factor of natural gas is likely to remain relatively static. With 85% of homes in the UK relying on gas to supply their heating and hot water, as well as a significant proportion of commercial buildings, heating buildings and industry represents an ever-greater proportion of UK emissions – 32% in 2015 (BEIS). For the UK to maintain a trajectory sufficient to meet the 2050 decarbonisation target, the focus must necessarily shift to other contributors.

The BEIS Clean Growth Strategy provides an indication of the direction the UK's energy policy is likely to take and "…sets out [the government's] proposals for decarbonising all sectors of the UK economy through the 2020s." This includes investing in infrastructure and mechanisms to facilitate a transition to low emission vehicles and strengthening the energy performance requirements of new and existing buildings.

Potential disruption: hydrogen

The trajectories for a gas strategy above assume that the carbon intensity of gas will remain constant. However, progress is being made in the efforts to establish utility-scale hydrogen production and distribution.

With relatively simple modifications to the burner of a typical gas boiler, hydrogen can be burned to serve the space heating and domestic hot water demand of buildings. Water is the only direct emission when hydrogen is combusted, meaning it is a solution that can enable the zero carbon operation of buildings.

Local pilots of hydrogen networks are emerging, the largest of which is the H21 blueprint proposed by Northern Gas Networks. This plan sets the intention to convert 3.7 million homes and buildings in the North of England to be served by hydrogen, beginning in 2028

Hydrogen generation in the UK is immature, which means regulation and the markets seem to be aligning behind electricity in the path to zero carbon buildings. However, with the minimum disruption to the standard servicing approach offered by hydrogen boilers, they are a promising emerging solution.

Other considerations

Operational cost

Whilst electricity offers increasing benefits from an emissions perspective, the operational cost of such a strategy should be considered.

Electricity currently costs around four times more than natural gas to a typical consumer, meaning that simply substituting a direct electric heating strategy for a gas boiler-based one would see consumers' energy bills nearly quadruple.

With 11% of households in the UK living in fuel poverty, this cannot be an acceptable solution. However, with improvements to building fabric reducing demand and highly efficient heating systems such as heat pumps offering efficiencies of 300% or more, the operational cost of such a strategy should be comparable to a typical gas boiler.

Demand reduction vs. diversification

The decarbonisation of electricity in the UK has been driven by an increasing deployment of renewables such as wind and solar. Whilst these sources are zero carbon, they are intermittent and do not offer the dispatchable generation of gas, coal, or nuclear.

As such, the grid is only as green as the generation available at the time of demand. At peak time (5 pm-7 pm), it is frequently the case that significant gas, and in the winter, coal, is required to supplement the renewable electricity being generated. This means the carbon factor for electricity varies by an average of 32% throughout the day, rising to as much as 50% in winter months. The average hourly carbon factor for 2019 is shown in Figure 12.

As a result, diversifying *when* a development uses electricity may be as, if not more, important than reducing its energy demand. With the advent of smart meters and the impending proliferation of smart appliances and devices, which will use electricity when it is greenest, our homes and buildings will automatically minimise their emissions.

The primary driver for this will most likely be the price of electricity, rather than carbon content, meaning electricity providers will sell electricity cheapest when demand is lowest, with the added benefit of reduced energy bills as well as carbon emissions.

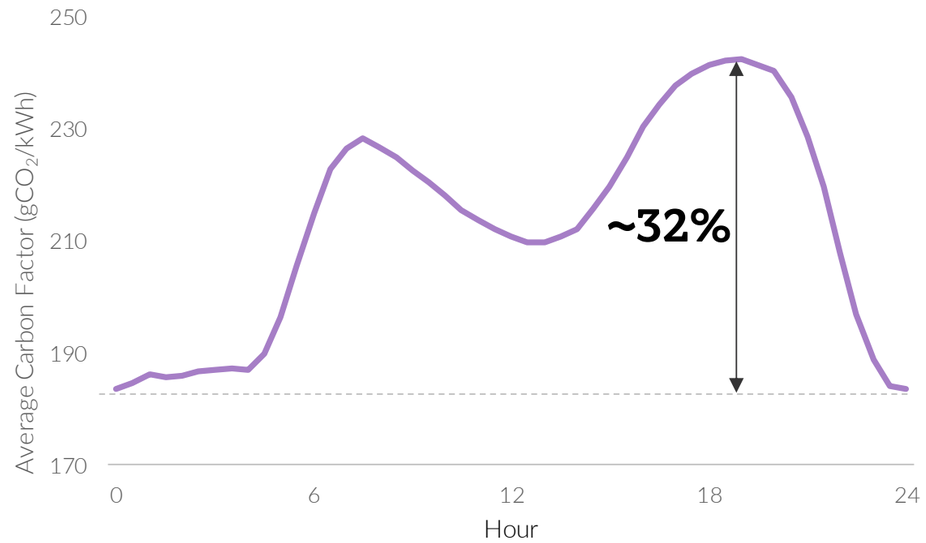


Figure 12: Average hourly carbon factor throughout the day for 2019 (source: https://carbonintensity.org.uk/).

WILLIAM NAISMITH
SUSTAINABILITY CONSULTANT

+44 1865 670 333
williamnaismith@hoarelea.co.uk

HOARELEA.COM

Ground Floor
Botanic House
100 Hills Road
Cambridge
CB2 1PH
England