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Peveril Securities

Lakeview Drive, Bicester Arc Zone B Office

230407

Energy & Sustainability Statement

Sustainability at our core.

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Executive Summary

Couch Perry and Wilkes have been appointed by Peveril Securities Ltd to help steer and inform the energy credentials of the Bicester Arc development at Lakeview drive and to provide an Energy Statements to demonstrate how the development will comply with planning policy relating to energy efficient design and generation of energy from renewable sources. Zone B of the development consists of an office building, an R&D building and a Tech and Manufacturing building. This report deals with the office building only.

The overall intended carbon reduction intended to be achieved across the site, once all steps of the Energy Hierarchy (Be Lean – Be Clean – Be Green) have been completed and incorporating the proposed energy efficiency measures, Air Source Heat Pumps and Solar PV, should equate to a target of greater than 50% reduction in comparison to the 'baseline' development, incorporating a gas-fired solution, when calculated with Part L 2022 emission factors which came into effect June 2022.

The design of the Bicester Arc Zone B Office proposal is underpinned by the desire to deliver a wide range of positive responses to climate change and the ambitions of Cherwell District Council's planning policies and the UK wide target of zero carbon. The proposal improves biodiversity, increases green space, reduces the impact on the local surface water drainage, significantly reduces energy use, and maximises the potential to benefit from continued decarbonisation of the electricity grid where possible.

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1.0 Introduction

CPW have been appointed by Peveril Securities Ltd to help steer and inform the energy credentials of the project and to produce a sustainable building energy strategy to compliment and inform design principles for the proposed office development at Lakeview Drive, Bicester. In undertaking this body of work CPW have also worked closely with the design team to ensure a well thought out and developed energy strategy can be taken forward and employed within the development.

The proposed energy strategy is summarized within this Energy Statement to support the detailed planning application for Zone B of the Bicester Arc development. This Energy Statement demonstrates how the development will comply with planning policy relating to energy efficient design and generation of energy from renewable sources. Planning Policy ESD3 requires the submission of further information concerning energy use within the building relating to BREEAM, and a further submission in relation to that condition will be made in due course.

The proposed Office development comprises Ground Floor (reception and office space) and three No. Upper Floor levels of office accommodation.

This statement considers that the development is required to maximise energy efficiency as far as possible by reducing the energy demand, reducing heat losses, ensuring good building fabric efficiency / passive design, encouraging useful solar gain, encouraging useful day lighting, and maximising efficiency of all fixed regulated building services systems (lighting, heating, cooling, hot water, and mechanical ventilation systems).

The possibility of connecting to the Bicester District Heating Network (Elmsbrook) scheme has been considered.

This Energy Statement is intended to provide an indication of the energy efficiency of the development and to reflect the latest building design in order to provide evidence for the planning condition relating to building carbon emissions. The strategy detailed within has been followed as the design has progressed to this stage. The figures quoted are estimates based on assumed plant and specifications.

The preferred solution has been strongly influenced by local Planning Policies relating to sustainability and energy efficiency. The Cherwell District Council's Local Plan highlights the Council's desires to limit energy consumption and reduce carbon dioxide emissions through Planning Policies ESD 1-5 and Peveril Securities Ltd fully support this aspiration. It is their intention to closely follow the specific guidance of this document in order to significantly reduce carbon emissions.

In order to ensure a well-considered sustainable design process the approach to assess the energy strategy will follow the proposed energy hierarchy below:

a) **'Be Lean' – Energy Efficient Design**

b) **'Be Clean' – Decentralised Energy**

c) **'Be Green' – Renewable Energy Technology**

This Energy Statement is therefore structured accordingly.

2.0 Methodology

A key objective of the energy strategy analysis undertaken is to avoid a proposal coming forward whereby poor energy efficiency is employed but renewable technologies included, only to satisfy regulatory requirements. Consideration should be given to potential increased inefficiency at part load conditions and at times when renewable energy generation is not available in this respect. The predicted energy efficiency and emissions ratings will be informed and assessed via BRUKL calculation using VE Compliance Modelling. The energy efficiency and emissions ratings detailed have been prorated and are taken as reasonable estimates at this stage of the design, based on the following strategies and equipment specifications.

2.1 Grid Decarbonisation

It is widely accepted, that the previous edition of Part L of the building regulations (2013) used out of date carbon emissions factors relating to different fuel types. None more impacted by this is electrical fuel which now takes greater contribution to its production from renewable sources, rather than relying so heavily on the burning of fossil fuels. With this in mind, an updated version of Part L, incorporating new emissions factors for gas and electricity in particular, has recently come into effect (June 2022) and recognises the ongoing decarbonisation of the electrical grid. It will therefore be that providing the option of electrically driven systems are far more attractive, in CO_2 emissions terms, than previously experienced.

To reflect the above, approved software which reflects the 2022 Part L changes has been utilised as the benchmark to support the CO_2 emissions calculations detailed within this energy statement and utilise the carbon emissions factors given within the 2022 edition of Part L of the building regulations, and as follows:

- Gas = 0.210 $kgCO_2/kWh$
- Grid Supplied Electricity = 0.139* $kgCO_2/kWh$
- Grid Displaced Electricity = 0.146* $kgCO_2/kWh$

* Note – carbon emissions factor derived by CPW as mean average of monthly emissions factors detailed within Part L 2022.

3.0 Baseline Building

The baseline building for comparison is represented by the notional building, as defined in building regulations and the NCM modelling guide, for a gas-fired servicing solution for the proposed development. This baseline has been chosen to highlight any potential improvement realised by benefiting from decarbonisation of the electrical grid. 'Benchmark' data has been derived from a model for a similar scheme on site and prorated to provide the basis for a suitable baseline building.

The baseline present below in carbon emissions terms shall be developed in the following sections with the carbon emissions reduction, from the level tabulated below, presented. As previously stated, the baseline for comparison considers a gas-fired solution without the benefit of the energy efficiency measures and technologies described further within this statement.

Carbon emissions for the Baseline Building are taken from the IES software model and reflect the Part L 2022 emissions factors, and shown in the table below:

Proposed 'Baseline' Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)
Bicester Arc Zone B Office	5109.4	56509.9

4.0 'Be Lean' – Energy Efficient Design

Reducing energy usage is the priority in the energy hierarchy. It is often the measure with the least cost implications, and any reduction will, in turn, reduce the requirement for on-site generation from renewable energy sources.

Achieving an optimum use of energy throughout a building's life requires the implementation of passive design to reduce the need for energy associated with controlling the environment and efficient controls to assist in occupant's use of energy.

The calculated energy demand is based on the following specification:

- Omission of gas fuel to the building to maximise benefit of decarbonising electrical grid. Highly efficient heat pumps in the form of VRF systems are proposed to meet the heating and cooling demand of the building.
- Maximising daylighting in all areas. The glazing specification will be carefully considered, aiming to provide an optimum balance between passive solar heating, limiting summertime overheating and maximising the potential for natural daylight transmission (Lt = 0.5 min. / g = 0.4 max.).
- HVAC and lighting systems to operate 'on demand' where practical.
- Practical zoning of HVAC systems.
- Weather compensation of all heating systems.
- LED lighting to be adopted throughout with automatic daylight dimming facility to the office areas.
- Mechanical ventilation to be delivered by high efficiency Air Handling Unit with heat recovery and low energy fans.
- An air permeability of $3m^3/hr/m^2$ @ 50Pa will be targeted

The following 'U' values are proposed for the building fabric of the new building:

Element	Criteria U-Value (W/m2K)	Notes	U-Value Improvement over Part L 2022 regulations
Glazing	U = 1.2	G-Value of 0.39 on North facing and 0.26 on South, East and West elevations	25%
Wall	U = 0.14	Build-up TBC at later stage	46%
Roof	U = 0.1	Build-up TBC at later stage	44%
Ground Floor	U = 0.1	Build-up TBC at later stage	44%
Thermal Bridging		Per the accredited details	
Air tightness		3 $m^3/m^2/hr$ (@ 50Pa)	40%

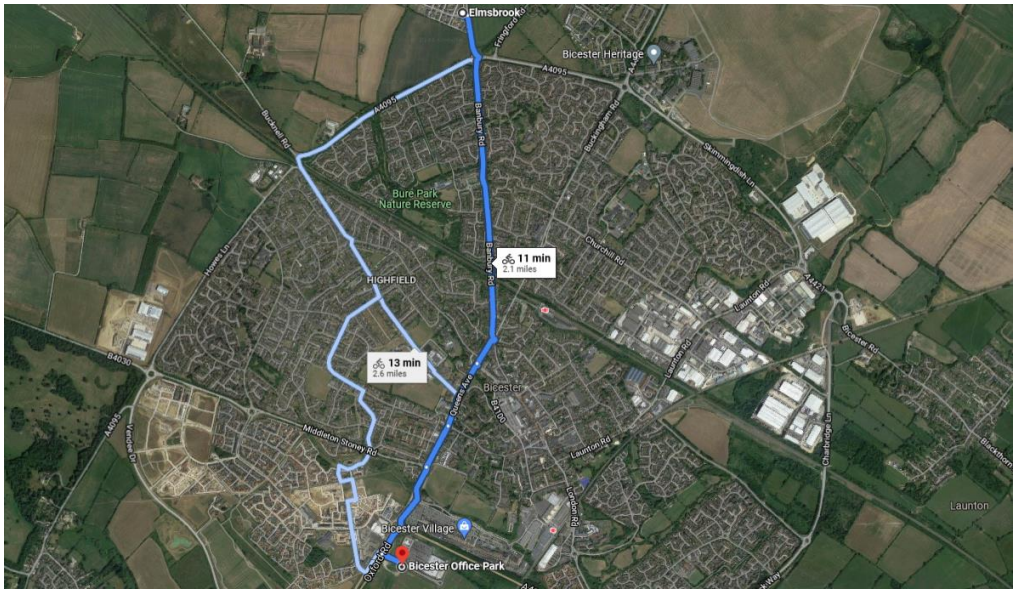
Carbon emissions for the 'Be Lean' building are taken from the IES software model, converted in line with Part L 2022 emissions factors, and as detailed in the table below:

Proposed 'Be Lean' Approach Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2/annum$)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions
Proposed 'Baseline' Development	5109	56509	N/A	N/A
Proposed 'Lean' Development	5109	24933	55%	55%

5.0 'Be Clean' – Decentralized Energy

Cherwell District Council's Local Plan encourages connection to existing decentralised energy and heat network through Policy EDS 4. In line with Policy EDS 4, opportunities to connect the planned development to existing or future decentralised heat distribution networks, including those featuring Combined Heat and Power (CHP) plant, have been investigated.



Investigations have been carried out into the viability of connection into a local district heating network. It was found that although the Bicester District Heating Network (Elmsbrook) is located in the general vicinity of the development, with the current provisions of the existing district heating network, connection of the development was not financially feasible.

For the purpose of this assessment, and until such time that a district heat network connection is deemed feasible, carbon emissions for the 'Be Clean' building do not demonstrate any further savings than those detailed for the 'Be Lean' building, and as detailed in the table overleaf:

Proposed 'Be Clean' Approach Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions
Proposed 'Baseline' Development	5109	56509	N/A	N/A
Proposed 'Lean' Development	5109	24933	55%	55%
Proposed 'Clean' Development	5109	24515	0%	55%

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6.0 'Be Green' – Renewable Energy Technology

The third stage of the energy hierarchy refers to the production of renewable and low/zero carbon energy, relating to the reduction in carbon emissions from on-site or near site renewable.

A range of approved renewable technologies have been appraised, considering the suitability, feasibility, size and capital cost of each system required to meet the target. This is summarised as below:

Technology	Brief Description	Benefits	Issues / Limitations	Feasible for Site?
Solar Photovoltaic	Solar photovoltaic panels convert solar radiation into electrical energy through semi-conductor cells.	• Low maintenance / no moving parts • Easily integrated into building design • No ongoing costs	• Any overshadowing affects panel performance • Panels ideally inclined at 30° to the horizontal facing a southerly direction • Site of conservation area and heritage interest require sensitivity of building aesthetic	Potentially
Solar Thermal	Solar thermal energy can be used to contribute towards space heating and hot water demand. The two most common forms of collector are panel and evacuated tube.	• Low maintenance • Little on going maintenance costs	• Must be sized for building DHW requirements. However, local policy encourages communal heat networks • Doesn't suit occupancy profile of a student residential development as likely to be unoccupied over summer months	No
Ground Source Heat Pump (GSHP)	GSHP systems tap into the earth's considerable energy store to provide heating and cooling to buildings. Installs include horizontal trench and vertical borehole	• Minimal maintenance • Unobtrusive technology (once implemented) • Flexible installation options to meet available site footprint • Decarbonisation of the grid promoting electrically driven heat pumps.	• Large area required for horizontal pipes and no available space on this project • Full ground survey required to determine geology • More beneficial if cooling req • Integration with piled foundations must be done at early stage	No – considering Air Source Heat Pump approach.
Air Source Heat Pump (ASHP)	As an alternative to GSHPs, ASHP systems draw energy from the air to provide heating and cooling to buildings. Installation methods include air-to-water and direct refrigerant (VRF)	• Limited plant space requirements • Efficient when supporting both heating and cooling (office element of development) • Decarbonisation of the grid promoting electrically driven heat pumps.	• External plant area required	Yes – considering grid de-carbonisation for low carbon heating and cooling. Technology utilized within 'Lean' stage.

Wind Turbine *(Roof Mounted)*	Wind generation equipment operates on the basis of wind turning a propeller, used to drive an alternator to generate electricity. Small scale (1kW – 15kW) turbines can be pole or roof mounted	• Low maintenance / on going costs • Local wind speed is sufficient *(www.bwea.com)* • Excess electrical generation can be exported to grid	• Planning issues • Aesthetic impact and background noise • Structural / vibration impact on building to be assessed • Potential for downstream turbulence due to proximity to other buildings	No
Gas Fired Combined Heat & Power (CHP)	A CHP installation is effectively a mini on-site power plant providing both electric power and thermal heat. CHP is strictly an energy efficient measure rather than a renewable energy technology	• Potential high CO2 saving available • Efficient use of fuel • Excess electrical generation can be exported to grid • Benefits from being part of an energy centre / district heating scheme	• Maintenance intensive • Sufficient base thermal and electrical demand required • Some additional plant space required	No – does not take benefit from grid de-carbonisation.
Bio-Renewable Energy Sources *(Automated feed wood-fuel boiler plant)*	Modern wood-fuel boilers are highly efficient, clean and almost carbon neutral (the tree growing process effectively absorbs the CO2 that is emitted during combustion). Automated systems require mechanical fuel handling and a large storage silo	• Stable long term running costs • Potentially good CO2 savings	• Large area needed for fuel delivery and storage, no available space on this project. • Reliable fuel supply chain required • Regular maintenance required • Significant plant space required	No
Fuel Cells	Fuel cells convert chemical energy directly into electricity by combining hydrogen and oxygen in a controlled reaction	• Virtually no pollution • High electrical efficiency	• Expensive • Early stages of commercialisation • High technology risk	No

The current and forecasted grid decarbonisation, outlined above, promotes electrically driven solutions in lieu of gas-fired considering the realistic and actual carbon emissions compared with those predicted within current Part L modelling software. It is therefore proposed for this stage of the hierarchy that the development utilise Air Source Heat Pumps to meet the heating and cooling demand of the development as discussed within section 5.0 of this statement.

The proposed strategy to incorporate Air Source Heat Pump technology has been discussed and agreed with the design team to ensure a coordinated solution is taken forward.

In addition to the use of Air Source Heat Pump technology, it is also deemed that the development can take benefit of a roof mounted Solar Photovoltaic (PV) array to further bolster the sustainable credentials of the development and maximise the potential for incorporation of renewable technologies.

Given that the development is at the early stages of design, plant space allocation at roof level will require further development at the next stages. However, an initial prediction dictates that an array in the order of 100m² could be incorporated without putting undue strain on the available space.

Carbon emissions for the 'Be Green' building are taken from the IES software model, converted in line with Part L 2022 emissions factors, and as detailed in the table below:

Proposed 'Be Green' Approach Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions
Proposed 'Baseline' Development	5109	56509	N/A	N/A
Proposed 'Lean' Development	5109	24933	55%	55%
Proposed 'Clean' Development	5109	24515	0%	55%
Proposed 'Green' Development	5109	24515	1%	56%

7.0 Key Objectives of Cherwell District Council

Cherwell District Council have set out the following key objectives for reducing carbon emissions and energy demand. Peveril Securities Ltd fully support the Council in this and are specifically targeting reducing emissions by adopting the Council's strategies.

At the proposed development, the space heating and cooling requirements will be minimised through good thermal envelope design (Be Lean) before being delivered via highly efficient Air Source Heat Pumps in the form of VRF systems as a low carbon heat supply. The hot water demand for the development is anticipated to be low and will be met by electric point of use systems. Core areas which will require heating only shall be provided with high efficiency direct electric panel heaters. This philosophy acknowledges the improvements in carbon emission factors of grid supplied electricity going forward and avoids a requirement for gas (or fossil fuels) being used in the building. Further, this also provides an ongoing pathway toward zero carbon in that the building carbon emissions will continue to naturally decrease as the carbon emissions of the national electricity grid continue to decrease toward zero in line with government predictions.

Additionally, various building fabric improvements are incorporated into the building design for the proposed development as listed in Section 5.0 of this report demonstrating the intention to reduce energy demand being the first priority for the scheme.

It should also be noted that the utilisation of air source heat pump technology offers superiority in terms of coefficient of performance when compared against, for instance, gas-fired only alternatives.

8.0 Water Efficiency

Cherwell District Council have set out key objectives for reducing water usage as detailed within Policy ESD 3 the Local Plan. Peveril Securities Ltd fully support the Council in this and are specifically targeting reducing water usage

by ensuring the design of the domestic water services installations and selection of associated sanitaryware will be undertaken with the primary aim of reducing the overall water consumption of the development, considering the following strategies:

- Wash Hand Basin outlets to be fitted with flow restrictors to limit the peak flow rate to 6 litres / minute or less
- Sink outlets to be fitted with flow restrictors to limit the peak flow rate to 7 litres / minute or less
- Showers to be fitted with flow restrictors to limit the peak flow rate to 8 litres / minute or less
- WC cisterns to be specified as 5 / 3 litre, or less, dual flush type
- Where white goods are specified – washing machines and dishwashers – water efficient appliances will be considered
- Metering of the external and internal points incoming water supply will enable major leak detection of the buried water services.
- Sanitary supply shut off devices to be considered on the water connections to WCs.

9.0 Conclusions

Following a well-structured energy hierarchy has enabled significant carbon reductions to be made to the development. The total carbon reduction is forecasted to be greater than 30% over building regulations, when compared against the notional benchmark building for the current Part L (2021 edition).

The total predicted carbon reduction estimated by prorating of similar office building, considering the proposal above for the energy efficiency measures, Air Source Heat Pumps and Solar PV is in the region of 56%, when calculated with current Part L 2022 emissions factors, when compared against the Benchmark 'Baseline' Building incorporating the gas-fired solution.

In the first stage of the energy hierarchy (Be Lean) a number of passive and high efficiency measures have been applied to reduce the energy consumption of the building through improving U-values, system efficiencies, etc. The inclusion of Air Source Heat Pump technology in the form of VRF systems also offered a good contribution leading to the bulk of carbon emission reduction coming at the first stage of the hierarchy.

In the second stage of the energy hierarchy (Be Clean) it is currently deemed not feasible for connection to the Local District Heat Network and therefore has not been considered within this Statement.

In the final stage of the energy hierarchy (Be Green) it was concluded that a Solar PV array in the order of 100m² can be incorporated into the scheme to maximize the inclusion of renewable technologies. It was noted that this addition provided an additional 1% reduction in CO_2 emissions above that of the 'Be Lean' building to total the 56% overall reduction.

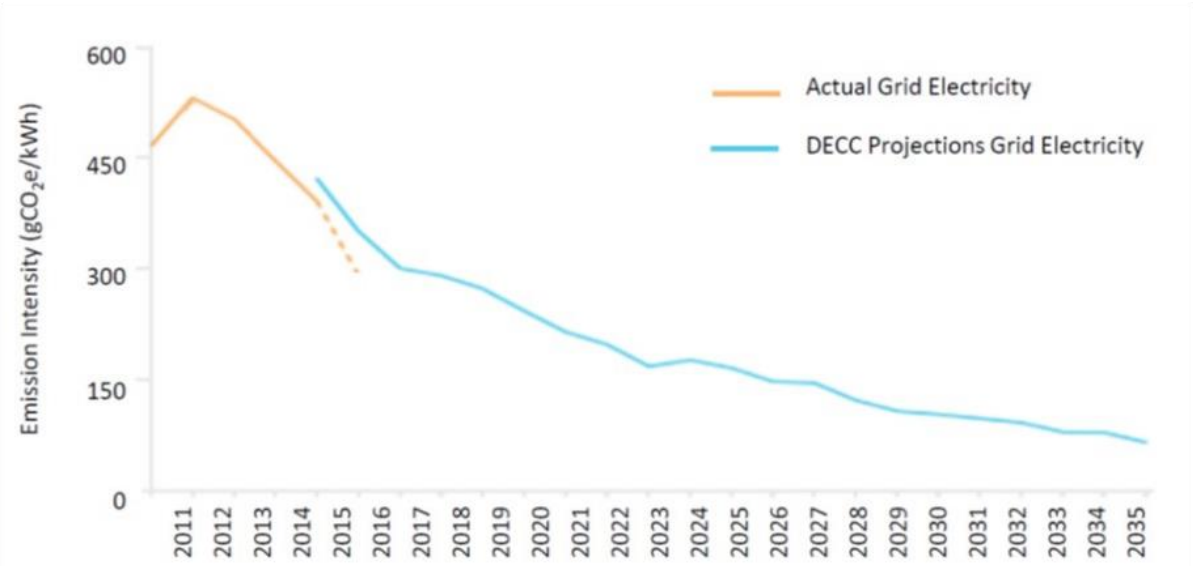
The total predicted carbon savings at each stage of the energy hierarchy are summarized as follows:

Building Carbon Emissions

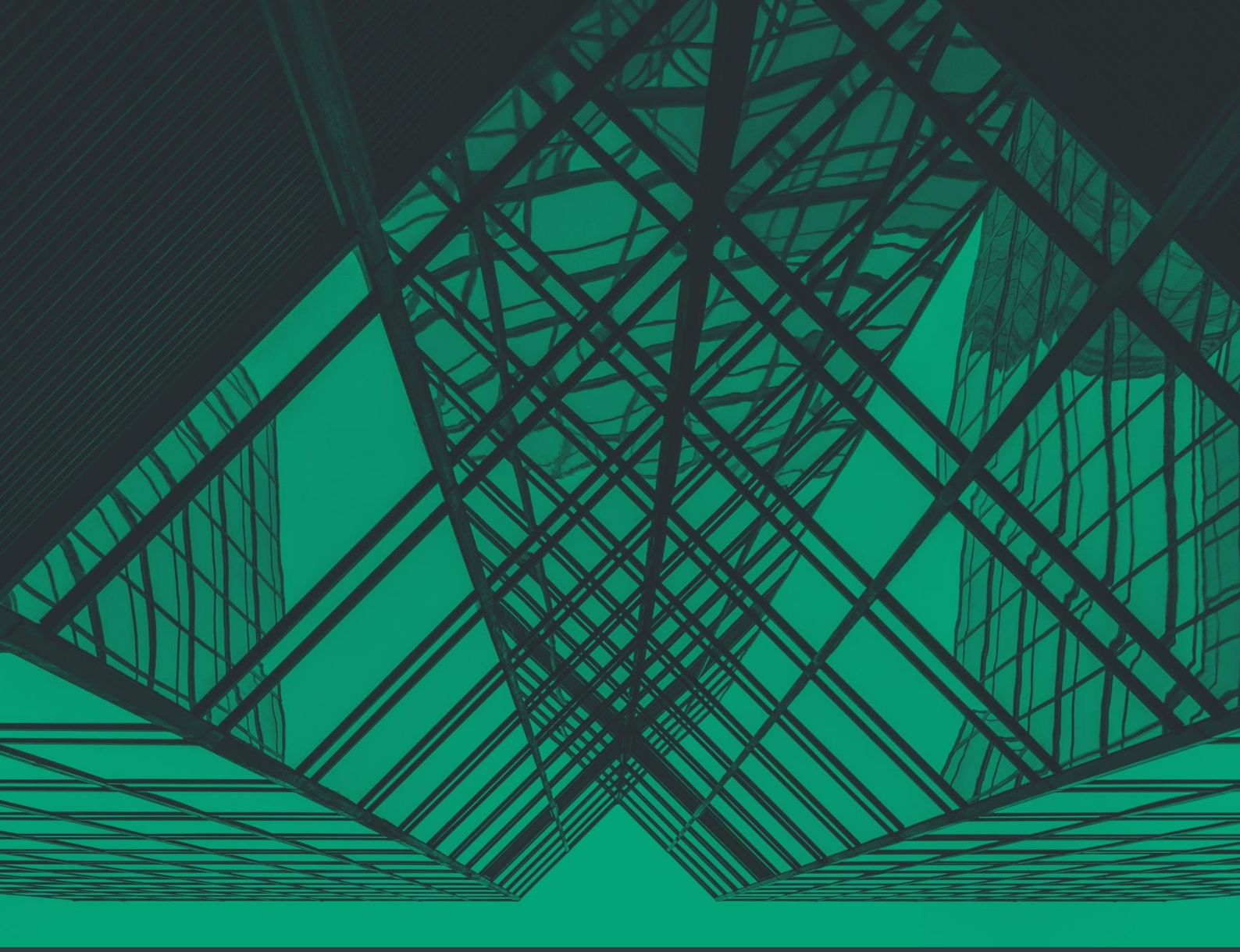
	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions
Proposed 'Baseline' Development	5109	56509	N/A	N/A
Proposed 'Lean' Development	5109	24933	55%	55%
Proposed 'Clean' Development	5109	24515	0%	55%
Proposed 'Green' Development	5109	24515	1%	56%

It has also been demonstrated that the strategy proposed for the development addresses the key aspects of Council's planning policies.

The proposed strategy for the office development, via the inclusion of electrically driven equipment, will enable the development to be zero carbon ready in line with the council's aspirations. By omitting the need for a natural gas connection to the site the strategy provides a pathway for the reduction in carbon emissions further through the residual reductions forecasted within the grid as per the figure below:



Period	Carbon Intensity (gCO_2e/kWhr)
Part L 2013	519
Actual Year 2017	275
Predicted Year 2023	175
Predicted Year 2030	110
Predicted Year 2035	65



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