Mepal Road, Sutton – Phase 2

Vistry Homes East Midlands

Energy and Sustainability Strategy

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This statement has been commissioned by Vistry Homes East Midlands to detail the proposed approach to energy and CO_2 reduction to be employed at Mepal Road Sutton – Phase 2. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved.

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1. Introduction

Preface

1.1. This Energy and Sustainability Statement has been prepared on behalf of Vistry Homes East Midlands in support of the reserved matters application for the development of Mepal Road, Sutton, Phase 2.

Development Description

1.2. The development is located on the northern edge of the village of Sutton, approximately 15 miles to the north of Cambridge, within the East Cambridgeshire District Council.

1.3. This statement has been prepared in support of an outline planning application, with proposals for up to 173 dwellings. See Figure 1 for proposed site layout.

Purpose and Scope of the Statement

1.4. This statement has been prepared to address relevant national and local policies relating to sustainable development, including the East Cambridgeshire Local Plan, adopted in April 2015 and the East Cambridgeshire District Council Climate Change – Supplementary Planning Document.

1.5. The statement demonstrates that the development will incorporate sustainable design considerations and ensure that a significant proportion of the energy demand of the development is met through renewable energy provision, meeting the requirements of Policy CC1.

1.6. The statement will also demonstrate how water saving measures have been incorporated into the design in order to deliver a calculated water use per person which far exceeds Building Regulations requirements.

Figure 1. Proposed site plan

2. Planning Policy

Local Planning Policy

2.1. The East Cambridgeshire Climate Change – Supplementary Planning Document (SPD) was adopted in February 2021, and contains the key guidance relating to sustainable development. An SPD is a document which adds further detail to the policies in a Local Plan and can be a material consideration in planning decisions. They do not form Policy but encourage development to go beyond Local Plan policy or national minimum requirements.

CC1: Reducing carbon dioxide emissions and maximising all aspects of sustainable design and construction

All proposals for new development should aim for reduced or zero carbon development in accordance with the zero carbon hierarchy: first maximising energy efficiency and then incorporating renewable or low carbon energy sources on-site as far as practicable.

And:

Applicants will be required to demonstrate how they have considered maximising all aspects of sustainable design and construction…

In order for an applicant to demonstrate how the above Local Plan policy requirement is to be met, a Sustainability Statement could usefully be prepared and submitted as part of the Design and Access Statement. The Sustainability Statement could outline the applicant's approach to:

a. Minimising demand for energy through design;
b. Maximising energy efficiency through design;
c. Carbon dioxide reduction achieved through items a and b above, and through incorporation of renewable and low carbon energy sources;
d. Water efficiency (including whether, for residential development, the design intends to voluntary incorporate the Part G Building Regulations option of estimated water consumption set at no more than 110 litres per person per day, rather than the standard 125 l/p/d);
e. Site waste management;
f. Use of materials (such as low carbon-embodied materials); and
g. Adaptability of the building, as the climate continues to change.

More generally, such a Statement could usefully explain where, if any, the development proposes, on any of the above themes, to go beyond what is the statutory minimum in Building Regulations…

For developments of 5 dwellings or more, the Statement could explain how the development will meet the policy requirement in ENV 4, which requires such development to "achieve Code for Sustainable Homes Level 4".

For the avoidance of doubt, and following the Ministerial Statement of March 2015, the requirement to meet the Code for Sustainable Homes Level 4 only applies to that aspect of Level 4 relating to energy performance standards for new housing or the adaptation of buildings to provide dwellings.

Other aspects of Level 4 are encouraged, but not required to be met. Level 4 should result in, across the build mix, energy efficiency improvements 20% above present (as at Jan 2021) Building Regulations.

2.2. Local policy relating to the sustainable design and construction of buildings is contained within the East Cambridgeshire Local Plan, adopted in April 2015. The following extracts from this document are relevant to the energy strategy:

The East Cambridgeshire Local Plan

Policy ENV 4: Energy and water efficiency and renewable energy in construction

All proposals for new development should aim for reduced or zero carbon development in accordance with the zero carbon hierarchy: first maximising energy efficiency and then incorporating renewable or low carbon energy sources on-site as far as practicable.

Applicants will be required to demonstrate how they have considered maximising all aspects of sustainable design and construction, as set out in the Code for Sustainable Homes (or its successor). Developments of 5 or more homes are required to achieve Code for Sustainable Homes Level 4 (or its replacement pending implementation of the zero carbon homes requirement). All non-domestic developments of 1000m^2 or more are required to meet BREEAM Very Good standard or equivalent.

The Council will negotiate with applicants over the most appropriate solutions for historic buildings and Conservation Areas.

Code for Sustainable Homes

2.3. The Code for Sustainable Homes, as referenced in Policy ENV4, was a scheme sponsored by the government, intended to promote and support the transition to more sustainable homes. It is the Government's view that the Code has achieved this aim, and has now been withdrawn following the conclusion of the Housing Standards Review on 25th March 2015.

2.4. The relevant extract from the statement to Parliament advises:

> *"From the date the Deregulation Bill 2015 is given Royal Assent, local planning authorities…should not set…any additional local technical standards relating to the construction, internal layout or performance of new dwellings. This includes any policy requiring any level of the Code for Sustainable Homes to be achieved by new development; the government has now withdrawn the Code…"*

2.5. This change is required to be reflected through amendments to all Local Plans, Neighbourhood Plans and supplementary planning documents. It is therefore anticipated that the Local Plan will be updated accordingly in due course to remove the requirements mandating certification of new development to Code standards.

National Planning Policy Framework

2.6. On the 20th July 2021, the Government published the revised National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development

2.7. Chapter 14 of the NPPF outlines its energy and climate change policies. New development should be planned in ways that:

- avoid increased vulnerability to the range of impacts arising from climate change…
- can help to reduce greenhouse emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

2.8. In determining planning applications, local planning authorities should expect new developments to:

- comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

2.9. This chapter also outlines the requirement of Local Plans to take account of climate change over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. The key focus of the NPPF is to support local and regional planning authorities.

Current and Future National Policy Standards

2.10. Government policy in relation to the energy performance of buildings has been evolving over the past decade, following government commitments to reduce the emission of greenhouse gases – particularly CO_2. This obligation was enshrined in the Climate Change Act 2008, which commits the UK to achieving a mandatory 80% reduction in the UK's CO_2 emissions by 2050, compared with 1990 levels.

2.11. In 2016, the UK government ratified the Paris Agreement, which provides a framework for governments to pursue the target of limiting global warming below 2°C.

2.12. In June 2019, the Government announced it had set a new net zero greenhouse gas emission target for the UK by 2050, compared with the previous target of at least 80% reduction from 1990 levels.

2.13. The built environment has a key role to play in delivering on these international commitments, as it accounts for approximately a third of overall CO_2 emissions. These commitments have been translated into national policies within the built environment driven by, amongst other mechanisms, the EU Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive.

2.14. Following the introduction of the 2013 edition of Building Regulations Part L, the successive updates now require regulated CO_2 emissions levels from new build domestic buildings to be approximately 30% lower than 2006 levels.

2.15. The Government proposes that the Building Regulations are the appropriate mechanism to drive future standards with respect to energy consumption, with local authorities able to apply the optional requirements of the national technical standards with respect to water consumption and space.

2.16. As an acknowledgement of the challenge to the built environment in meeting future 'net zero' targets, the Government published the next revision to the Building Regulations Approved Document L1A (Part L) in December 2021.

2.17. The uplift to Part L 2021 will incorporate:

Higher Standards for Carbon Dioxide Emissions

2.18. The CO_2 emissions requirement is set at a 31% improvement on Part L 2013, expected to be met through a combination of efficient heating systems, improved fabric standards and on-site renewable energy generation.

Higher Standards for Fabric Energy Efficiency

2.19. The Building Regulations control thermal insulation requirements through setting an upper limit on space heating demand. These requirements will be further improved in Part L 2021, meaning that insulation standards will need to be improved.

Introduction of Primary Energy Demand Compliance Metric

2.20. The regulations will introduce a primary energy demand compliance metric. This is in order to align the regulations with the amended EU Energy Performance of Building Directive (2018), which states:

"The energy performance of a building shall be expressed by a numeric indicator of primary energy use in kWh/(m².y) for the purpose of both energy performance certification and compliance with minimum energy performance requirements."

2.21. Primary energy is an expression of the energy content available in a fuel / fuel source which has not undergone any conversion or transformation process. Individual factors are assigned to all fuel types to take account of upstream processes and energy use – e.g. mains electricity has a higher factor due to the additional transformation and distribution processes that the energy undergoes before it reaches the home, compared with gas where the fuel is burned directly within the dwelling.

2.22. Dwellings will therefore be assessed based on their primary energy consumption in a similar way to current carbon compliance.

Revised Transitional Arrangements

2.23. Revised transitional arrangements will apply once the new regulatory standards are introduced. Dwellings will now need to be covered by the building notice, initial notice, or full plans before July 2022 and individual plots commenced prior to July 2023 in order to continue under Part L 2013. Registration or commencement falling after these dates means that dwellings will be required to meet Part L 2021 standards.

Proposed Strategy

2.24. It is proposed that the development is designed to incorporate guidance contained within Policies CC1 and ENV4 relating to renewable energy provision and the construction of highly efficient buildings which seek to minimise energy demand and CO_2 emissions. As acknowledged in Policy CC1, following the Ministerial Statement of March 2015, the requirement to meet the Code for Sustainable Homes Level 4 only relates to energy performance standards. Therefore, all plots will be expected to meet a 19% CO2 reduction from Part L 2013.

2.25. Due to development timescales it is assumed that 50 plots will be constructed under Part L 2013 and the remaining 123 plots under Part L 2021, which therefore supersedes the carbon reduction requirement equivalent to 19% over Part L 2013 by delivering a 31% reduction. In order to meet the regulatory requirements, the fabric of the buildings will also be further improved over current typical standards.

2.26. The current edition of Part L of the Building Regulations requires regulated CO_2 emission levels from new build domestic buildings to be approximately 30% lower than 2006 levels. In addition, renewable energy technologies will be installed to meet the required 19% reduction in energy demand across the development. This statement is also intended to establish the proposed approach to water demand reduction to be delivered at the development.

2.27. The following sections of this document set out the specific measures to be incorporated and an assessment of appropriate technologies and methods in meeting the requirements of the relevant policies.

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3. Energy Consumption and CO_2 Emissions

3.1. As one of the key areas of ongoing impact of any development, the energy demand of the dwellings to be constructed is a key consideration in the overall sustainability strategy.

3.2. As set out within the policy review section of this statement, it is considered that Building Regulations form the minimum requirement for new dwellings in terms of energy performance.

Building Regulations

3.3. The proposed site will be constructed in accordance with the 2013 edition of Approved Document L1A (hereafter 'Part L'), therefore this forms the baseline compliance level in terms of energy demand and CO_2 emissions

3.4. Part L sets out 5 Criteria which must be met in order to demonstrate that the dwellings are designed and constructed in accordance with the approved standards:

- Criterion 1 – Achieving the TER
- Criterion 2 – Limits on Design Flexibility
- Criterion 3 – Limiting the Effects of Solar Gain in Summer
- Criterion 4 – Building Performance Consistent with DER
- Criterion 5 – Provisions for Energy-Efficient Operation of the Dwelling

Criterion 1 - Achieving the TER

3.5. Criterion 1 relates to achieving a maximum calculated level of CO_2 emissions, referred to as the 'Target Emission Rate' (TER). The TER is calculated in accordance with the Standard Assessment Procedure (SAP), which establishes a maximum rate - expressed in kilograms of carbon dioxide per metre squared of total useful floor area, per annum ($kgCO_2/m^2/yr$) – as the benchmark for compliance.

3.6. As shown in Table 1, the CO_2 standards contained within Part L were increased in 2010 and 2013, reducing the TER by approximately 25% and a further 6% respectively, requiring substantial improvements to thermal insulation and heating services, or a significant increase in on-site renewable energy provision.

3.7. The next revision to Part L is set to be published in December 2021, coming into effect for any homes constructed from July 2023 onwards. These updated requirements will require CO_2 emissions to be reduced by circa 31% compared with Part L 2013, thereby exceeding the requirements of Policy ENV 4.

Table 1. CO_2 emissions improvements from successive Part L editions

Building Regulations	CO_2 emissions improvements over L1A 2006
L1A 2006	-
L1A 2010	25%
L1A 2013	Circa 30%
L1A 2021	Circa 50%

Baseline CO_2 Emissions

3.8. The development is to be designed and constructed to meet the requirements of, at minimum, Part L1A of the Building Regulations 2013, therefore compliance with this standard forms the first stage in the sustainable construction approach.

3.9. Part L compliance is assessed through the Standard Assessment Procedure (SAP), which uses the 'Target Emission Rate' (TER) – expressed in kilograms CO_2 per metre squared of total useful floor area, per annum – as the benchmark. The calculated performance of the dwelling as designed - the Dwelling Emission Rate (DER) – is required to be lower than this benchmark level.

3.10. Calculations have been undertaken to all house types proposed to build a site model and establish the strategy required to meet Policy CC1 and ENV4

3.11. The Part L compliant calculated baseline CO_2 emissions for the proposed dwelling types are reported in Table 2.

Table 2. Part L 2013 compliant CO_2 emissions of dwelling types proposed

House Type	CO_2 emissions ($kgCO_2/yr$)
Asher Semi	1,629
Asher Mid	1.521
Aslin	1,765
Cooper Semi	1,364
Eveleigh Semi	1,488
Mylne Detached	1,902
Pembroke Detached	2,151
Knightley Detached	2,188
Goodridge Detached	1,993
Mountford Detached	1,772

3.12. Based on these calculations as shown in Table 2, the estimated phase-wide Part L 2013 compliance CO_2 emissions are shown in Table 3:

Table 3. Phase-wide Part L 2013 compliant CO_2 emissions

	Part L Compliant CO_2 emissions ($kgCO_2/yr$)
Phase-wide emissions	293,201

4. Energy Reduction Strategy – Fabric First

4.1. The proposed construction specification and sustainable design principles to be applied to the development will ensure that each dwelling meets the CO_2 reductions mandated by Part L1A of the Building Regulations through fabric measures alone.

4.2. It is proposed that the energy demand reduction strategy for the development incorporates further improvements beyond a Part L compliant specification and initially concentrates finance and efforts on reducing energy demand as the first stage of the Energy Hierarchy (Figure 2).

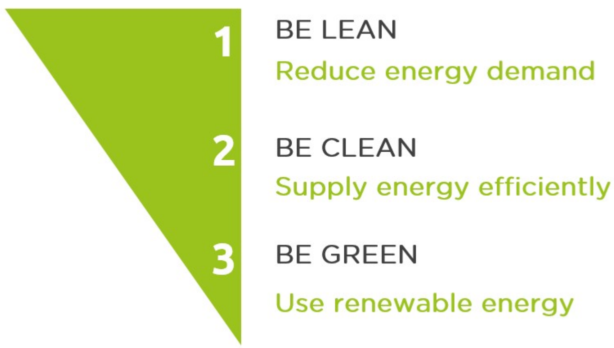

Figure 2. The Energy Hierarchy

Be Lean – reduce energy demand

4.3. The design of a development - from the masterplan to individual building design - will assist in reducing energy demand in a variety of ways, with a focus on minimising heating, cooling and lighting loads. Key considerations include:

- Building orientation – maximise passive solar gain and daylight
- Building placement – control overshading and wind sheltering
- Landscaping – control daylight, glare and mitigate heat island effects
- Building design – minimise energy demand through fabric specification

Be Clean – supply energy efficiently

4.4. The design and specification of building services to utilise energy efficiently is the next stage of the hierarchy, taking into account:

- High efficiency heating and cooling systems
- Ventilation systems (with heat recovery where applicable)
- Low energy lighting
- High efficiency appliances and ancillary equipment

Be Green – use low carbon / renewable energy

4.5. Low carbon and renewable energy systems form the final stage of the energy hierarchy and can be used to directly supply energy to buildings, or offset energy CO_2 emissions arising from unavoidable demand. This may be in the form of:

- Low carbon fuel sources – e.g. biomass
- Heat pump technologies
- Building scale renewable energy systems
- Small-scale heat networks
- Development-scale heat networks

4.6. As this hierarchy demonstrates, designing out energy use is weighted more highly than the generation of low-carbon or renewable energy to offset unnecessary demand. Applied to the development, this approach is referred to as 'fabric first' and concentrates finance and efforts on improving U-values, reducing thermal bridging, improving airtightness, and installing energy efficient ventilation and heating services.

4.7. This approach has been widely supported by industry and government for some time, particularly in the residential sector, with the Zero Carbon Hub[1] and the Energy Savings Trust[2] having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.

4.8. The benefits to prospective homeowners of following the Fabric First approach are summarised in Table 4.

[1] Zero Carbon Hub, Zero Carbon Strategies for tomorrow's new homes, Feb 2013

[2] Energy Savings Trust, Fabric first: Focus on fabric and services improvements to increase energy performance in new homes, 2010

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Table 4. Benefits of the Fabric First approach

	Fabric energy efficiency measures	Bolt-on renewable energy technologies
Energy/CO_2/fuel bill savings applied to all dwellings	✓	×
Savings built-in for life of dwelling	✓	×
Highly cost-effective	✓	×
Increases thermal comfort	✓	×
Potential to promote energy conservation	✓	✓
Minimal ongoing maintenance / replacement costs	✓	×
Significant disruption to retrofit post occupation	✓	×

Building Regulations Standards – Fabric Energy Efficiency

4.9. In addition to the CO_2 reduction targets, the importance of energy demand reduction was further supported by the introduction of a minimum fabric standard into Part L1A 2013, based on energy use for heating and cooling a dwelling. This is referred to as the 'Target Fabric Energy Efficiency' (TFEE), and expressed in kWh/m^2/year.

4.10. This standard enables the decoupling of energy use from CO_2 emissions and serves as an acknowledgement of the importance of reducing demand, rather than simply offsetting CO_2 emissions through low carbon or renewable energy technologies.

4.11. The TFEE is calculated based on the specific dwelling being assessed with reference values for the fabric elements contained within Approved Document L1A. These reference values are described as 'statutory guidance' as opposed to mandatory requirements, allowing full flexibility in design approach and balances between different aspects of dwelling energy performance to be struck so that the ultimate goal of achieving the TFEE is met. The proposed approach and indicative construction specifications are set out in the following sections of this Strategy.

4.12. The assessed target fabric energy efficiency (TFEE) for compliance and the designed fabric energy efficiency (DFEE) after demand reduction measures are shown for the proposed dwelling types in Table 5.

Table 5. Fabric Energy Efficiency of dwellings

House Type	Target FEE (kWh/m^2/yr)	Design FEE (kWh/m^2/yr)	% Reduction
Asher Semi	49.97	34.04	31.89
Asher Mid	44.05	29.58	32.85
Aslin	50.90	37.53	26.28
Cooper Semi	49.97	36.19	18.48
Eveleigh Semi	52.19	35.25	32.45
Mylne Detached	56.48	40.47	28.34
Pembroke Detached	56.66	40.60	28.34
Knightley Detached	55.42	40.07	27.70
Goodridge Detached	63.06	43.37	31.22
Mountford Detached	61.49	39.97	35.00

Criterion 2 – Limits on Design Flexibility

4.13. In order to ensure that the energy demand of the development is reduced, the dwellings should be designed to minimise heat loss through the fabric wherever possible. Table 6 details the proposed fabric specification of the major building elements, with the first column in this table setting out the Part L1A limiting fabric parameters in order to demonstrate the improvements made.

Table 6. Proposed construction specification – main elements

	Part L1a Limiting Fabric Parameters	Part L1a 2013 Specification	Indicative Part L 2021 Specification
External wall – u-value	0.30 W/m²K	0.25 W/m²K	0.21 W/m²K
Party wall – u-value	0.20 W/m²K	0.00 W/m2K	0.00 W/m²K
Plane roof – u-value	0.20 W/m²K	0.11 – 0.17 W/m²K	0.11 W/m²K
Ground floor – u-value	0.25 W/m²K	0.15 – 0.19 W/m²K	0.15 W/m²K
Windows – u-value	2.00 W/m²K	1.40 W/m²K	1.30 W/m²K
Doors – u-value	2.00 W/m²K	0.9 W/m²K	0.9 W/m²K
Air Permeability	10 m³/h.m² at 50 Pa	5.01 W/m²K	4.50 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = ≤ 0.036 (calculated)	Y = ≤ 0.033 (calculated)

Criterion 3 – Limiting the Effects of Solar Gains in Summer

Passive design measures and overheating risk mitigation

4.14. Glazing should be specified with a solar transmittance value (g-value) to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer.

4.15. Where feasible, dwellings should be fitted with high-efficiency combination boilers, removing the need for hot water cylinders which would lose useful heat to the dwelling at the rate of around 1.5kWh/day, or circa 550kWh over the course of a year.

4.16. Due to these measures to reduce internal heat gain, natural ventilation provided through window openings and the opportunity for cross ventilation will allow sufficient air exchange rates to purge any heat build-up. Active cooling systems are therefore not proposed.

4.17. By following these principles, the development will be designed to build in resilience to a potentially changing climate over the lifetime of the buildings and minimise overheating risk, which can be exacerbated by the drive to build better insulated, more airtight homes if not considered within the design and construction process.

Criterion 4 – Building Performance Consistent with DER

Thermal bridging

4.18. The significance of thermal bridging as a potentially major source of fabric heat losses is increasingly understood. Improving the U-values for the main building fabric without accurately addressing the thermal bridging will not achieve the desired energy and CO_2 reduction targets.

4.19. The specification should seek to minimise unnecessary bridging of the insulation layers, with avoidable heat loss therefore being reduced wherever possible. Accurate calculation of these heat losses forms an integral part of the SAP calculations undertaken to establish energy demand of the dwellings, and as such thermal modelling will be undertaken to assess the performance of all main building junctions. It is calculated that the average total Y value is around 0.033, against the SAP default figure of 0.150.

Air leakage

4.20. After conductive heat losses through building elements are reduced, convective losses through draughts are the next major source of energy wastage. The proposal adopts an airtightness standard of 4.50-5.01 m³/h.m² at 50Pa, with pressure testing of all dwellings to be undertaken on completion to confirm that the design figure has been met.

Criterion 5 – Provisions for Energy-Efficient Operation of the Dwelling

4.21. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services.

4.22. Currently it is assumed that all dwellings will be provided with modern gas-fired heating systems, fully insulated primary pipework, and controls including programmers, thermostats and thermostatic radiator valves to avoid unnecessary heating of spaces when not required.

5. CO_2 emissions after Fabric Measures

5.1. Table 7 demonstrates the total CO_2 reductions achieved through the proposed fabric measures across the house types.

Table 7. CO_2 emissions of dwellings – after Fabric Efficiency measures

House Type	Part L 2013 compliant ($kgCO_2/yr$)	As designed Part L 2021 ($kgCO_2/yr$)	% Reduction
Asher Semi	1,629	858	47.32
Asher Mid	1,522	820	46.08
Aslin	1,766	1033	41.46
Cooper Semi	1,364	816	40.15
Eveleigh Semi	1,487	829	44.26
Mylne Detached	1,902	1,077	43.39
Pembroke Detached	2,151	1,188	44.77
Knightley Detached	2,188	1,219	44.30
Goodridge Detached	1,992	1,116	43.97
Mountford Detached	1,772	971	45.21

5.2. Table 8 demonstrates the total phase-wide CO_2 reductions achieved through the proposed fabric measures.

Table 8. Phase-wide performance – after Fabric Efficiency measures

	CO_2 Emissions ($kgCO_2/yr$)	
Part L compliant	293,201	
After fabric measures	206,830	
	$kgCO_2/yr$	%
Total savings	86,371	29.45

5.3. In line with Policy CC1, a 19% CO_2 emission reduction will be achieved through the use of renewable technology. The appropriate technologies and fabric first approach should be capable of offsetting 55,708 $kgCO_2$/year in order to demonstrate compliance. An analysis of potentially appropriate technologies is undertaken in the following section of this strategy.

6. Low Carbon and Renewable Energy Systems

6.1. A range of technologies have been assessed for potential incorporation into the scheme in accordance with Regulation 25A of the Building Regulations and with the intent of meeting an overall 19% reduction in phase-wide CO_2 emissions, in accordance with Policy CC1 and ENV4.

Combined Heat and Power (CHP) and District Energy Networks

6.2. A CHP unit is capable of generating heat and electricity from a single fuel source. The electricity generated by the CHP unit is used to displace electricity that would otherwise be supplied from the national grid, with the heat generated as effectively a by-product utilised for space and water heating.

6.3. The economic and technical viability of a CHP system is largely reliant on a consistent demand for heat throughout the day to ensure that it operates for over 5000 hours per year. Heat demand from mainly residential schemes is not conducive to efficient system operation, with a defined heating season and intermittent daily profile, with peaks in the morning and the evening. For this reason, the use of a CHP system is considered unfeasible for this development.

6.4. There are currently no heat networks which extend near the proposed development. High network heat losses associated with distribution to individual houses, as opposed to large high-rise apartment blocks and commercial developments mean that a new heat network to serve the area is not considered viable or an environmentally preferred option. Due to these reasons, the provision for future connection to a district heating system is also not proposed.

Wind Power

6.5. Locating wind turbines adjacent to areas with buildings presents a number of potential obstacles to deployment. These include the area of land onsite required for effective operation, installation and maintenance access, environmental impact from noise and vibration, visual impact on landscape amenity and potential turbulence caused by adjacent obstacles, including the significant amount of woodland on and around the development.

6.6. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 5.3m/s[3]. Wind turbines at this site are therefore unlikely to generate sufficient quantities of electrical energy to be cost effective[4]. For these reasons wind power is not considered feasible.

Building Scale Systems

6.7. The remaining renewable or low carbon energy systems considered potentially feasible are at a building scale. These are as follows;

- Individual Biomass Heating
- Solar Thermal
- Solar Photovoltaic (PV)
- Air Source Heat Pumps (ASHPs)
- Ground Source Heat Pump (GSHPs)

6.8. The advantages and disadvantages of these technologies are evaluated in Tables 9-13.

[3] NOABL Wind Map (http://www.rensmart.com/Weather/BERR)

[4] CIBSE TM38:2006. Renewable energy sources for buildings.

Table 9. Individual Biomass Heating feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Potential to significantly reduce CO_2 emissions as the majority of space and water heating will be supplied by a renewable fuel • Decreased dependence on fossil fuel supply	• A local fuel supply is required to avoid increased transport emissions • Fuel delivery, management and security of supply are critical • Space is required to store fuel, a thermal store and plant • A maintenance regime would be required even though modern systems are relatively low maintenance • Building users or a management company must be able to ensure fuel is supplied to the boiler as required. Local environmental impacts potentially include increased NO_x and particulate emissions
Estimated costs and benefits	
• Cost £2,000 upwards for a wood-pellet boiler, not including cost of fuel • Not eligible for RHI payments as new-build properties	
Conclusions	
Biomass heating is considered technically feasible in large dwellings provided sufficient space can be accommodated for fuel supply, delivery and management.	

Table 10. Solar Thermal systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Mature and reliable technology offsetting the fuel required for heating water (typically gas) • Solar thermal systems require relatively low maintenance • Typically, ~50% of hot water demand in dwellings can be met annually	• Installation is restricted to favourable orientations on an individual building basis • The benefit of installation is limited to the water heating demand of the building • Safe access must be considered for maintenance and service checks • Buildings need to be able to accommodate a large solar hot water cylinder • Distribution losses can be high if long runs of hot water pipes are required • Visual impact may be a concern in special landscape designations (e.g. AONB)
Estimated costs and benefits	
• Cost £2,000 - 5,000 for standard installation • Not eligible for RHI payments as new-build properties • Ongoing offset of heating fuel, minimal maintenance requirements	
Conclusions	
Solar thermal systems are considered technically feasible on all buildings with suitable roof orientations.	

Table 11. Solar Photovoltaic systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• The technology offsets the high carbon content of grid supplied electricity used for lighting, pumps and fans, appliances and equipment • Mature and well proven technology that is relatively easily integrated into building fabric • Adaptable to future system expansion • Solar resource is not limited by energy loads of the dwelling as any excess generation can be transferred to the national grid • PV systems generally require very little maintenance • Occupiers could benefit from Feed in Tariff payments • Service and maintenance requirement minimal, and 2-3 storey buildings should not require significant additional safety measures (mansafe systems etc) for roof access	• Poor design and installation can lead to lower than expected yields (e.g. from shaded locations) • Installation is restricted to favourable orientations • Feed in Tariff support mechanism has been discontinued • Safe access must be considered for maintenance and service checks • Visual impact may be a concern in special landscape designations (e.g. AONB) or conservation areas • Reflected light may be a concern in some locations
Estimated costs and benefits	
• Cost £1,500 upwards (1kWp+) and scalable • Ongoing offset of electricity fuel costs, minimal maintenance requirements	
Conclusions	
PV panels are considered technically feasible for all buildings with suitable roof orientations. The relatively low cost, high carbon saving potential and limited additional impacts mean that PV is considered a feasible option for this development.	

Table 12. Air Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 250% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings • Will benefit from ongoing decarbonisation of the electricity grid	• Air source heat pumps are powered by electricity, leading to potentially higher fuel bills than gas heating systems • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved. Users must be educated in how heat pump systems should be operated for optimal efficiency • Air source heat pump plant should be integrated into the building design to mitigate concerns regarding the visual impact of bolt-on technology • Noise in operation may be an issue particularly when operating at high output
Estimated costs and benefits	
• Cost £5,000 - £7,000 for standard installation • Not eligible for RHI payments as new-build properties	
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme. However, the potential increase in running costs associated with their use in comparison to the proposed gas heating systems means that they are not considered a preferred low carbon technology at this stage.	

Table 13. Ground Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 320% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings • Will benefit from ongoing decarbonisation of the electricity grid	• Low temperature heating circuits (underfloor heating) would be required to maximise the efficiency of heat pumps • A hot water cylinder would also be required for both space and water heating • Ground source heat pumps are powered by electricity, leading to potentially higher fuel bills than gas heating systems • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved • Ground source heat pumps either require significant land to incorporate a horizontal looped system or significant expense to drill a bore hole for a vertical looped system
Estimated costs and benefits	
• Cost circa £10,000+ • Shared ground loop approach eligible for non-domestic RHI. Estimated simple payback at circa 18 years (systems only) • Running cost linked to COP of heat pump, circa 3.0 equates to 66% reduction vs electricity or around 5-6p/kWh (higher than mains gas) • Additional costs to upgrade electricity infrastructure currently unknown	
Conclusions	
Ground source heat pumps are considered technically feasible for buildings in this scheme. However, the cost and difficulty associated with vertical boreholes at this site means that they are not considered a preferred low carbon technology at this stage.	

Summary

6.9. Following this feasibility assessment, it is considered that as biomass heating systems would require significant storage space for fuel as well as regular deliveries at different times to all dwellings, they are not appropriate for this development.

6.10. Roof-mounted systems are therefore likely to be most suited to the development:

- Solar thermal systems to dwellings that have space to incorporate a hot water cylinder and a suitable roof orientation.
- Solar photovoltaic modules to dwellings that have suitable roof orientations.

6.11. It is considered that solar PV systems are most appropriate in meeting a significant proportion of energy demand without introducing additional energy loss through larger hot water cylinders.

7. Site-Wide CO_2 reduction

7.1. Through a combination of the described fabric first approach to sustainable construction and the installation of solar PV panels, the development will deliver energy demand and CO_2 emissions reductions in line with the requirements of Policy CC1.

7.2. It is assumed that first 50 plots will be constructed to meet the standards of Part L 2013, and with the additional fabric measures shown will deliver a circa 1.69% reduction in CO_2 emissions.

7.3. It is assumed that the remainder of the development – a further 123 units - will be constructed to meet Part L 2021 as a minimum, or future regulatory standards dependent on build timescales.

7.4. A site-wide model has been undertaken with the above split to demonstrate the minimum site-wide CO_2 and energy reductions that will be delivered. The results are shown in Table 13.

Table 14. Total site-wide CO_2 emission reductions

	CO_2 emissions (kgCO_2/year)	
Part L compliant (2013 and 2021) emissions	293,201	
Part L 2013 units (as designed) emissions	76,961	
Part L 2021 units (estimated) emissions	129,869	
Total as designed emissions (2013 and 2021)	206,830	
	kgCO_2/year	**%**
Total emission savings	86,371	**29.45**

7.5. The calculations demonstrate that the development as a whole will deliver estimated carbon emission savings of 86,371 kgCO_2/year, equivalent to 29.45% improvement from Part L 2013 compliant development, significantly exceeding the requirements of Policies CC1 and ENV4.

7.6. For each reserved matters application, a recalculation of baseline and actual CO_2 emissions may be required to ensure that the requirements of Policies CC1 and ENV4 are still being met.

8. Water Conservation

8.1. Policy CC1 of the The East Cambridgeshire Climate Change – Supplementary Planning Document (SPD) requires measures to limit water use to no more than 110 litres/person/day and external water use of no more than 5 litres/person/day.

8.2. In line with Policy CC1 and Building Regulations 2013, water use will be managed effectively throughout the development through the incorporation of appropriate efficiency measures.

8.3. Water efficiency measures including the use of efficient dual flush WCs, low flow showers and taps and appropriately sized baths will be encouraged with the aim to limit the use of water during the operation of the development to limit water use.

8.4. Table 7 shows how the development could achieve a result less than the required 110 litres/occupier/day calculated in accordance with Building Regulations 17.K methodology.

8.5. The calculation results in a total water consumption of 105.9 Litres/Person/Day for the intended specification, including external use, well below the maximum of 110 Litres/Person/Day required by Policy CC1.

Table 15. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/Person/Day
WC (dual flush)	Full flush (l)	6	8.76
	Part flush (l)	4	11.84
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
Bath	Capacity to overflow (l)	181	19.91
Shower	Flow rate (l/min)	6	26.22
Kitchen sink taps	Flow rate (l/min)	6	13.00
Calculated Use			110.9
Normalisation Factor			0.91
Total Internal Consumption (L)			100.9
External Use			5.0
Building Regulations 17.K			105.9

9. Conclusions

9.1. This Statement has been prepared on behalf of Vistry Homes East Midlands in support of the application for development of Mepal Road, Sutton – Phase 1.

9.2. The reserved matters application for development comprises the construction of 173 dwellings, to be constructed under both Part L 2013 and Part L 2021.

9.3. Policy ENV4 of the East Cambridgeshire Local Plan previously required certification of new dwellings against the Code for Sustainable Homes. This standard has been discontinued; however, this Statement aims to demonstrate that a number of key considerations which would previously have been assessed through Code certification will be addressed through the application of Building Regulations standards together with an appropriate level of developer responsibility. These areas include energy demand reduction, water consumption, materials use and waste management.

9.4. The statement sets out a fabric first approach to sustainable construction, demonstrating that improvements in insulation specification, a reduction in thermal bridging, unwanted air leakage paths and further passive design measures will ensure that energy demand and consequent CO_2 emissions are minimised. Calculations demonstrate that the design specification will deliver CO_2 emission savings of approximately 29.45% over the Part L 2013 standards.

9.5. A range of potentially appropriate technologies have been assessed for feasibility in achieving the 19% reduction in CO_2 emissions in line with CC1, concluding that solar PV constitutes both the preferred and viable technology for this site.

9.6. The overall savings from the combination of fabric efficiency measures and renewable energy lead to phase-wide emissions reductions of 29.45% over 2013 Building Regulations standards in accordance with the requirements of Policy CC1.

9.7. In line with Policy CC1, this statement also demonstrates how the water conservation target can be achieved. Water will be managed effectively throughout the development through the incorporation of appropriate efficiency measures to achieve a maximum internal water consumption of 105 litres/person/day.