

Land Surrounding Burloes Cottages, Royston

Vistry Homes Ltd, Northern Home Counties

Energy and Sustainability Statement

AES Sustainability Consultants Ltd

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This statement has been commissioned by Vistry Homes, Northern Home Counties to detail the proposed approach to energy and CO₂ reduction to be employed in the development at Land Surrounding Burloes Cottages, Royston. 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 Limited, Northern Home Counties in support of the application for development of the site at Land Surrounding Burloes Cottages, Royston.

Development Description

- 1.2. The development site is located in the east boundary of Royston and sits just off the A505 to the south of Newmarket Road. The development lies within the administrative boundary of North Hertfordshire District Council.
- 1.3. The proposal for Phase 1 will deliver 102 new dwellings across a mix of two to four bed detached, semi-detached and terraced houses and bungalows, as well as one and two bed apartments. The proposed site layout is shown in Figure 1.
- 1.4. The proposal is part of a wider development that will provide up to 325 dwellings.

Purpose and Scope of the Statement

- 1.5. The statement has been prepared to address local and national policy relating to sustainable design and construction of dwellings, including relevant policies contained within the North Hertfordshire Core Strategy 2011-2031. Specifically, Policy SD1: Sustainable design and energy efficiency; and Policy SD2: Renewable and low carbon energy generation.
- 1.6. The statement will demonstrate that by following a 'fabric first' approach and incorporating renewable energy systems, the proposed development will be designed to meet and exceed the fabric energy efficiency requirements of Part L.
- 1.7. A range of additional sustainable design considerations are addressed, including overheating risk, water consumption, sustainable procurement and waste minimisation and management.



Figure 1. Proposed Site Layout – Land Surrounding Burloes Cottages, Royston.

2. Planning Policy

Local Planning Policy

2.1. The development site lies within the boundary of the North Herefordshire District Council. Local policy relating to construction standards is principally contained within the North Herefordshire Core Strategy 2011-2031 which was adopted in November 2022.

Policy SD1 – Sustainable design and energy efficiency

Development proposals should create safe, sustainable, well integrated environments for all members of the community. In conjunction with this, all development proposals should incorporate the following requirements:

- ensure that proposals make efficient use of land - taking into account the local context and site characteristics;
- new buildings should be designed to maintain local distinctiveness through incorporating local architectural detailing and materials and respecting scale, height, proportions and massing of surrounding development. While making a positive contribution to the architectural diversity and character of the area including, where appropriate, through innovative design;
- safeguard residential amenity for existing and proposed residents;
- ensure new development does not contribute to, or suffer from, adverse impacts arising from noise, light or air contamination, land instability or cause ground water pollution;
- where contaminated land is present, undertake appropriate remediation where it can be demonstrated that this will be effective;
- ensure that distinctive features of existing buildings and their setting are safeguarded and where appropriate, restored;
- utilise physical sustainability measures that include, in particular, orientation of buildings, the provision of water conservation measures, storage for bicycles and waste including provision for recycling, and enabling renewable energy and energy conservation infrastructure;

- where possible, on-site renewable energy generation should also be incorporated;
- create safe and accessible environments, and that minimise opportunities for crime and anti-social behaviour by incorporating Secured by Design Herefordshire Local Plan – Core Strategy 2011-2031 principles, and consider the incorporation of fire safety measures; •

- ensuring designs can be easily adapted and accommodate new technologies to meet changing needs throughout the lifetime of the development;

- utilise sustainable construction methods which minimise the use of non-renewable resources and maximise the use of recycled and sustainably sourced materials;

All planning applications including material changes of use, will be expected to demonstrate how the above design and energy efficiency considerations have been factored into the proposal from the outset.

Policy SD2 – Renewable and low carbon energy generation

Development proposals that seek to deliver renewable and low carbon energy will be supported where they meet the following criteria:

1. the proposal does not adversely impact upon international or national designated natural and heritage assets;
2. the proposal does not adversely affect residential amenity;
3. the proposal does not result in any significant detrimental impact upon the character of the landscape and the built or historic environment and
4. the proposal can be connected efficiently to existing national grid infrastructure unless it can be demonstrated that energy generation would be used on-site to meet the needs of a specific end user.

National Planning Policy Framework

- 2.2. In December 2023, the Government published the updated National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England and how these are expected to be applied.
- 2.3. The planning process has been identified as a system to support the transition to a low carbon future in response to climate change by assisting in the reduction of greenhouse gas emissions and supporting renewable and low carbon energy.
- 2.4. Paragraph 159 sets out what is expected from new developments when considering strategies to mitigate and adapt to climate change:

159. New development should be planned for in ways that:

Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

Can help to reduce greenhouse gas 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.

Current National Policy Standards

- 2.5. The government introduced the next revision in Building Regulations, known as Part L 2021 in December 2021, to come into effect for buildings where construction is commenced after 15th June 2023. The new standards require a 31% reduction in CO₂ emissions compared with the previous Building Regulations standard.

Proposed Approach

- 2.6. This statement is intended to establish the proposed approach to sustainable construction and the reduction of CO₂ emissions to be delivered at the development.
- 2.7. It is proposed that the development is designed to incorporate all applicable guidance contained within Policy SD1 of the Rochdale Core Strategy, specifically in relation to the construction of highly efficient buildings which seek to minimise CO₂ emissions, as well as energy use.
- 2.8. The development will achieve these carbon reductions through higher fabric standards and low carbon and renewable energy systems across the development.
- 2.9. This statement details the proposed fabric specification and a strategy which would enable the dwellings to meet these higher standards, with the precise strategy to achieve this being subject to change as development design progresses.
- 2.10. Additional sustainable construction considerations are addressed, including overheating risk and climate resilience, sustainable and responsible materials usage and water consumption of the dwellings.

3. Energy and CO₂ Reduction Strategy

- 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.
- 3.3. As shown in Table 1, the CO₂ standards contained within Part L were increased in 2010 and 2013, reducing the 'Target Emission Rate' (TER) by approximately 25% and a further 6% (9% for non-residential) respectively, requiring substantial improvements to thermal insulation and heating services, or a significant increase in on-site renewable energy provision.
- 3.4. The 2021 uplift to the regulations requires a further 31% reduction in emissions, delivering dwellings with emissions levels less than half of homes built to L1A 2006 standards.

Table 1. CO₂ Emissions improvements from successive Part L editions

Building Regulations	CO ₂ emissions improvements
L1A 2006	-
L1A 2010	25%
L1A 2013	6%
L1 2021	31%

Energy Reduction Strategy – Fabric First

- 3.5. The proposed construction specification and sustainable design principles to be applied to the development will ensure that all dwellings will be designed to meet and exceed the fabric energy efficiency requirements of Part L 2021 standards.
- 3.6. 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

- 3.7. 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 overshadowing 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

3.8. 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

3.9. 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 carbon 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

3.10. 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.

3.11. This approach has been widely supported by industry and government for some time, particularly in the residential sector, with the Zero Carbon Hub¹ and the Energy Savings Trust² having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.

3.12. The benefits to prospective homeowners of following the 'Fabric First' approach are summarised in Table 2.

Table 2. 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

3.13. In addition to the CO₂ 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/m²/year.

3.14. This standard enables the decoupling of energy use from CO₂ emissions and serves as an acknowledgement of the importance of reducing demand, rather than simply offsetting CO₂ emissions through low carbon or renewable energy technologies.

3.15. The TFEE is calculated based on the specific dwelling being assessed with reference values for the fabric elements contained within Approved Document L1. 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.

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

3.16. These standards have been tightened under Part L 2021. The proposed approach and construction specifications are set out in the following sections of this strategy.

Proposed Fabric Specification

3.17. In order to ensure that the energy demand of the development is reduced, the dwellings have been designed to minimise heat loss through the fabric wherever possible. Table 3 details the proposed fabric specification of the major building elements, with the first column in this table setting out the Part L1 2021 limiting fabric parameters in order to demonstrate the potential improvements.

Table 3. Proposed Construction Specification – Main Elements

	Part L1 2021 Limiting Fabric Parameters	Proposed Specification
External wall – u-value	0.26 W/m²K	0.24 W/m²K
Party wall – u-value	0.20 W/m²K	0.00 W/m²K
Roof – u-value	0.16 W/m²K	0.09 W/m²K
Ground floor – u-value	0.18 W/m²K	≤0.12 W/m²K
Windows – u-value	1.60 W/m²K	1.30 W/m²K
Doors – u-value	1.60 W/m²K	≤1.10 W/m²K
Air Permeability	8.00 m³/h.m² at 50 Pa	4.50 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = ≤ 0.030 (calculated)

Thermal Bridging

3.18. 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 CO₂ reduction targets.

3.19. The specification seeks 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 has been undertaken to assess the performance of all main building junctions.

Air Leakage

3.20. 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 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.

Fabric Energy Efficiency

3.21. Table 4 demonstrates that the dwellings will exceed the uplifted Fabric Energy Efficiency targets within Part L 2021 through the proposed specification.

Table 4. Fabric Energy Efficiency of sample dwellings

	Target Fabric Energy Efficiency (kWh/m²/year)	Design Fabric Energy Efficiency (kWh/m²/year)	Improvement %
Aspen - Det	41.19	40.32	2.11
B4 - Semi	34.68	33.2	4.27
1B Maisonette GF	38.72	34.80	10.13
Cypress - Det	41.46	40.36	2.64
2B Bungalow - Det	44.16	41.18	6.76
Chestnut - Det	40.97	40.16	1.98
B6 - Mid	29.45	26.62	9.61
Maple - Det	43.06	42.23	1.92
Mulberry - Det	38.13	37.38	1.97

Provisions for Energy-Efficient Operation of the Dwelling

- 3.22. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services. Currently it is assumed that all dwellings will be provided with modern gas-fired heating systems, with controls enabling different temperature profiles in a minimum of two defined zones, a measure which services to avoid unnecessary heating of spaces when not required – for example, bedrooms and living rooms with differing hours of occupancy.

4. Baseline CO₂ Emissions

- 4.1. The development is to be designed and constructed to meet the requirements of Part L1 of the Building Regulations 2021, therefore compliance with this standard forms the first stage in the sustainable construction approach.
- 4.2. Part L1 compliance is assessed through the Standard Assessment Procedure (SAP), which uses the 'Target Emission Rate' (TER) – expressed in kilograms CO₂ per meter 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.
- 4.3. Calculations have been undertaken to a sample range of dwellings proposed to build a representative site model and establish the predicted CO₂ emissions of the development under Part L 2021, with the proposed fabric strategy applied to provide an overview of the typical as-designed CO₂ emissions. The results of these calculations are shown in Table 5.

Table 5. Part L compliant CO₂ emissions by house type

House type	CO ₂ emissions (kgCO ₂ /year)
Aspen - Det	1301.01
B4 - Semi	911.32
1B Maisonette GF	763.15
Cypress - Det	1171.58
2B Bungalow - Det	803.93
Chestnut - Det	1300.23
B6 - Mid	907.28
Maple - Det	1569.91
Mulberry - Det	1346.86

- 4.4. Based on these calculations, the estimated site-wide Part L compliant CO₂ emissions are shown in Table 6.

Table 6. Part L compliant baseline CO₂ emissions for the site

Site-wide emissions baseline	Part L Compliant CO ₂ emissions (kgCO ₂ /year)
	116.320

5. Low Carbon and Renewable Energy

5.1. In accordance with Regulation 25A of Part L, a full range of low carbon and renewable energy technologies have been assessed to establish their suitability for the site.

5.2. The final stage of the energy hierarchy requires the assessment of appropriate low carbon and renewable energy technologies to offset residual emissions. The following section therefore considers large scale and building scale technologies to establish the most appropriate system(s) for the buildings under assessment.

Combined Heat and Power (CHP) and District Energy Networks

5.3. 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.

5.4. 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.

5.5. 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

5.6. 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.

5.7. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 4.9m/s³. Wind turbines at this site are therefore

unlikely to generate sufficient quantities of electrical energy to be cost effective⁴. For these reasons wind power is not considered feasible.

Building Scale Systems

5.8. 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 photo-voltaic (PV)
- Air Source Heat Pumps (ASHPs)
- Ground Source Heat Pump (GSHPs)

5.9. The advantages and disadvantages of these technologies are evaluated in Tables 7-12.

³ NOABL Wind Map (<http://www.rensmart.com/Weather/BERR>)

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

Table 7. Individual biomass heating feasibility appraisal

Potential Advantages	Risks & Disadvantages
- Potential to significantly reduce CO₂ 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	
Conclusions	
Biomass heating is considered technically feasible in large dwellings provided sufficient space can be accommodated for fuel supply, delivery and management however air quality concerns mean that it is not considered appropriate.	

Table 8. 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 - Ongoing offset of heating fuel, minimal maintenance requirements	
Conclusions	
Solar thermal systems are considered technically feasible on all buildings with suitable roof orientations.	

Table 9. Solar photovoltaic systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
- The technology offsets the 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 - Service and maintenance requirement minimal, and 2-3 storey buildings should not require significant additional safety measures (fall protection 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 - 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, carbon saving potential and limited additional impacts mean that PV is considered a feasible option for this development.	

Table 10. 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 - With grid decarbonisation will be a low carbon heating source in the future	- Air source heat pumps are powered by electricity, with a significantly higher unit price than gas, leading to potentially increased running costs - 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	
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme. However, the capital and running cost increases in comparison to a gas baseline means that they are not considered a preferred low carbon technology at this stage.	

Table 11. 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 - With grid decarbonisation will be a low carbon heating source in the future	- 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 with a significantly higher unit price than gas, leading to potentially increased running costs - 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+ - 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.	

Table 12. Hot Water Heat Pump Feasibility Appraisal

Potential Advantages	Risks & Disadvantages
- Hot water demand met through grid electricity with low effective emissions factor - Heat pump element increases efficiency over immersion heater, circa 200%+ - No external heat exchanger requirement, only intake and exhaust duct runs - Low noise levels - Compact solution in same footprint as hot water cylinder	- Maximum length of duct runs means that cylinder positioning needs to be considered within the dwelling - Less appropriate for larger dwellings with higher hot water demands due to potentially slower recharge rate - Some noise, however likely to be easily suppressed with appropriate cylinder location - Space heating must be met through separate system
Conclusions	
Hot water heat pumps are considered feasible for dwellings with a relatively low number of wetrooms and appropriate cylinder location to allow for duct runs to building façade.	

Summary

5.10. Following this feasibility assessment, it is considered that there are range of potentially suitable low carbon or renewable energy systems which may be appropriate for incorporation to deliver Part L 2021 compliance.

5.11. Potential technologies include:

- 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.
- Air source heat pumps

5.12. At this stage it is considered that solar PV systems are most appropriate in meeting a significant proportion of energy demand and reducing carbon emissions without introducing additional energy loss through larger hot water cylinders.

Photovoltaic Panels (PV)

5.13. Photovoltaics (PV) or solar cells, as they are often referred to, are semiconductor devices that convert sunlight into direct current (DC) electricity.

5.14. Groups of PV cells are electrically configured into modules and arrays which can be used to charge batteries, operate motors and power any number of electrical loads. With the appropriate power conversion equipment (inverters), PV systems can produce alternating current (AC) compatible with any conventional appliances and operate in parallel with the utility grid.

5.15. Excess electricity can be sold to the National Grid when the generated power exceeds the local need, this can be beneficial with a large system, when the building is not used all of the time. PV systems require only daylight, not sunlight to generate electricity (although more electricity is produced with more sunlight). Therefore, energy can still be produced in overcast or cloudy conditions and used successfully in all parts of the UK.

5.16. PV panels can be fitted to the top of roofs. Photovoltaic cells can be incorporated into glass for atria walls and roofs or used as cladding or a rain screen on a building wall, wall mounted systems are not proposed for this development due to security risk and potential for damage as well as the implied maintenance costs associated with this type of installation.

5.17. Ideally the panels should face between south-east and south-west, at an elevation of about 30-40°. However, in the UK even flat roofs receive 90% of the energy of an optimum system.

5.18. Roof mounted photovoltaic panels are considered a feasible technology for the dwellings within this development.

5.19. Systems must be carefully sited to avoid shading and lower than expected energy yields. Therefore, installation on favourable orientations is recommended. Safe access for installation, maintenance and service checks must be considered.

Proposed Systems

5.20. Solar PV systems will be installed to optimum roof pitches for each dwelling, with the specific units and system sizes to be assessed when bringing forward designs for the development as required.

5.21. PV system designs will be worked up once final house designs are available, however indicative SAP calculations for each house type indicate that all dwellings will be specified with solar PV systems of between around 0.81 – 3.65 kWp, depending on the specific characteristics of the homes. Individual SAP calculations will be produced and assessed according to orientation for each plot to ensure the targets are met.

6. As-Designed CO₂ reductions

- 6.1. Through following the strategy described, the dwellings will significantly reduce energy demand and consequent CO₂ emissions beyond a Part L 2021 compliant level of performance through the dwelling fabric, and the incorporation of solar PV systems.
- 6.2. Using the latest SAP 10 software, a sample range of dwellings have been assessed under Part L 2021 to build a representative site model and establish the predicted CO₂ emissions of the development under Part L 2021, with the proposed fabric strategy applied to provide an overview of the typical as-designed CO₂ emissions. The results of these calculations are shown in Table 13.

Table 13. Sample dwelling as-designed CO₂ emissions after renewables (Part L 2021)

House Type	Part L 2021 Target Emissions (kgCO ₂ /m ² /yr.)	As-Designed Emissions (kgCO ₂ /m ² /yr.)	Reduction %
Aspen - Det	10.22	9.96	2.54
B4 - Semi	11.4	10.62	6.84
1B Maisonette GF	14.38	13.58	5.56
Cypress - Det	11.39	10.73	5.79
2B Bungalow - Det	10.32	9.99	3.20
Chestnut - Det	10.23	9.70	5.18
B6 - Mid	9.17	8.13	11.34
Maple - Det	9.43	9.29	1.48
Mulberry - Det	9.06	8.90	1.77

- 6.3. Table 14 demonstrates the site-wide savings over and above the Part L 2021 compliant baseline that will be delivered through this approach.

Table 14. Site-wide CO₂ emission reductions

	CO ₂ Emissions (kgCO ₂ /yr.)
Part L 2021 compliant baseline	116,320
Part L 2021 calculated emissions	111,335
	kgCO ₂ /yr. %
Total site-wide savings	4,985 4.29

7. Overheating Risk and Passive Design

7.1. Dwellings constructed today may be operating in a substantially different climate over the coming decades, and therefore should be designed to ensure that they are able to adapt and reduce the risk of overheating with potentially higher summer temperatures and longer hot spells.

7.2. Key design decisions can affect the potential risk of overheating:

- Poor consideration of orientation of large, glazed facades
- High density development contributing to urban heat island effects
- High glazing ratios contributing to excessive unwanted solar gain
- Inadequate ventilation strategies
- Very high levels of thermal insulation without considering heat build-up

7.3. Other factors which additionally contribute to heat build-up within homes and should be addressed where possible include:

- High levels of occupation
- Appliance use contributing to internal gains

Cooling hierarchy

7.4. In common with sustainable heating strategies, it is possible to apply a sustainable 'cooling hierarchy' which sets out the priorities to ensure overheating risk is minimised:

- Minimise internal heat gain
- Manage heat through internal thermal mass and design of spaces
- Passive ventilation strategies
- Mechanical ventilation systems
- Active cooling systems

Addressing overheating risk

7.5. The cooling hierarchy described has been considered, with passive measures of reducing overheating risk given priority. Key measures which will be taken within the development include:

- A layout which incorporates significant green space around the site and in rear gardens reducing the potential for heat build-up in enclosed and low albedo external areas such as tarmac and dark roofs

- Glazing specification which has been considered to balance the requirements for useful solar gain with unwanted summer gain

- Consideration of thermal mass of construction materials to smooth internal temperature profiles, storing excess heat during the day and releasing at night

7.6. The development is proposed to use traditional masonry construction, which has a relatively high thermal mass, compared with timber or steel construction. A construction with a high thermal mass can help to reduce overheating risk as it absorbs heat during the day and slowly releases it during cooler nighttime hours, effectively smoothing out temperature fluctuations within the property.

7.7. Within the development layout, orientation and massing has been considered to maximise useful passive solar gain. Glazing will 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.

7.8. When possible houses will be able to benefit from cross-ventilation to effectively purge warm air from the properties during periods of hot weather. Window opening areas will be considered and guided by the Part O assessment, with increased opening areas being designed in as required.

Approved Document O

7.9. In order to address overheating risk more robustly, the Government has introduced a new Approved Document, 'Part O', into the Building Regulations.

7.10. This document requires a more in-depth assessment of the risk of overheating, considering site location, dwelling orientation, glazing proportions and openable window areas for natural ventilation.

7.11. This assessment will be undertaken at the start of detailed design and any mitigation measures that may be required will be built in.

8. Resource Efficiency

- 8.1. This section sets out details of additional resource efficiency and sustainable design principles to be applied at the development.

Materials

- 8.2. The impacts of construction materials range from the depletion of natural resources to the greenhouse gas emissions and water use associated with their manufacture and installation.
- 8.3. Within the development choices will be made in order to reduce the consumption of primary resources and using materials with fewer negative impacts on the environment, including but not limited to the following:

- Use fewer resources and less energy through designing buildings more efficiently
- Specify and select materials and products that strike a responsible balance between social, economic and environmental factors
- Incorporate recycled content, use resource-efficient products and give due consideration to end-of-life uses
- Influence, specify and source increasing amounts of materials which can be reused and consider future deconstruction and recovery
- All insulating materials will have a Global Warming Potential (GWP) of < 5 in manufacture and installation.
- All materials used in construction will be responsibly sourced, with certification obtained wherever possible. Materials with a low environmental impact as per the BRE Green Guide will be preferred.

Waste

- 8.4. Sending waste to landfill has various environmental impacts, such as the release of local pollution, ecological degradation and methane emissions, in addition to exacerbating resource depletion. Waste in housing comes from two main streams; construction waste and domestic waste during occupation.

Household waste

- 8.5. In this respect regard has been given to the policy advice contained in the NPPF together with the Council's current guidance to ensure that the new dwellings are provided with adequate storage facilities for both waste and recyclable materials.

- 8.6. North Herts Council currently offer kerbside collection for recycling, separated into two collections streams:

- glass, cans, bottles, cardboard, brown paper, cartons
- paper – magazines, newspapers, white printing paper

- 8.7. Dedicated bin storage space will be provided on plot to accommodate the relevant collection boxes.

- 8.8. Future occupiers of the dwellings will be provided with an information pack detailing the Council's current collection arrangements for waste and recycling and advising of the nearest recycling centres to the Application site.

Construction waste

- 8.9. The construction process will be managed to monitor and manage construction site waste effectively and appropriately. Target benchmarks for resource efficiency will be set in accordance with best practice – e.g., 5m³ of waste per 100m² / tonnes waste per m².

- 8.10. Wherever possible materials will be diverted from landfill through re-use on site, reclamation for re-use, returned to the supplier where a 'take-back' scheme is in place or recovered and recycled using an approved waste management contractor.

Electric Vehicle Charging

- 8.11. It is recognised that there is a need to ensure that the development is adaptable to accommodate a future shift in personal transportation to electric vehicles, to promote sustainable transport and to minimise air pollution. As Electric Vehicle (EV) ownership increases, developers have an increasing responsibility to provide EV charging points for occupants.

- 8.12. EV charging units will be installed in line with Approved Document S of Building Regulations 2021 and provided to all dwellings. Each charge point will have a minimum nominal rated output of 7kW.

9. Water Efficiency

- 9.1. The UK Climate Change Risk Assessment 2017 identified risks of shortages in water supply as a future climate change impact. Therefore, the efficient use of water is an important factor when considering future resilience to climate change.
- 9.2. As well as aiming to minimise water usage through the materials used, water consumption of the end user will be considered in line with current national policy. Building Regulations 2021 Part G require water efficiency measures for all new dwellings:

Water Efficiency

G2. Reasonable provision must be made by the installation of fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water.

Water Efficiency of New Dwellings

36. (1) The potential consumption of wholesome water by persons occupying a new dwelling must not exceed the requirement in paragraph (2)

(2) The requirement referred to in paragraph (1) is either –

(a) 125 litres per person per day; or

(b) in a case to which paragraph (3) applies, the optional requirement of 110 litres per person per day,

As measured in either case in accordance with a methodology approved by the Secretary of State.

- 9.3. Water efficiency measures are met under Part G if the estimated consumption of wholesome water resulting from the design of cold and hot water systems (calculated in accordance with the methodology set out in Appendix A) is not greater than the standard set by the Secretary of State of 125/litres/person/day, or the optional standard of 110 litres/person/day.

- 9.4. Appendix A of Part G provides a water efficiency calculation methodology. This assesses the whole house potable water consumption in new dwellings. The calculation methodology is to be used to assess compliance against the water performance targets in Regulation 36 to ensure that all new dwellings meet the water efficiency requirement.

- 9.5. Each new dwelling will minimise water usage to at least 125 litres/person/day in line with the current national standards.

- 9.6. 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 of limiting the use of water during the operation of the development to limit water use.

- 9.7. Table 15 shows how the development could achieve a result of less than 125 litres/occupier/day calculated in accordance with Building Regulations 17.K methodology.

Table 15. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/occupier/d ay
WC (dual flush)	Full flush (l)	6	8.76
	Part flush (l)	3	8.88
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
	Capacity to overflow (l)	173	19.03
Shower	Flow rate (l/min)	6	26.22
Kitchen sink taps	Flow rate (l/min)	15.6	17.22
Washing Machine	Litres/kg dry load	Default	17.16
Dishwasher	Litres/place setting	Default	4.50
Calculated Use			111.3
Normalisation Factor			0.91
Total Internal Consumption (L)			101.2
External Use			5.0
Building Regulations 17.K			106.2

10. Conclusions

- 10.1. This Energy and Sustainability Statement has been prepared on behalf of Vistry Homes Limited, Northern Home Counties to detail the proposed approach to energy and CO₂ reduction to be employed in the development at Land Surrounding Burloes Cottages, Royston.
- 10.2. The development site is located in the east boundary of Royston and sits just off the A505 to the south of Newmarket Road. The development lies within the administrative boundary of North Hertfordshire District Council.
- 10.3. The statement has been prepared to address local and national policy relating to sustainable design and construction of dwellings, including relevant policies contained within the North Hertfordshire Core Strategy 2011-2031. Specifically, Policy SD1: Sustainable design and energy efficiency; and Policy SD2: Renewable and low carbon energy generation.
- 10.4. The site falls under Part L 2021, and therefore the development will be designed to meet these increased standards. With respect to carbon reduction, all dwellings will be built to meet Part L 2021, which will deliver a >31% reduction compared with 2013 regulatory standards. The approach presented delivers a reduction of 4,985kgCO₂/year over Part L 2021 equating to an improvement of 4.29%.
- 10.5. The statement demonstrates that the development will achieve these carbon reductions through higher fabric standards and the implementation of renewable energy systems. PV designs will be worked up once final House designs are available, however indicative SAP calculations for each house type indicate that all dwellings will be specified with solar PV systems of between around 0.81 – 3.65 kWp, depending on the specific characteristics of the homes.
- 10.6. The statement additionally details the proposed approach to addressing overheating risk and climate resilience, sustainable and responsible materials usage, and water consumption of the dwellings.
- 10.7. It has been determined that the typical calculated internal water consumption would equate to circa 107 litres/person/day, and therefore satisfy the requirements, which require a maximum internal water consumption of 125 litres/person/day.
- 10.8. The development will be designed to be resilient to a future changing climate, through passive design measures to reduce the risk of overheating and fenestration designs and specifications guided by the new Approved Document O calculations.

10.9. The development will help to enable the shift in personal transportation to electric vehicles by ensuring that all dwellings will be provided with active EV charging facilities. This is in line with Approved Document S of Building Regulations 2021.