

Park Lane, Charvil

Bellway Homes, Thames Valley

Energy and Sustainability Statement

AES Sustainability Consultants Ltd

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	Author	Date	E-mail address
Produced By:	Paul Frearson	13/11/2025	Paul.Frearson@aessc.co.uk
Reviewed By:	Maja Wheeler	13/11/2025	Maja.Wheeler@aessc.co.uk

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This statement has been commissioned by Bellway Homes, Thames Valley to detail the proposed approach to energy and CO₂ reduction to be employed in the development of Park Lane, Charvil. 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 by AES Sustainability Consultants on behalf of Bellway Homes, Thames Valley in support of the application for the development at Park Lane, Charvil.

Development Description

- 1.2. The development site is located East of Reading within the administrative boundary of Wokingham Borough Council.
- 1.3. The Outline Planning Permission (ref: 232704) has been granted for:
- "..erection of up to 75 dwellings with only access to be considered via Park Lane. Appearance, Landscaping, Layout and Scale to be matters reserved."*
- 1.4. The proposal would deliver up to 75 dwellings across a range of two-to-five-bedroom houses. The proposed site layout is shown in Figure 1.

Purpose and Scope of the Statement

- 1.5. The statement has been prepared in support of the proposed development at Park Lane, Charvil to address both local and national policy in relation to the sustainable design and construction of dwellings. This includes relevant policies contained within the Wokingham Borough Council Adopted Core strategy (January 2010) and the Climate Change Interim Policy Statement (January 2022), along with requirements from the approval application ref: 232704 for the Park Lane development.
- 1.6. This statement demonstrates that by following a 'fabric first' approach to demand reduction and with the inclusion of low-carbon renewable technology, the development will deliver a level of energy performance and CO₂ reductions that meet current building regulation standards, equating to a circa 31% improvement over previous regulatory standards.
- 1.7. it is proposed that a proportion of the development will fall under future Building Regulations, namely the governments proposed Future Homes Standard (FHS). This standard proposes a 75% reduction in CO₂ emissions over a Part L 2021 baseline. This will also address the Net-Zero requirement and if this would be a viable option within the development.

- 1.8. Further sustainable construction considerations are addressed, including overheating risk and climate resilience, sustainable and responsible materials usage, water consumption of the dwellings and Electric Vehicle Charging (EVC).



Figure 1. Park Lane, Charvil – Proposed Site Layout

2. Planning Policy

Local Planning Policy

- 2.1. Wokingham Borough Council adopted the current Adopted Core Strategy Development Plan Document in January 2010, with updated requirements established within the Climate Change Interim Policy Position Statement dated December 2022. Wokingham Borough Council adopted also Development Plan in February 2014. Policies CP1 (Core Strategy), CC04 & CC05 (Development Plan) relate to sustainable design and construction of new development.
- 2.2. Wokingham Borough Council are currently in the process of implementing the new emerging Local plan that will replace the current core strategy for 2023 – 2040.

CP1 – Sustainable development

Planning permission will be granted for development proposals that:

- 1) Maintain or enhance the high quality of the environment;
- 2) Minimise the emission of pollutants into the wider environment;
- 3) Limit any adverse effects on water quality (including ground water);
- 4) Ensure the provision of adequate drainage;
- 5) Minimise the consumption and use of resources and provide for recycling;
- 6) Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;
- 7) Avoid areas of best and most versatile agricultural land;
- 8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;
- 9) Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);
- 10) Provide attractive, functional, accessible, safe, secure and adaptable schemes;
- 11) Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and

CP1 – CD

12) Contribute towards the goal of reaching zero-carbon developments as soon as possible by:

- a) Including appropriate on-site renewable energy features; and
- b) Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

CC04: Sustainable Design and Construction

Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by:

1. In respect of all new homes:
 - a) Seeking to achieve the requirements of the full Code for Sustainable Homes Level 4;
 - b) Meet internal potable water consumption targets of 105 litres or less per person per day (as part of the requirement to meet full Code for Sustainable Homes Level 4).
2. All new non-residential proposals of more than 100 sq m gross non-residential floorspace shall at least:
 - a) Achieve the necessary mandatory Building Research Establishment Assessment Method (BREEAM) requirements or any future national equivalent
 - b) Meet or exceed statutory requirements for water resource management.
3. All development, including conversions, alterations and extensions shall incorporate suitable waste management facilities, including on-site recycling.

Policy CC05: Renewable energy and decentralised energy networks

Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged

2. Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for:

- a) Schemes of more than 10 dwellings (gross), or
 - b) Non-residential proposals of more than 1,000 sq m gross floorspace.
3. Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:
- a) They are appropriate in scale, location and technology type;
 - b) Are compatible with the surrounding area, including the impact of noise and odour;
 - c) Do not have a damaging impact on the local topography and landscape;
 - d) There is no significant impact upon heritage assets, including views important to their setting;
 - e) In the case of wind turbines, take account of their cumulative effect and properly reflect their increasing impact on the landscape and on local amenity

- 2.3. The Outline Planning Permission ref: 232704 was approved in May 2025 and contains Conditions 7,8,9 & 10

Park Lane, Charvil Planning Application (232704)

7. Future Homes Standard

The dwellings hereby permitted shall meet the interim Future Homes Standard in accordance with the requirements of the Building Regulations. No dwelling shall be occupied until compliance has been confirmed by an accredited assessor certifying that a 31% reduction in carbon dioxide emissions has been achieved per the Standard.

Reason: To ensure developments contribute to sustainable development in accordance with the requirements of Part L of the Building Regulations and Core Strategy policy CP1 and Managing Development Delivery Local Plan policy CC04.

Park Lane, Charvil Planning Application (232704)

8. Sustainability and energy efficiency

The reserved matters application(s) shall be accompanied by a scheme to be approved in writing by the local planning authority for achieving a 50% reduction in the predicted carbon emissions arising from operation of the development through the use of decentralised renewable and/or low carbon sources. The minimum 50% reduction shall be achieved in addition to the levels of reduction in carbon emissions required through the Building Regulations in force at the time of the submission of planning application. The approved scheme shall be implemented before the development is first occupied and shall remain operational for the lifetime of the development.

9. Water consumption rates

Prior to the commencement of development, details of how all dwellings shall meet internal potable water consumption targets of 110 litres or less per person per day. Thereafter, all dwellings shall be built in accordance with the measures to achieve this water consumption target and the measures maintained for the lifetime of the development.

Reason: To ensure developments contribute to sustainable development. Relevant policy: NPPF Section 14 (Meeting the Challenge of Climate Change, Flooding and Coastal Change), WBC Climate Emergency Action Plan, Core Strategy policy CP1, Managing Development Delivery Local Plan policy CC05 & the Sustainable Design and Construction Supplementary Planning Document.

10. Carbon Neutral Homes

Prior to the approval of any reserved matters application, a statement/ report shall be provided to demonstrate whether the development is practicable and viable to provide carbon neutral homes; carbon neutral homes meaning a scenario in which greenhouse gas emissions arising from human activity are eliminated by minimizing energy demands and meeting remaining energy demand with energy from renewable sources. These measures shall be implemented prior to the occupation of the development. If it cannot be satisfactorily demonstrated that carbon neutral cannot be achieved as part of the development, measures to bring the development Public: Information that can be seen and used by everyone inside and outside the Council. closer to this target shall be submitted to and agreed with the Local Planning Authority before the development commences. These shall be implemented and maintained for the lifetime of the development.

Reason: To ensure developments contribute to sustainable development in accordance with the WBC Climate Emergency Action Plan, Core Strategy Policy CP1, Managing Development Delivery Local Plan policy CC05, Sustainable Design and Construction Supplementary Planning Document and the Wokingham Council Climate Emergency

- 2.4. Wokingham Borough Council adopted the Sustainable Design and Construction Supplementary Document in May 2010. The Sustainability issue 3 relates to on site decentralised low carbon energy generation.

Sustainability Issue 3: On-site decentralised/ renewable/ low carbon Energy Generation

In line with the South East Plan policy NRM11, all developments involving 10 or more dwellings or 1,000m2 or more gross non-residential floorspace (major developments) will be expected to secure at least 10% of their expected energy demand from decentralised, renewable or low carbon sources.

Non-residential development of 1000m2 criteria applies to all proposals outside use class order C3. This means that nursing homes and residential institutions are included.

See the Council's 'Developers Guidance note for the 10% renewable energy requirement of the South East Plan policy NRM11'.

- An Energy Statement should be submitted with a planning application as part of a wider Sustainability Statement or the Design and Access Statement.
- The Energy Statement should also include detailed information on the selected technology e.g layout plan, floor plans and elevations and visual impact etc.

On-site renewable energy/ low carbon technologies are encouraged on all sizes and types of development. As stated in 'Sustainability Issue 1', renewable energy technology can be used as part of reaching Code for Sustainable Homes levels and BREEAM standards.

Policy NRM11 (of the South East Plan) requirements are not 'in addition' to any requirements of the Code for Sustainable Homes or BREEAM. Unless this is a requirement of the subsequent MDD DPD.

In some situations, decentralised/ renewable/ low carbon energy generation may not be appropriate.

Development can deliver on carbon reduction targets without requiring the use of renewable energy.

- 2.5. The Climate Change Interim Policy Position Statement states that applicants must meet the interim Future Homes Standard of a minimum 31% reduction in emissions and are encouraged to work towards the full Future Homes standard of 75-80% less carbon emissions.

Code for Sustainable Homes

- 2.6. The Code for Sustainable Homes was discontinued in 2015, with a ministerial statement advising:

"From the date the Deregulation Bill is given Royal Assent, local planning authorities and qualifying bodies preparing neighbourhood plans should not set in their emerging Local Plans, neighbourhood plans, or supplementary planning documents, any additional local technical standards or requirements 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, aside from the management of legacy cases."

- 2.7. The statement additionally provided guidance on appropriate energy standards which may be enforced for new development:

"For the specific issue of energy performance, local planning authorities will continue to be able to set and apply policies in their Local Plans which require compliance with energy performance standards that exceed the energy requirements of Building Regulations until commencement of amendments to the Planning and Energy Act 2008 in the Deregulation Bill. Until the amendment is commenced, we would expect local planning authorities to take this statement of the Government's intention into account in applying existing policies and not set conditions with requirements above a Code level 4 equivalent."

National Planning Policy Framework

- 2.8. In January 2024, 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.
- 2.9. 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.
- 2.10. 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:

- a) 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 adaption measures, including through the planning of green infrastructure; and
- b) 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

- 2.11. 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 CO₂. This obligation was enshrined in the Climate Change Act 2008, which commits the UK to achieving a mandatory 80% reduction in the UK's CO₂ emissions by 2050, compared with 1990 levels.
- 2.12. 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.
- 2.13. 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.
- 2.14. The built environment has a key role to play in delivering on these international commitments, as it accounts for approximately a third of overall CO₂ 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.
- 2.15. Following the introduction of the 2013 edition of Building Regulations Part L, the successive updates required regulated CO₂ emissions levels from new build domestic buildings to be approximately 30% lower than 2006 levels.
- 2.16. The introduction of Part L 2021, mandatory from June 2023, introduced a further uplift in carbon reduction standards of 31% over Part L 2013, mandating improved fabric standards and the incorporation of low carbon or renewable energy systems.

Future Homes Standard

- 2.17. In December 2023, the Government released the consultation on the forthcoming Future Homes Standard (FHS). The consultation presents two options aimed at delivering homes with carbon emissions at least 75% lower than Part L 2013 requirements.
- 2.18. At this stage, both options closely follow Part L 2021 fabric standards, with the addition of low carbon heating systems in the form of air source heat pumps. The higher performance option (Option 1) additionally includes solar photovoltaics and waste-water heat recovery, as well as a slightly lower design air leakage figure.
- 2.19. Currently, it is not clear whether similar transitional arrangements will apply and when the regulations may be introduced, however, it is expected that these standards will affect a proportion of the proposed development.

Proposed Strategy

- 2.20. This statement is intended to establish the proposed approach to sustainable construction and reduction in CO₂ emissions to be delivered at the development.
- 2.21. It is proposed that the development at Park Lane, Charvil is designed to incorporate the applicable guidance contained within policies set by Wokingham Borough Council in relation to renewable energy provision and the construction of highly efficient buildings which seek to minimise water demand and CO₂ emissions, as well as energy use.
- 2.22. The development will be designed and constructed to meet Part L Future homes assumed standards, as a minimum.
- 2.23. Therefore, this statement will demonstrate that through a combination of fabric efficiency measures and renewable energy, the development will achieve site wide CO₂ emission reductions of greater than 75% over 2021 Building Regulations standards, exceeding policy requirements and demonstrating a commitment to low carbon development which is affordable for residents.
- 2.24. The current projection is that the site will initially be constructed to adopt Future Homes Standard (FHS) at such time as it becomes relevant. Therefore, this strategy will discuss and outline solutions for this standard.
- 2.25. The development will achieve these carbon reductions through higher fabric standards and low carbon and renewable energy systems being installed to offset emissions and reduce fuel bills for residents.

- 2.26. This statement provides the proposed fabric specification and a strategy which would enable the dwellings to meet these higher standards.
- 2.27. Additional sustainable construction considerations are addressed, including overheating risk and climate resilience, sustainable and responsible materials use and water consumption.

3. Energy Reduction Strategy – Fabric First

- 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. It is considered that Building Regulations Part L 2021 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.
- 3.5. The proposed Future Homes Standard constitutes an emissions reduction of circa 75% over Part L 2013 regulatory 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%
Future Homes Standard	75 – 80% (over L1A 2013)

Energy Reduction Strategy – Fabric First

- 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).

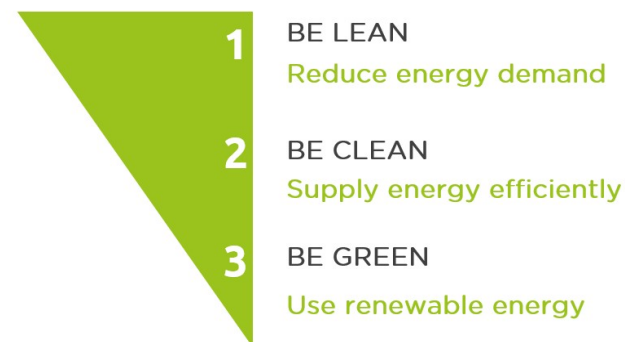


Figure 2. The Energy Hierarchy

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 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.

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 were tightened by 15% under Part L 2021, ensuring that all new residential developments are constructed with Fabric First designs in mind.

Fabric Standards

- 3.17. 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 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 to demonstrate the improvements delivered.

Table 3. Proposed construction specification – main elements

	Part L1 2021 Limiting Fabric Parameters	Proposed Specification
External wall – u-value	0.26 W/m ² K	0.18 – 0.26 W/m ² K
Party wall – u-value	0.20 W/m ² K	0.00 W/m ² K
Plane roof – u-value	0.16 W/m ² K	0.09 W/m ² K
Ground floor – u-value	0.18 W/m ² K	≤ 0.12 W/m ² K
Windows – u-value	1.60 W/m ² K	1.30 W/m ² K
Doors – u-value	1.60 W/m ² K	1.40 W/m ² K
Air Permeability	8.00 m ³ /h.m ² at 50 Pa	3.00 – 4.50m ³ /h.m ² at 50 Pa

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 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.

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 ≤ 3.00 – 5.01 m³/h.m² at 50 Pa, with pressure testing of all dwellings to be undertaken on completion to confirm that the design figure has been met.

Energy efficient heating and lighting

- 3.21. Heat generation and distribution systems will be designed to give the occupants a high level of control over their use, encouraging and allowing energy-efficient behaviour.
- 3.22. It is currently proposed that all houses will benefit from air source heat pumps (ASHPs). Primary pipework should be fully insulated, and time and temperature zoning controls installed in all dwellings.
- 3.23. Internal lighting should be low energy wherever possible, and areas of infrequent use will be fitted with occupancy sensors. External security and space lighting should be low energy and fitted with PIR and daylight sensors where appropriate.
- 3.24. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services.

Passive design measures and overheating risk mitigation

- 3.25. 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.
- 3.26. 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.
- 3.27. 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.

Fabric Energy Efficiency

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

Table 4. Fabric Energy Efficiency of proposed dwellings (Sample Houses)

	Target Fabric Energy Efficiency (kWh/m ² /year)	Design Fabric Energy Efficiency (kWh/m ² /year)	Improvement %
Baker Semi	36.66	34.56	5.73
Potter Semi	37.91	37.61	0.81
Tillman Semi	36.3	35.85	1.24
Ploughwright Semi	38.53	38.26	0.71
Cartographer Semi	37.72	36.91	2.14
Walker Semi	38.92	38.3	1.58
Scrivener Det	35.33	34.68	1.81
Bowyer Det	38.57	37.38	3.09

4. Baseline CO₂ Emissions & Energy Demand

- 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 these 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 representative sample of house types proposed to assess the carbon emissions of the development. The Part L 2021 compliant calculated baseline carbon emissions and baseline energy demand are reported in Table 4.

Table 5. Part L compliant baseline CO₂ emissions by house type

House type	CO ₂ emissions (kgCO ₂ /yr)	Energy Demand (kWh/yr)
Baker Semi	942	3826
Cartographer Semi	1069	4233
Ploughwright Semi	1044	4180
Scrivener Det	1214	4832

- 4.4. Based on these calculations, the representative site-wide Part L compliant CO₂ emissions energy demand are shown in Table 5.

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

Part L Compliant Energy Demand (kWh/yr)	Part L Compliant CO ₂ emissions (kgCO ₂ /yr)
380,998	98,889

5. Low Carbon and Renewable Energy Systems

- 5.1. A range of technologies have been assessed for potential incorporation into the scheme in accordance with Regulation 25A of the Building Regulations and to assess the systems which may be applicable on site to future Regulatory standards.

Combined Heat and Power (CHP) and District Energy Networks

- 5.2. 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.
- 5.3. 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.
- 5.4. 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

- 5.5. Locating wind turbines adjacent to areas with buildings presents several 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.
- 5.6. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 4.6m/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

- 5.7. 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 photo-voltaic (PV)
- Air Source Heat Pumps (ASHPs)
- Ground Source Heat Pump (GSHPs)
- Hot Water Heat Pumps (HWHPs)

- 5.8. 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
Conclusions	
Biomass heating is considered technically feasible in large dwellings provided sufficient space can be accommodated for fuel supply, delivery and management.	

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	
• 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 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 (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	
• 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 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 • Very low carbon heating source based on Part L 2021 carbon factor of 0.136kgCO₂/kWh	• 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
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme and a preferred technology for the houses.	

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	- 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	
- 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, however likely to be higher than mains gas - Additional costs to upgrade electricity infrastructure currently unknown	
Conclusions	
Ground conditions at the development site are unknown, therefore the drilling boreholes is not known. Viability considerations mean that GSHPs are not considered a preferred technology.	

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
Estimated costs and benefits	
Running costs for provision of domestic hot water linked to COP of heat pump, delivering significant benefit over direct electric heating	
Conclusions	
Hot water heat pumps are considered feasible for dwellings with relatively low number of wetrooms and appropriate cylinder location to allow for duct runs to building façade.	

Summary

5.9. Following this feasibility assessment, it is considered that there are a range of technically feasible low carbon or renewable energy systems, however a number of these may be discounted on the grounds of increased running costs for residents or other adverse effects:

- Biomass heating systems would require significant storage space for fuel as well as regular deliveries at different times to all dwellings. Local NO_x and particulate pollution are also an increasing concern, and therefore they are not appropriate for this development.
- Ground Source Heat Pump systems may be technically feasible; however, the ground conditions are unknown, and the capital cost is likely to be prohibitive.

5.10. There are three main technologies with significant potential for the development:

- Solar photovoltaics
- Air Source Heat Pumps
- Hot Water Heat Pumps

5.11. Heat pump systems are most appropriate in meeting a significant proportion of energy demand and are the preferred technology to deliver the carbon reductions proposed for plots under the FHS.

5.12. PV systems will be worked up at design stage, ensuring compliance with Part L 2021 of Building Regulations and, where appropriate, the proposed Future Homes Standard, subject to its final definition.

6. Indicative Dwelling Performance

- 6.1. Through following the strategy described, the dwellings will significantly reduce energy demand and consequent CO₂ emissions beyond a Part L compliant level of performance through the dwelling fabric and PV panels.
- 6.2. Indicative SAP calculations have been undertaken on a sample of the proposed dwelling types to provide an overview of the typical as-designed energy performance, in comparison with Building Regulations standards. The results of these calculations are shown in Tables 13 and 14.

Table 13. Indicative dwelling performance – CO₂ emissions

House type	Part L compliant emissions (kgCO ₂ /year)	As-designed emissions (kgCO ₂ /year)	Improvement %
Baker Semi	11.79	1.31	88.89
Cartographer Semi	10.56	1.78	83.14
Ploughwright Semi	11.17	1.28	88.54
Scrivener Det	10.96	1.07	90.24

Fabric Energy Efficiency

- 6.3. Table 14 demonstrates that the dwellings will exceed the uplifted Fabric Energy Efficiency targets within Part L 2021 through the proposed specification.

Table 14. Fabric Energy Efficiency of sample dwellings

	Target Fabric Energy Efficiency (kWh/m ² /year)	Design Fabric Energy Efficiency (kWh/m ² /year)	Improvement %
Baker	36.78	36.50	0.77
Cartographer	36.86	36.65	0.58
Ploughwright	38.22	37.89	0.86
Scrivener	41.59	41.46	0.31

- 6.4. This calculated performance indicates that the dwellings will significantly exceed the requirements of Part L through the proposed specification.

- 6.5. Table 15 demonstrates the site-wide savings over and above the Part L 2021 compliant baseline that will be delivered.

Table 15. Site-wide CO₂ emission reductions achieved

	CO ₂ Emissions (kgCO ₂ /yr)	
Part L 2021 compliant baseline	98,889	
Part L 2021 calculated emissions	13,918	
	kgCO ₂ /yr	%
Total site-wide savings	84,970	85.9

- 6.6. Any dwellings constructed beyond the implementation of the Future Homes Standard, which is expected to be introduced in 2025, will meet a 75-80% reduction in CO₂ emissions compared with Part L 2013. It will be ensured as design progresses that revised calculations will be undertaken on a plot-by-plot basis under the relevant Part L to accurately represent the final CO₂ emissions of the development.

- 6.7. Table 16 demonstrates the estimated site-wide energy reductions achieved.

Table 16. Site-wide kWh/yr Energy demand

	Energy Demand (kWh/yr)
DER Energy	544,347
Energy delivered by Renewables	472,899
	%
	86.9

7. Overheating Risk and Passive Design

7.1. Dwellings constructed today are likely to 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. Therefore, Passive design measures will be considered and incorporated to enhance resilience to climate change impacts throughout the lifetime of the development.

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

Approved Document O

7.5. To more robustly address overheating risk, the Government has introduced a new Approved Document, 'Part O', into the Building Regulations.

7.6. 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.

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

Addressing overheating risk

7.8. The cooling hierarchy described will be 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

7.9. The development is proposed to use traditional timber construction for the houses, which has a relatively low thermal mass, compared with masonry constructions.

7.10. Within the development layout, orientation and massing will be 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.

7.11. Wherever possible, dwellings 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.

8. Electric Vehicle Charging

- 8.1. 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.
- 8.2. The development will therefore provide EVC infrastructure in accordance with the technical requirements of Approved Document S: Infrastructure for charging electric vehicles.

9. Sustainable Construction Considerations

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

Materials

- 9.2. 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.

- 9.3. Within the development, choices will be made 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

- 9.4. 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

- 9.5. 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.

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

- 9.7. Wokingham Borough Council currently operates domestic waste collection services through which households can recycle materials including paper and cardboard, plastic bottles and food containers, tins, glasses and metal foils, together with garden waste.

- 9.8. 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

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

- 9.10. 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.

10. Water Conservation

- 10.1. 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.
- 10.2. 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.

- 10.3. 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.
- 10.4. 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.

- 10.5. In line with Part G of the Building Regulations, water use will be managed effectively to reduce the water consumption associated with the proposed development.
- 10.6. 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 to limit the use of water during the operation of the development.
- 10.7. Table 17 shows a typical specification to achieve a result less than the optional requirement for 110 litres/occupier/day calculated, in accordance with Building Regulations 17.K methodology.

Table 17. 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)	3	8.88
Taps (excluding kitchen taps)	flow rate (l/min)	3.50	7.11
Bath	Capacity to overflow (l)	155	17.05
Shower	Flow rate (l/min)	6	26.22
Kitchen sink taps	Flow rate (l/min)	6	13.00
Calculated Use			102.68
Normalisation Factor			0.91
Total Internal Consumption (L)			93.44
External Use			5.0
Building Regulations 17.K			98.4

11. Conclusions

- 11.1. This Sustainability Statement has been prepared by AES Sustainability Consultants Ltd to detail the proposed approach to sustainable construction to be employed at the development known as Park Lane, Charvil.
- 11.2. The development site is located East of Reading within the administrative boundary of Wokingham Borough Council.
- 11.3. The proposal would deliver up to 75 dwellings across a range of two-to-five-bedroom houses.
- 11.4. The statement has been prepared in support of the proposed development at Park Lane, Charvil to address both local and national policy in relation to the sustainable design and construction of dwellings. This includes relevant policies contained within the Wokingham Borough Council Adopted Core strategy (January 2010) and the Climate Change Interim Policy Statement (January 2022), along with requirements from the approval application ref: 232704 for the Park Lane development.
- 11.5. The statement demonstrates that by following a fabric first approach to demand reduction, combined with low carbon or renewable energy systems, the proposed development will deliver a level of energy performance and a reduction in CO₂ emissions in accordance with the current Building Regulation standards.
- 11.6. This statement shows that the development will be designed and constructed to meet Part L Future homes standards, this also shows that a Net-zero wouldn't be a viable approach if not required due to the heating and Photovoltaics required to reach the Net-Zero requirement. This would be due to maximum fit for photovoltaics on roofs.
- 11.7. It is proposed that dwellings constructed beyond the implementation of the Future Homes Standard, expected to be introduced in 2025, will meet a 75-80% reduction in CO₂ emissions compared with Part L 2021 regulatory standards.
- 11.8. The statement demonstrates that the development will achieve these carbon reductions through higher fabric standards and low carbon and renewable energy systems being installed to offset emissions and reduce fuel bills for residents.
- 11.9. Heating and PV system designs will be worked up at design stage, ensuring compliance with Part L 2021 and the proposed Future Homes Standard, subject to its final definition.
- 11.10. To ensure that the development is adaptable in accommodating a future shift in personal transportation to electric vehicles, the development will provide EVC infrastructure in accordance with the technical requirements of Approved Document S.
- 11.11. 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.
- 11.12. Appropriate provision for internal waste and recycling storage will be provided to ensure that recycling can be split into the appropriate streams for collection.
- 11.13. A typical water demand calculation shows how the development could achieve a water consumption of 98.4 Litres/Person/Day, significantly lower than the 125 Litres/Person/Day required under current Building Regulations standards.