

Land North of Sun Lane, Riseley, Berkshire

3West Group and Wellington Estate

Energy & Sustainability Statement

AES Sustainability Consultants Ltd

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This statement has been commissioned by 3West Group and Wellington Estate to detail the proposed approach to energy and CO₂ reduction to be employed in the development of Land North of Sun Lane, Riseley, Berkshire. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design progresses, whilst ensuring that the overall commitments will be achieved.

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1. Introduction

Preface

- 1.1. Written by AES Sustainability Consultants on behalf of 3West Group and Wellington Estate, this statement has been prepared in support of the Outline Planning application for development of Land North of Sun Lane, Riseley, Berkshire.

Development Description

- 1.2. The development site is located in the village of Riseley, Berkshire, approximately six miles south of Reading and eight miles north east of Basingstoke. It sits adjacent to the A33, with Sun Lane to the south and Bull Lane to the north. The illustrative site layout is shown in Figure 1. The development description is as follows;

"Outline application with all matters reserved except for access for the construction of up to 44 dwellings, including affordable housing together with access, landscaping and associated infrastructure (cross boundary application)."

Purpose and Scope of the Statement

- 1.3. This Energy Statement is in support of the Outline Planning application for development at Land North of Sun Lane, Riseley and details the proposed energy and CO₂ reduction strategy to be employed at the development. By following a fabric first approach and with the implementation of low carbon renewable technology, the development will reduce carbon emissions in excess of current Part L 2021 regulatory standards and align with forthcoming national standards, complying with relevant national and local planning policy.
- 1.4. Due to development timescales, the construction of the site is likely to fall under future Building Regulations, namely the governments proposed Future Homes Standard. The statement will detail how the development will seek to achieve the anticipated CO₂ emissions reductions, over a Part L 2013 compliant baseline, in line with this proposed standard, delivering 'zero carbon ready' buildings fit for the future. The development will achieve a minimum of a 63% reduction in carbon emissions, equivalent to a circa 75% reduction over Part L 2013, and accord with Policy CP1 of the Wokingham Borough Adopted Core Strategy DPD, January 2010.
- 1.5. It is important to note that the development will comply with the regulatory standards in place at the time of Reserved Matters Application.



Figure 1. Illustrative Site Layout

2. Planning Policy

Local Planning Policy

- 2.1. The development will address relevant planning policy contained within the Wokingham Borough Local Development Framework Adopted Core Strategy DPD, January 2010 as well as the accompanying Sustainable Design and Construction SPD, adopted May 2010. This statement is principally concerned with sustainable construction, energy use, CO₂ emissions and water efficiency; therefore, the relevant policies are as extracted below:

Policy 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

Policy CP1 Continued...

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.

- 2.2. Additionally, the development acknowledges the Wokingham Borough Local Plan Update 2023-2040. Regulation 19 consultation process has taken place and the proposed submission plan was submitted for examination on the 28th February 2025. The examination is progressing to Part 2 hearings, due for commencement in March 2026. It is important to note that the development will the regulatory standards and adopted policy in place at the time of Reserved Matters Application.

National Planning Policy Framework

- 2.3. In December 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.
- 2.4. 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.
- 2.5. Paragraph 164 sets out what is expected from new developments when considering strategies to mitigate and adapt to climate change:

164. 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 adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and
- b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.

Current National Policy Standards

- 2.6. The UK Government has committed to reducing greenhouse gas emissions to 'net zero' by 2050. This stands as the over-arching, legally binding target for the UK as recommended by the Climate Change Committee via a series of Carbon Budgets, which limit the volume of greenhouse gases emitted over a 5-year period.
- 2.7. The UK response to achieving Net Zero Carbon sets out several policies and proposals with the aim of transitioning to a sustainable future, including setting of national standards for new development.

Building Regulations Standards

- 2.8. The government introduced the latest revision in Building Regulations, known as Part L 2021 in December 2021, coming into effect for buildings where construction commenced after 15th June 2023. The current standards provide a 31% reduction in CO₂ emissions compared with the previous Building Regulations standard, alongside improvements to fabric standards and a focus on primary energy usage as a new compliance metric.

Future Homes Standard

- 2.9. In December 2023, the Government released the consultation on the forthcoming Future Homes Standard (FHS). The consultation presented two options aimed at delivering homes with carbon emissions at least 75% lower than Part L 2013 requirements.
- 2.10. 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 additionally includes solar photovoltaics and waste-water heat recovery, as well as a slightly lower design air leakage figure.
- 2.11. As of February 2026, a government response to the consultation, including publication of the proposed standard and calculation methodology, has not yet been published, however it is expected in early 2026 and therefore likely to be in place prior to any reserved matters applications.

Proposed Strategy

- 2.12. The energy strategy for the development aims to align with both adopted policy at the local level and expectations for future national regulation to deliver a sustainable development suitable for future use, that will be net 'zero carbon' in operation when the UK electricity grid is fully decarbonised.
- 2.13. To demonstrate this commitment to low carbon development, the proposals will seek to be compliant with the adopted carbon strategies at the time of reserved matters.
- 2.14. This will be achieved through following the energy hierarchy approach to low energy design, with consideration given to building design, passive solar design and energy efficient site-layouts as a first principle.
- 2.15. The buildings will be constructed following a fabric first approach, with insulation standards, thermal bridging and air leakage all improved beyond the current minimum compliance levels.
- 2.16. Low carbon and renewable energy systems will be installed to meet the residual energy demands in the most efficient way possible and further reduce CO₂ emissions arising from the buildings.
- 2.17. The following sections of this statement set out the sustainable design considerations which will be applied in order to deliver low energy, comfortable and affordable development.

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 TER by approximately 25% and a further 6% (9% for non-residential) respectively.
- 3.4. Part L 2021 has been mandatory from June 2023 and constitutes a much larger step change of a 31% reduction in emissions.
- 3.5. The Future Homes Standard is the Governments proposed next step in significantly reducing carbon emissions within the built environment and is expected to be introduced in early 2026, equating to a circa 75-80% improvement on Part L 2013, equivalent to a circa 63% uplift on current regulatory standards.

Table 1. CO₂ Emissions improvements from successive Part L editions

Building Regulations	CO ₂ emissions improvements preceding regulations
L1A 2006	-
L1A 2010	25%
L1A 2013	6%
L1 2021	31%
Future Homes Standard	Circa 75%

Energy Reduction Strategy

- 3.6. It is proposed that the energy demand reduction strategy for the development follows the Energy Hierarchy approach to sustainable construction, as shown in Figure 2.

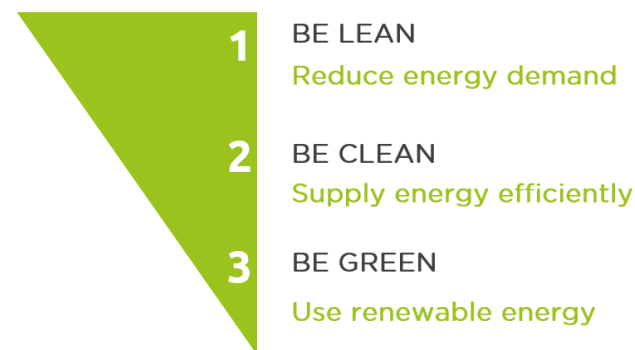


Figure 2. The Energy Hierarchy

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 and peak load in a variety of ways, with a focus on minimising heating, cooling and lighting loads. Key considerations include:
 - Building orientation - maximise passive solar gain and daylight.
 - Building placement - control overshading and wind sheltering.
 - Landscaping - control daylight, glare and mitigate heat island effects.
 - Building design - minimise energy demand through fabric specification.

Be Clean – supply energy efficiently

3.8. The design and specification of building services to utilise energy efficiently is the next stage of the hierarchy, considering:

- 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

4. Energy Demand Reduction

Layout for passive design

- 4.1. Wherever possible, the development will be designed to ensure that the dwellings are able to benefit from passive solar gain. This is achieved through appropriate dwelling spacing, allowing light penetration to all windows, also improving internal daylight levels.
- 4.2. Appropriate orientation of buildings can additionally assist with passive solar gain, and larger fenestration to southern facades will be prioritised. These measures must be balanced against reducing the risks of overheating.
- 4.3. The detailed development layout will respond to these requirements, with future reserved matters applications setting out how these principles have been considered.

Building Fabric – Energy Demand Reduction

- 4.4. As the Energy Hierarchy demonstrates, designing out energy use is weighted more highly than the generation of low-carbon or renewable energy to offset unnecessary demand.
- 4.5. Applied to the development of new buildings, this approach is referred to as 'fabric first' and concentrates finance and efforts on improving U-values, reducing thermal bridging, improving airtightness, and installing energy efficient ventilation and heating services.
- 4.6. 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.
- 4.7. 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

- 4.8. 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.
- 4.9. 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.
- 4.10. The TFEE is calculated based on the specific dwelling being assessed with reference values for the fabric elements contained within Approved Document L1A. These reference values are described as 'statutory guidance' as opposed to mandatory requirements, allowing full flexibility in design approach and balances between different aspects of dwelling energy performance to be struck so that the ultimate goal of achieving the TFEE is met. The proposed approach and indicative construction specifications are set out in the following sections of this Strategy.

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

Proposed Fabric Specification

- 4.11. 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 a potential fabric specification for the major building elements, with the first column in this table setting out the current Part L1 2021 limiting fabric parameters to demonstrate the improvements which will be sought.
- 4.12. Although precise requirements of the FHS are unknown at this stage, it is assumed that an increase in thermal insulation together with a further focus on thermal bridging of building elements and improved airtightness of buildings will form a key part of the requirements. These are indicated in the right-hand columns of the table

Table 3. Proposed construction specification - main elements

	Part L1 2021 Limiting Fabric Parameters	Potential FHS compliant Design Specification	Potential FHS compliant Design - Proposed Specification
External wall u-value	0.26 W/m ² K	0.25 W/m ² K	0.15-0.18 W/m ² K
Party wall u-value	0.20 W/m ² K	0.00 W/m ² K	0.00 W/m ² K
Plane roof u-value	0.16 W/m ² K	0.09 – 0.11 W/m ² K	0.09 W/m ² K
Ground floor u-value	0.18 W/m ² K	0.14 – 0.16 W/m ² K	0.11 – 0.12 W/m ² K
Windows u-value	1.6 W/m ² K	0.86 W/m ² K	0.85 W/m ² K
Doors u-value	1.6 W/m ² K	1.20 W/m ² K	1.20 W/m ² K
Air Permeability	8.00 m ³ /h.m ² at 50 Pa	4.00 m ³ /h.m ² at 50 Pa	4.00 m ³ /h.m ² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = ≤ 0.030 (indicative)	Y = ≤ 0.060 (indicative)

Thermal bridging

- 4.13. 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.
- 4.14. 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 calculations undertaken to establish energy demand of the dwellings (SAP or HEM), and as such thermal modelling will be undertaken to assess the performance of all main building junctions.

Air leakage

- 4.15. After conductive heat losses through building elements are reduced, convective losses through draughts are the next major source of energy wastage. The proposals assume a minimum airtightness standard of 4.00 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.

Eliminate Performance Gap

- 4.16. The reasons why buildings do not perform in accordance with design are increasingly understood. Part L1 2021 introduces a BREL report and photographic evidence requirement which will ensure that key areas of the build affecting thermal performance of each home must be inspected, photographed and reviewed. This process will help to ensure that any issues on a site can be identified prior to completion and handover and rectification works undertaken in a timely manner.

Fabric Energy Efficiency

4.17. 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/m ² /year)	Design Fabric Energy Efficiency (kWh/m ² /year)	Improvement %
1B2P	35.77	30.14	15.75
2B4P	52.78	42.57	19.34
3B4P	37.95	33.00	13.04
3B5P	40.75	34.91	14.32
4B6P	36.74	31.95	13.03

5. Low Carbon and Renewable Energy Systems

- 5.1. A range of low carbon and renewable energy systems have been assessed for their potential to deliver suitable emission savings.

District Energy Networks

- 5.2. District Energy Networks, or Heat Networks, deliver heat from a single or small number of generating plant to the distributed loads across an area, from a single building up to city scale. Where operating from locally generated heat, as opposed to waste or unwanted process heat for example, they are most suitable where there are numerous different heat loads (i.e. not purely residential) to provide a consistent baseload demand and allow for maximisation of plant efficiency.
- 5.3. The installation of heat networks is encouraged through government policy where they are demonstrably viable low carbon options.
- 5.4. There are currently no district heat networks which extend near the proposed development. High network heat losses associated with distribution predominantly to individual houses, as opposed to large high-rise apartment blocks and dense commercial developments, means that consideration of a new heat network to serve the area should be done carefully to understand both economic viability and environmental impact.

Heat Network - CO₂ Emissions

- 5.5. The carbon savings associated with a heat network would vary depending on the fuel source:
- Biomass – while potentially a low carbon fuel, this relies on a local, reliable source of fuel to avoid the import of biomass, giving rise to transport emissions considerations and concerns over the source of the fuel itself, which may be from unsustainable sources. The combustion of fuels on site additionally gives rise to potential air quality concerns associated with the release of particulates and NO_x emissions.
 - Waste heat – waste heat from industrial processes, refrigeration or other low-grade heat sources can be utilised to provide a proportion of heating demand on a network. There are not known to be any appropriate sources of waste heat in the location of the development and therefore this option is not feasible
 - Gas – this can be burned directly or in a CHP engine. Neither will deliver significant carbon reductions and are not compatible with future regulatory standards.
 - Heat pumps – a fully electrified approach via large scale air or ground source heat pumps is the only potential option which would deliver significant carbon reductions

compatible with anticipated regulatory requirements, while continuing to improve with ongoing grid decarbonisation.

- 5.6. Consideration of energy networks for the development would therefore be restricted to renewable-energy opportunities only, such as heat pump led schemes.

Distribution loss factor

- 5.7. A proportion of heat generated by the central plant for distribution through a heat network will be lost during transmission, as a function of the both the temperature of water and the level of insulation of the pipework. The proportion of heat lost is directly related to the overall energy or CO₂ saving potential of a network and therefore should form a key consideration when assessing the overall benefit of installation.
- 5.8. Previously, a default loss value of 1.05 – i.e. 5% losses – was considered a 'default' state utilised for Building Regulations compliance calculations. Documents published alongside the Part L 2021/Future Homes standard consultation presented several case studies demonstrating that, in reality, loss factors may be significantly higher – potentially as high as 50% for large networks. The consultation therefore proposed a change to the default assumptions to more accurately reflect these losses in line with emerging in-use evidence.
- 5.9. SAP10 therefore currently adopts a default distribution loss factor (DLF) of 1.5 (33% heat loss) where the network is signed off in accordance with the CIBSE/ADE 'Heat Networks: Code of Practice for the UK'. In the absence of a confirmed declaration to this effect, a default DLF of 2.0 is applied (50% heat loss).

Heat networks - Protection for the consumer

- 5.10. Where a development is served by a heat network, the residents and building owners are naturally tied into a single supplier for their heat and hot water. With limited consumer choice there is the risk that companies could capitalise on their guaranteed customer base through increasing prices or providing a poor service, and with the long supply contracts necessary to ensure commercial viability for the supplier there would be little potential for a competitive environment to reduce pricing.
- 5.11. At this stage it is assumed that the development will pursue an individual heating systems approach as this is considered the most appropriate solution. This solution will deliver maximum flexibility and equivalent carbon savings from the heating technologies while avoiding distribution losses.

Wind Power

- 5.12. 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.
- 5.13. 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 effective⁴. For this reason, as well as the likely adverse environmental and amenity impacts, wind power is not considered feasible.

Building Scale Systems

- 5.14. 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)
- 5.15. The advantages and disadvantages of these technologies are evaluated in Tables 5-10.

Table 5. 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 or buildings provided sufficient space can be accommodated for fuel supply, delivery and management. Air quality concerns in addition to increased transport emissions for fuel delivery mean that it is not a preferred technology for the development.	

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

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

Table 6. Solar Thermal systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Mature and reliable technology offsetting the fuel required for heating water • 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, however the contribution to carbon reduction is expected to be low and therefore it is not a preferred technology.	

Table 7. 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 (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 £1,300 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. PV panels can be sensitively integrated into the housing typologies and non-domestic buildings through detailed design to ensure no adverse visual or amenity impacts The relatively low cost and limited additional impacts mean that PV is considered a feasible option for this development.	

Table 8. 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	- 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, requires good system design
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 and due to the high carbon saving potential are considered a preferred technology. Detailed design can ensure that these systems are integrated carefully to avoid any adverse visual amenity impacts.	

Table 9. 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 - 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+ - Estimated simple payback at circa 18 years (systems only) - Running cost linked to COP of heat pump, however may be 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. Communal schemes utilise an approach which is typically funded through annual homeowner payments, increasing overall costs. In addition, the capital 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 10. 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	
- Cost circa £2,500 - Potentially cost-effective where hot water heating is largest proportion of heat demand (e.g. apartments) - Avoids need for external heat exchanger	
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. Hot water heat pumps are considered a suitable low-carbon technology at this stage.	

Summary

5.16. 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 buildings. Local NO_x and particulate pollution is 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. In addition, these are typically installed as communal arrays with borehole ownership transferring to a third party who will require an annual payment from the occupier, increasing running costs.

5.17. Air Source Heat pumps are considered the most appropriate low carbon renewable energy systems for the development, delivering significant carbon emission reductions and aligning with the trajectory of future regulatory standards.

5.18. Solar photovoltaic panels are also expected to feature in the governments Future homes Standard (FHS), with the methodology of calculating precise arrays to be determined.

5.19. In accordance with Policy CP1 of the Adopted Core Strategy, low carbon renewable energy systems will contribute towards achieving a minimum of 63% reductions in carbon emissions via on-site measures and align with the pathway of future regulations in reaching 'zero-carbon' development.

Electrification of heat

- 5.20. To meet the carbon reduction requirements of the Future Homes and Future Buildings Standards, it is assumed that heating systems based on the local combustion of fossil fuels will no longer be appropriate, with all heating to be electrified. The selected low carbon systems must therefore be capable of delivering space and water heating demands.
- 5.21. This approach will ensure that buildings reduce emissions over time with no further intervention, alongside the electricity grid as it continues to rapidly decarbonise.

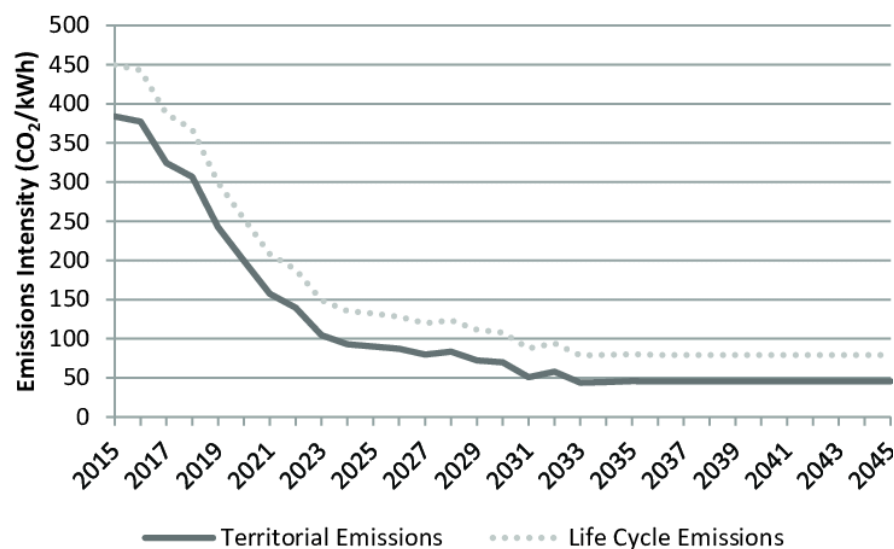


Figure 3. UK electricity grid emissions intensity projections

Low carbon heating systems

- 5.22. To take full advantage of the low carbon opportunities that electrification of heat provides; the energy must be used efficiently.
- 5.23. It is proposed that the development will supply heat through air source heat pump systems, taking advantage of 'free' environmental heat to boost system efficiencies to 250% or above, delivering effective carbon intensity of heat of 2.5-3.5 times lower than the electricity grid.
- 5.24. These measures alone will deliver carbon reductions of circa 60-70% over Part L 2021 standards, and support the scheme in meeting the Future Homes Standard.

Renewable Energy

- 5.25. Any shortfall from the FHS carbon reduction requirements will be met through on-plot generation of renewable energy.
- 5.26. It is considered that solar PV systems are most appropriate in meeting a significant proportion of energy demand without introducing additional energy loss through larger hot water cylinders. These will be primarily installed to southerly facing roof pitches, with the specific units and system sizes to be assessed when bringing forward detailed designs as the development progresses.

6. Indicative As Designed CO₂ Emissions

- 6.1. The development is to be designed and constructed to meet the requirements of the FHS, therefore compliance with these standards form the first stage in the sustainable construction approach.
- 6.2. Compliance is currently 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.
- 6.3. Calculations have been undertaken to an indicative sample of house types to assess the estimated carbon emissions of the development. The proposed carbon emissions are reported against the Part L 2021 baseline in Table 11.

Table 11. CO₂ emissions by house type

House type	DER CO ₂ emissions (kgCO ₂ /m ² /yr)	TER CO ₂ emissions (kgCO ₂ /m ² /yr)	% Reduction
1B2P	4.98	15.09	67.00
2B4P	4.10	12.47	67.12
3B4P	3.88	11.71	66.87
3B5P	3.33	10.70	68.88
4B6P	3.22	10.30	68.74

Table 12. Estimated residential site-wide CO₂ emissions

	Part L 2021 CO ₂ emissions (kgCO ₂ /yr)		Part L 2013 CO ₂ emissions (kgCO ₂ /yr)	
Part L compliant	39,601		57,392	
As Designed	12,874			
	kgCO ₂ /yr	%	kgCO ₂ /yr	%
Total savings	26,727	67.00	44,518	78.00

- 6.4. Table 12 shows the estimated site-wide emission reductions over a Part L 2021 baseline based on the approach described. The headline Future Homes Standard target was expressed as 75% over Part L 2013, and therefore it is demonstrated that the proposed strategy delivers CO₂ reductions in line with the forthcoming standard, with additional savings likely to be achieved through ongoing grid decarbonisation.

7. Climate Change Resilience

- 7.1. Buildings 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 resilient to future climate change impacts such as increases in temperature, rainfall, wind and sea level. Climate resilience is important to homeowners and building occupiers against a backdrop of increasingly extraordinary weather events.
- 7.2. Passive design measures will therefore be considered and incorporated to enhance resilience to climate change impacts throughout the lifetime of the development.
- 7.3. 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
- 7.4. 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

- 7.5. 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

- 7.6. To address overheating risk more robustly, the Government has introduced a new Approved Document, 'Part O', into the Building Regulations.
- 7.7. 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.
- 7.8. This assessment will be undertaken at the start of detailed design and any mitigation measures that may be required will be built in.



8. Sustainable Construction Considerations

Materials

- 8.1. 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.
- 8.2. 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

- 8.3. 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

- 8.4. 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.
- 8.5. Wokingham Borough Council currently operates domestic waste collection services through which households are able to recycle materials including paper and cardboard, plastic bottles and food containers, tins, glasses and metal foils, together with garden waste.

Construction waste

- 8.6. The construction process will be managed 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. m³ of waste per 100m² / tonnes waste per m².
- 8.7. 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.

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 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,

- 1.1. 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. Table 13 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 13. Water Demand Calculation

Installation Type	Unit of measure	Capacity/flow rate	Litres/person/day
WC (dual flush)	Full flush (l)	4	5.84
	Part flush (l)	2.6	7.7
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
Bath (where shower also present)	Capacity to overflow (l)	199	21.89
Shower (where bath also present)	Flow rate (l/min)	8	34.96
Kitchen sink taps	Flow rate (l/min)	5	12.56
Calculated Use			112.5
Normalisation Factor			0.91
External Use			5.0
Total Consumption			107.4

10. Conclusions

- 10.1. This Energy Statement has been prepared by AES Sustainability Consultants on behalf of 3West Group and Wellington Estate to detail the proposed approach to energy and CO₂ reduction for development of Land North of Sun Lane, Riseley, Berkshire.
- 10.2. A review of National policy including the NPPF and relevant recent Government statements has established that the Building Regulations are considered the appropriate method for setting standards relating to energy use and CO₂ emissions, considering building design and site-layout to further reduce energy consumption.
- 10.3. Current adopted planning policy expresses a target of emission reductions which is aligned with the forthcoming Future Homes Standard, currently scheduled to be introduced early in 2026.
- 10.4. The strategy to deliver low energy, low carbon homes focus on a 'Fabric First' approach which prioritises improvements to the fabric of the dwellings to avoid unnecessary energy demand and consequent CO₂ production. Low carbon heating systems in the form of air source heat pumps are proposed, delivering space heating and hot water demand at very high efficiency, delivering a 'zero carbon ready' development.
- 10.5. This approach will be supplemented with renewable technology, as required, to meet the carbon reduction standards and ensure a minimum 63% reduction in CO₂ emissions over 2021 regulatory standards, equivalent to a circa 75% reduction over Part L 2013 regulatory standards - or as defined in the FHS, upon confirmation.
- 10.6. Indicative SAP calculations show site-wide annual savings of circa 26,727 kgCO₂/yr or 67% over a Part L 2021 baseline. Design SAP calculations will be produced as the development progresses, ensuring the relevant targets are delivered.
- 10.7. Climate resilience will be considered through development layout, materials choices and passive design measures, with overheating assessments being undertaken during detailed design to ensure that buildings are adaptable to a future changing climate.
- 10.8. Through the proposed strategy, the development exceeds adopted policy relating to sustainable construction standards and aligns with the forthcoming uplift in regulatory standards.
- 10.9. This statement additionally details the proposed approach to addressing overheating risk, sustainable and responsible material usage and water consumption, providing an indicative specification that achieves a water efficiency standard of 110 litres/person/day, in accordance with Building Regulations Part G.