

Former Arborfield Studios (Parcels W, Y and Z), Arborfield Green Crest Nicholson Operations Ltd

Energy & Sustainability Statement

24th August 2026

Revision 02

AES JOB NUMBER 9267

Revision	Date	Comments	Prepared by	Reviewed by	Approved by
00	27.02.2026	First Issue	Ruth Pike	Mitchel Armitage	MA
01	13.07.2026	Updates to description	Ruth Pike	Joshua Collet	JC
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- 1.3 Save as required in the Retainer, modelling carried out by us and in the preparation of the Report has been carried out in accordance with the guidance issued by the BRE.
- 1.4 This Report reflects the position as at 13th July 2026

Sources

- 1.5 This Report is based on our review and analysis of the information provided by the Client and Design Team (the "Information"), upon which we have relied in compiling this Report.
- 1.6 We have not sought to establish the accuracy of the Information or the reliability of these sources by reference to independent evidence, but where any independent evidence has been obtained, we have relied upon it for the purpose of preparing this Report.

Assumptions

- 1.7 In relation to each of the source materials provided to us, we have assumed that:
- 1.8 any Information supplied was, when supplied, and continues to be, true accurate and not misleading;
- 1.9 none of the Information has been superseded; and
- 1.10 there is no other information which has not been disclosed to us and which has or may have a bearing on or which is or may be material or significant in relation to any of the Information disclosed to us.

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1. Introduction

Preface

- 1.1. Written by AES Sustainability Consultants on behalf of Crest Nicholson Operations Ltd, this Energy and Sustainability Statement has been prepared in support of the hybrid planning application at Former Arborfield Studios (Parcels W, Y and Z) Arborfield Green. This planning application falls under the jurisdiction of Wokingham Borough Council.

Development Description

- 1.2. The Former Arborfield Studios are situated to the far north of Arborfield Green, an existing development site of approximately 167 hectares that forms part of the wider Arborfield Garrison Strategic Development Location (SDL) and allocated within Wokingham Borough Council's Core Strategy (2010).
- 1.3. The site is included within Wokingham Borough Council's draft submission Local Plan Update (Policy SS11) as land allocated for 'around 300' additional homes within the Arborfield Green SDL boundary.
- 1.4. This statement has been prepared in support of a hybrid planning application which seeks approval for the following:
 - 1.5. *Full planning application for the demolition of existing buildings and construction of new homes, together with creation of accesses, parking, green infrastructure (including landscaping, public open space, play areas), associated drainage, roads, substations, plant, bin and cycle storage and other related infrastructure works.*
 - Outline planning application (all matters reserved except for access) for the construction of up to 2 new homes including through the retention (of whole or part) and conversion of the existing Langley Common Farmhouse.*
- 1.6. This energy and sustainability statement sets out the proposed approach to sustainability for the application at the Former Arborfield Studios.



1.7.

Figure 1 - Proposed Site Layout - Former Arborfield Studios.

Purpose and Scope of the Statement

- 1.8. This statement will address relevant national and local policies relating to sustainable development, including Wokingham Borough Council Local Plan Policy CP1 and Policy CC04: Sustainable Design and Construction of the Wokingham Borough Council Managing Development Document (MDD).
- 1.9. This statement will also demonstrate that the development will incorporate sustainable design considerations and ensure that a significant reduction in carbon dioxide emissions is achieved to align with the upcoming future homes standard and beyond to future proof the scheme to deliver exemplary standards of construction as well as addressing the climate emergency declared by Wokingham Borough Council in 2019.
- 1.10. The calculations have followed the energy hierarchy throughout to lower energy demand through passive design measures in the first instance, then adding renewable energy technologies to maximise carbon emissions on site and future proof the development for upcoming changes to the building regulations.

2. Planning Policy

National Planning Policy Framework

- 2.1. The National Planning Policy Framework (NPPF) sets out the Government's policies for plan-making and for making decisions on development proposals in England.
- 2.2. In August 2026, the Ministry for Housing, Communities and Local Government (MHCLG) published a new NPPF to replace the previous version (December 2024) with immediate effect.
- 2.3. Chapter 5 of the 2026 NPPF (*Meeting the challenge of climate change*) includes guidance which is particularly relevant to the proposed energy performance and climate resilience of this development:

The objective of the policies in this chapter is to support the transition to net zero by 2050 and to shape places in ways which are more resilient to the effects of climate change.

It does this by setting out policies to shape places in ways that contribute to radical reductions in greenhouse gas emissions and adapt to the full range of current and potential impacts of climate change, by minimising vulnerability and improving resilience.

CC1: Planning for Climate Change

1. Development plans should take a proactive approach to mitigating climate change and supporting the transition to net zero, in accordance with the objectives and provisions of the Climate Change Act 2008. They should also take a proactive approach to adapting to climate change, taking into account the implications of extreme weather and long-term climate trends including overheating, wildfires, drought, flood risk, coastal change, water supply, biodiversity and landscapes. They should do this by:
 - a. Proposing development patterns through their spatial strategy and allocations which
 - i. Can help contribute to radical reductions in greenhouse gas emissions (which can be informed by an assessment of baseline carbon emissions and the potential effect of development options on future emissions and their mitigation), and
 - ii. Avoid increased vulnerability and improve resilience to the risk of climate change.
 - b. Addressing any specific risks from climate change in their proposed allocations for development, and necessary adaptations, both of which should be considered for the anticipated lifetime of the development,
 - c. Setting local water efficiency standards for new development where these are justified
 - d. Identifying opportunities for green infrastructure provision and nature based solutions which can safeguard and improve carbon storage, support nature recovery and resilience, and which take account of Local Nature Recovery Strategies.
- 2.4.

CC2: Mitigation of Climate Change

1. In order to contribute to climate change mitigation and the transition to net-zero, development proposals should, where relevant to the proposal:
 - a. Accord with policies TR3 and TR4 (promoting sustainable transport) so that sustainable patterns of movement are prioritised, and infrastructure is provided to support the transition to zero emission vehicles,
 - b. Support good access to facilities in order to limit the need to travel,
 - c. Use design approaches that conserve energy and other resources,
 - d. Take advantage of opportunities to re-use existing structures and materials,
 - e. Take advantage of opportunities to draw low carbon energy from decentralised networks (such as district heat networks), where these are available, and to co-locate energy and heat generators and users, especially to take advantage of suppliers of surplus heat and energy,
 - f. Contribute to the creation and restoration of habitats, while avoiding harm to habitats
 - g. Not involve the extraction of fossil fuels
2. Substantial weight should be given to the benefits of improving energy efficiency of existing buildings and/or drawing energy efficiency from district heat networks, renewable and low carbon sources (including through the installation of heat pumps) and solar panels.

CC3: Adaptation of climate change

1. Development proposals should take into account the current and potential impacts of climate change over the lifetime of the scheme, and in order to minimise vulnerability to these impacts should, where relevant to the proposal:
 - a. Be located where the risk of flooding is minimised
 - b. Comply with Policy F9 (Coastal change management areas) where development would be located in an area vulnerable to coastal change,
 - c. Incorporate sustainable drainage systems to manage surface water flow rates and reduce volumes of runoff,
 - d. Use design approaches which minimise the risks from overheating in accordance with Policy DP3 (Key principles for well designed places)
 - e. Incorporate proportionate measures against wildfires
2. Substantial weight should be given to the benefits of improving the resilience existing buildings and public spaces to anticipated climate change impacts where this would be achieved through proposals for development.

Plan-making Policies

- 2.5. Section 2 of the 2026 NPPF (*Plan-Making Policies*) requires local planning authorities produce and maintain key documentation, so the planning process allows residents to influence in how development and growth is prioritised in their area.

- 2.6. Required documents include spatial development strategies, a local plan, a policies map, and may also include supplementary and neighbourhood specific plans for future development.
- 2.7. Policy PM13 is relevant to this document, as locally written council policies are expected not to contradict nationally approved standards:

PM13:Setting Standards

1. Quantitative standards set through development plan policies for infrastructure provision, affordable housing requirements, parking, density, and design and placemaking should provide clarity and a high degree of certainty about the requirements that relevant development proposals are expected to meet. Such standards should:
 - a. Be justified, drawing upon relevant evidence of local characteristics and needs, while utilising or adapting relevant national standards where it is appropriate to do so. Evidence in support of standards should be proportionate, in accordance with Policy PM8, especially where relevant national standards already exist, and
 - b. Not cover matters which are already addressed by Building Regulations, other than in relation to:
 - i. Accessibility standards, for which local standards in relation to requirement M4(2) and/ or M4(3) of the Building Regulations should be set in accordance with Policy HO5 (Meeting the needs of different groups); or
 - ii. Water efficiency, for which it may be appropriate to apply the tighter Building Regulations optional requirement when justified, or exceptionally a more stringent local standard in areas of serious water stress; or
 - iii. Energy efficiency, for which any standards that go beyond the current or proposed Building Regulations should have a clear and robustly costed rationale which shows that there will not be an adverse impact on the viability and deliverability of development. Any such standards should be expressed as a percentage uplift of a dwellings Target Emission Rate (TER) calculated using a specified version of the Standard Assessment Procedure (SAP) or other approved calculation methodology.
2. Quantitative standards should not cover other matters, or relate solely to the internal layout of buildings unless:
 - a. They are to implement a nationally described space standard; or
 - b. They have a clear or robustly costed rationale, are proportionate and will not have an adverse impact on the viability and deliverability of development.

Current National Policy Standards

- 2.8. 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.
- 2.9. 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.
- 2.10. 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.

- 2.11. 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.
- 2.12. The built environment plays a key role in delivering these international commitments. 2025 data show buildings and their users account for 22% of the UK's total CO₂ generation; approximately two thirds of this total is attributed to the UK's existing housing stock.

Local Planning Policy

- 2.13. Local policy relating to the sustainable design and construction of buildings is contained within the Wokingham Borough Council Core Strategy, adopted in 2010 and the Wokingham Borough Council Managing Development Document (MDD). The following extracts from these documents are relevant to the energy strategy, further information can be found in the environmental statement that accompanies the application.
- 2.14. In addition to the adopted plans detailed below, Wokingham Borough Council are also working on an emerging Local Plan.

Wokingham Borough Council Core Strategy (Jan 2010)

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);*

Wokingham Borough Managing Development Document (Feb 2014)

Policy 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.

The Future Homes Standard and future Zero carbon policy

- 2.15. The applicant is committed to adhering to the forthcoming changes to the Building Regulations known as the Future Homes Standard which will introduce a step change of 75-80% CO₂ reduction over ADL 2013 later in 2026.

Proposed Strategy

- 2.16. It is proposed that the development is designed to incorporate all applicable guidance contained within Policy CP1 and Policy CC04 relating to renewable energy provision and the construction of highly efficient buildings which seek to minimise energy demand and CO₂ emissions.
- 2.17. It is proposed that the dwellings will be constructed following a fabric first approach to meet, and exceed the current Building Regulations, with insulation standards, thermal bridging and air leakage all improved beyond the minimum compliance levels.
- 2.18. In addition, consideration will be given to building design, passive solar design and energy efficiency site-layouts where possible, together with the installation of low carbon energy systems to further reduce carbon emissions arising to address the climate emergency declared by Wokingham Borough Council in 2019.
- 2.19. The following sections of this statement set out the sustainable design considerations which will be applied to the dwellings in order to deliver low energy, comfortable and affordable housing.
- 2.20. There are many other aspects of sustainability which relate to new housing development and will be considered further within this statement, including water use and the environmental impacts of materials, construction and household waste.

3. Energy Consumption and CO₂ Emissions

- 3.1. As one of the key areas of ongoing impact of any development, the energy demand of the dwellings to be constructed is a key consideration in the overall sustainability strategy.
- 3.2. As set out within the policy review section of this statement, it is considered that Building Regulations form the minimum requirement for new dwellings in terms of energy performance.
- 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 became mandatory from June 2023, which constitutes a much larger step change of a 31% reduction in emissions.

Table 1. CO₂ Emissions improvements from successive Part L editions

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

Energy Reduction Strategy - Fabric First

- 3.5. The proposed construction specification and sustainable design principles to be applied to the development will ensure that each dwelling meets the CO₂ reductions mandated by Part L of the Building Regulations through fabric measures alone.
- 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. 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 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, 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 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. 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.

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

Table 2. Benefits of the Fabric First approach

	Fabric energy efficiency measures	Bolt-on renewable energy technologies
Energy/CO ₂ /fuel bill savings applied to all dwellings	✓	✗
Savings built-in for life of dwelling	✓	✗
Highly cost-effective	✓	✗
Increases thermal comfort	✓	✗
Potential to promote energy conservation	✓	✓
Minimal ongoing maintenance / replacement costs	✓	✗
Significant disruption to retrofit post occupation	✓	✗

Building Regulations Standards – Fabric Energy Efficiency

- 3.13. In addition to the CO₂ reduction targets, the importance of energy demand reduction was further supported by the introduction of a minimum fabric standard into Part L1A 2013, based on energy use for heating and cooling a dwelling. This is referred to as the 'Target Fabric Energy Efficiency' (TFEE) and expressed in kWh/m²/year.
- 3.14. This standard enables the decoupling of energy use from CO₂ emissions and serves as an acknowledgement of the importance of reducing demand, rather than simply offsetting CO₂ emissions through low carbon or renewable energy technologies.
- 3.15. The TFEE is calculated based on the specific dwelling being assessed with reference values for the fabric elements contained within Approved Document L1. These reference values are described as 'statutory guidance' as opposed to mandatory requirements, allowing full flexibility in design approach and balances between different aspects of dwelling energy performance to be struck so that the ultimate goal of achieving the TFEE is met. The proposed approach and indicative construction specifications are set out in the following sections of this Strategy.

Proposed Fabric Specification

- 3.16. In order to ensure that the energy demand of the development is reduced, the dwellings should be designed to minimise heat loss through the fabric wherever possible. Table 3 details the proposed fabric specification of the major building elements, with the first column in this table setting out the Part L limiting fabric parameters in order to demonstrate the improvements to be delivered.

Table 3. Indicative construction specification – main elements

	Part L Limiting Fabric Parameters	Design Specification
External wall – u-value	0.26 W/m ² K	0.20 W/m ² K
Party wall – u-value	0.20 W/m ² K	0.00 W/m ² K
Roof – u-value	0.16 W/m ² K	0.09 W/m ² K – Plane 0.15 W/m ² K – Bay
Ground floor – u-value	0.18 W/m ² K	≤ 0.15 W/m ² K
Windows – u-value	1.60 W/m ² K	1.20 W/m ² K
French doors – u-value	1.80 W/m ² K	1.30 W/m ² K
Doors – u-value	1.60 W/m ² K	1.20 W/m ² K
Air Permeability	8.0 m ³ /h.m ² at 50 Pa	4.50 m ³ /h.m ² at 50 Pa
Ventilation	Natural Ventilation with Intermittent extract fans	Vent axia Lo-Carbon dMEV

Thermal bridging

- 3.17. 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.
- 3.18. 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.
- 3.19. All junctions have been modelled and perform better than those as outlined in Appendix R of the SAP conventions.

Air leakage

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

Provisions for Energy-Efficient Operation of the Dwelling

- 3.21. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services. Currently it is assumed that all dwellings will be provided with air source heat pumps, fully insulated primary pipework, and multi-zone zone controls to avoid unnecessary heating of spaces when not required.

4. Baseline CO₂ Emissions

- 4.1. The development is to be designed and constructed to meet the requirements of Part L of the Building Regulations 2021, therefore compliance with this standard forms the first stage in the sustainable construction approach.
- 4.2. Part L 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. In order to measure the effectiveness of demand-reduction measures, it is first necessary to calculate the baseline energy demand and this has been done using SAP 10.2 methodology.
- 4.4. The resulting ADL 2021 Baseline for the proposed Development has been calculated using Part L model designs which have been applied to the Applicant's Development details. The TER, or baseline energy demand, represents the maximum CO₂ emissions that are permitted for the proposed Development in order to comply with ADL 2021.
- 4.5. The resulting TER has been calculated and displayed in Table 4, below.

Table 4. Part L compliant baseline CO₂ emissions for the site – Residential and community centre combined

	Part L Compliant CO ₂ emissions (kgCO ₂ /year)
Site-wide emissions baseline	309,170

5. Reduced Energy Demand – Be Lean

- 5.1. Many Local Planning Authorities are now recognising the benefits of a fabric-first approach, where the lifetime energy consumption of a building takes precedence over the use of bolt-on renewable energy technologies. It is clear that the fabric-first approach can create buildings with a very comfortable living and working environment. The internal temperature is consistent, and fuel bills are kept to a minimum. One key advantage of a fabric-first approach is that it does not require changes to the behavioural patterns of the occupants and, as such, a building designed using a fabric-first approach will often perform more effectively once completed than a building that incorporates a low-carbon or renewable-energy technology that requires behavioural change (e.g. solar thermal). This becomes an increasingly important consideration as energy costs rise and the issue of fuel poverty becomes commonplace.
- 5.2. AES Sustainability consultants has considered a fabric-first approach as the priority solution for this proposed Development.
- 5.3. The Applicant will integrate the following design measures to reduce energy demand:
- Energy-efficient building fabric and insulation to all heat loss floors, walls and roofs.
 - High-efficiency double-glazed windows throughout.
 - Quality of build will be confirmed by achieving good air-tightness results throughout.
 - Efficient-building services including high-efficiency heating systems.
 - Low-energy lighting throughout the building.
- 5.4. Whilst the steps of the energy hierarchy have been followed, due to the change in methodology between ADL 2013 and ADL 2021, it is not possible to show a reduction over the baseline with fabric measures alone. This is because the notional calculation includes renewables within the baseline, therefore, if we were to present a scenario where no renewables were incorporated, the emissions would be greater than the baseline. However, the fabric specification has not deviated from the originally submitted energy strategy, so we would expect the results to be the same if we were to be using the methodology of ADL 2013.

6. Low Carbon and Renewable Energy Systems

- 6.1. A range of technologies have been assessed for potential incorporation into the scheme in accordance with Regulation 25A of the Building Regulations and with the intent of meeting Part L 2021 and the relevant policies within the adopted Wokingham Council Local Plan.

Wind Power

- 6.2. Locating wind turbines adjacent to areas with buildings presents a number of potential obstacles to deployment. These include the area of land onsite required for effective operation, installation and maintenance access, environmental impact from noise and vibration, visual impact on landscape amenity and potential turbulence caused by adjacent obstacles.
- 6.3. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 5.2 m/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

- 6.4. The remaining renewable or low carbon energy systems considered potentially feasible are at a building scale. These are as follows;
- Individual Biomass Heating
 - Solar Thermal
 - Solar Photovoltaic (PV)
 - Air Source Heat Pumps (ASHPs)
 - Ground Source Heat Pump (GSHPs)
- 6.5. The advantages and disadvantages of these technologies are evaluated in Tables 5-9.

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

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

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 not considered technically feasible in this development scheme due to insufficient space and difficulty in securing adequate fuel supply.	

Table 6. Solar Thermal systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Mature and reliable technology offsetting the fuel required for heating water (typically gas) • Solar thermal systems require relatively low maintenance • Typically, ~50% of hot water demand in dwellings can be met annually	• Installation is restricted to favourable orientations on an individual building basis • The benefit of installation is limited to the water heating demand of the building • Safe access must be considered for maintenance and service checks • Buildings need to be able to accommodate a large solar hot water cylinder • Distribution losses can be high if long runs of hot water pipes are required • Visual impact may be a concern in special landscape designations (e.g. AONB)
Estimated costs and benefits	
• Cost £2,000 - 5,000 for standard installation • Ongoing offset of heating fuel, minimal maintenance requirements	
Conclusions	
Solar thermal systems are considered feasible for the development proposals.	

Table 7. Solar Photovoltaic systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
- The technology offsets the high carbon content of grid supplied electricity used for lighting, pumps and fans, appliances and equipment - Mature and well proven technology that is relatively easily integrated into building fabric - Adaptable to future system expansion - Solar resource is not limited by energy loads of the dwelling as any excess generation can be transferred to the national grid - PV systems generally require very little maintenance - 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 - Safe access must be considered for maintenance and service checks - Visual impact may be a concern in special landscape designations (e.g. AONB) or conservation areas - Reflected light may be a concern in some locations
Estimated costs and benefits	
- Cost £1,500 upwards (1kWp+) and scalable - Ongoing offset of electricity fuel costs, minimal maintenance requirements	
Conclusions	
PV panels are considered technically feasible for all buildings with suitable roof orientations. The relatively low cost, high carbon saving potential and limited additional impacts mean that PV is considered a feasible option for this development.	

Table 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 - Will benefit from ongoing decarbonisation of the electricity grid	- Air source heat pumps are powered by electricity, leading to potentially higher fuel bills than gas heating systems - It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved. Users must be educated in how heat pump systems should be operated for optimal efficiency - Air source heat pump plant should be integrated into the building design to mitigate concerns regarding the visual impact of bolt-on technology - Noise in operation may be an issue particularly when operating at high output
Estimated costs and benefits	
- Cost circa £2,000 - Low space requirements and no external unit - Significant running cost reduction compared with direct immersion - Low carbon water heating	
Conclusions	
Air source heat pumps are considered technically viable for the development proposals. Significant reductions to carbon emissions are achieved and would align with the future homes standard by moving away from the on-site combustion of fossil fuels.	

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 - Will benefit from ongoing decarbonisation of the electricity grid	- Low temperature heating circuits (underfloor heating) would be required to maximise the efficiency of heat pumps - A hot water cylinder would also be required for both space and water heating - Ground source heat pumps are powered by electricity, leading to potentially higher fuel bills than gas heating systems - It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved - Ground source heat pumps either require significant land to incorporate a horizontal looped system or significant expense to drill a bore hole for a vertical looped system
Estimated costs and benefits	
- Cost circa £10,000+ - Shared ground loop approach eligible for non-domestic RHI. Estimated simple payback at circa 18 years (systems only) - Running cost linked to COP of heat pump, circa 3.0 equates to 66% reduction vs electricity or around 5-6p/kWh (higher than mains gas) - Additional costs to upgrade electricity infrastructure currently unknown	
Conclusions	
Ground source heat pumps are not considered a technically-viable option for this development scheme as there are physical constraints in terms of ground conditions and area available for installation. The capital installation cost would also be high which leads us to the conclusion that GSHPs would not be a commercially viable option for this development scheme.	

6.6. The following low-carbon and renewable energy technologies, summarised below, are considered potentially-viable options for the proposed Development.

Table 10: Summary of feasible technologies

Feasible	Unfeasible
• Solar Photovoltaic • Aerothermal • Solar Thermal	• Wind • Geothermal • Biomass

7. Indicative Dwelling Performance

- 7.1. 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 ASHPs to serve domestic hot water and space heating demand.
- 7.2. 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 11 and 12.

Table 11. Indicative dwelling performance including ASHPs and PV – CO₂ emissions.

House type	Part L compliant emissions (kgCO ₂ /year)	As-designed emissions (kgCO ₂ /year)	Improvement %
1 Bed Flat	14.10	5.44	61.42
2 Bed Flat	10.46	3.54	66.16
AFR 2B3P	11.71	3.83	67.29
AFR 3B4P	10.92	3.57	67.31
AFR 4B5P	10.10	3.21	68.22
Caldwell	12.13	5.04	58.45
Chelmsford	11.76	4.62	60.71
Dromer	12.34	6.04	51.05
Edenbridge	10.82	4.31	60.17
Edgeworth	10.82	4.32	60.07
Fairford	10.56	4.03	61.84
Richmond	10.67	4.30	59.70
Salcott	9.49	3.82	59.75
Winchester	9.72	3.56	63.17
Winslow	9.89	4.02	59.35

Fabric Energy Efficiency

- 7.3. Table 12 demonstrates that the dwellings will exceed the uplifted Fabric Energy Efficiency targets within Part L 2021 through the proposed specification.

Table 12. Fabric Energy Efficiency of sample dwellings

	Target Fabric Energy Efficiency (kWh/m ² /year)	Design Fabric Energy Efficiency (kWh/m ² /year)	Improvement %
1 Bed Flat	31.07	31.07	4.29
2 Bed Flat	22.66	22.56	0.46
AFR 2B3P	35.89	34.40	1.14
AFR 3B4P	35.15	33.66	4.23
AFR 4B5P	34.89	33.47	4.08

Caldwell	36.50	34.94	4.29
Chelmsford	41.59	39.93	4.00
Dromer	51.20	49.58	3.16
Edenbridge	34.97	33.50	4.21
Edgeworth	35.02	33.57	4.14
Fairford	36.26	35.04	3.37
Richmond	40.06	38.82	3.09
Salcott	40.77	40.77	3.02
Winchester	40.05	40.05	3.65
Winslow	39.60	38.27	3.37

- 7.4. The indicative site-wide Part L compliant and as-designed CO₂ emissions are shown in Table 13.
- 7.5. This calculated performance indicates that the development proposals will significantly exceed the requirements of Part L through the proposed specification.

Table 13. Indicative site-wide Part L compliant and as-designed CO₂ emissions

	Part L compliant emissions (kgCO ₂ /year)	As-designed emissions (kgCO ₂ /year)	Improvement %
Site-wide emissions	309,170	116,333	62.37

- 7.6. Within the development proposals, the applicant has opted to install air source heat pumps (ASHP) to serve space heating and domestic hot water demand as the most viable option for meeting ADL 2021 and the energy standard as well as future proofing the development against upcoming changes to the building regulations, and DHW ASHP for the flats. This reduces the Site carbon emissions by 62.37% over the ADL 2021 baseline.
- 7.7. When combined with the 31% uplift of ADL 2021 over ADL 2013, the proposals lead to a scheme that achieves significant emissions reductions in line with those expected to be required within the future homes standard released later this year.
- 7.8. The strategy has a further advantage of future proofing for upcoming changes to the building regulations through the omission of on-site combustion of fossil fuels.
- 7.9. The total calculated CO₂ emissions for the proposed design after energy reduction measures and low-carbon and renewable technologies have been considered is 116,333 kg/CO₂ per annum, which is a reduction of 62.73% or 192,837 kg/CO₂ per annum over the ADL 2021 baseline TER emissions.

8. Resource Efficiency

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

Sustainable Materials

- 8.2. The impact of materials selection is an important consideration when designing a new development. The energy and natural resources consumed over the course of extraction or procurement, processing and manufacturing can be significant.
- 8.3. The Applicant will implement an environmentally responsible approach to the procurement of construction materials and supply chain management for the development where possible.
- 8.4. Within the development choices will be made in order to reduce the consumption of primary resources and using materials with fewer negative impacts on the environment, including but not limited to the following;
- Use fewer resources and less energy through designing buildings more efficiently.
 - Specify and select materials and products that strike a responsible balance between social, economic and environmental factors. An example would be to use locally sourced materials where possible.
 - 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.
 - Choose materials with lower embodied impact.
 - Consider the durability of materials so that they don't need to be replaced as often.
 - Choose materials from a sustainable source with appropriate certification. For example, Forestry Stewardship Council (FSC), Environmental Management Systems (EMS), PEFC, ISO 14001 (International Organisation for Standardisation).

Waste

- 8.5. The Applicant is committed to prioritising steps of the waste hierarchy and implements the following Strategy to ensure a sustainable and environmentally responsible approach is taken to the management of domestic waste and waste during the design and construction of the development. Full details are available in the submitted Site Waste Management Plan and Waste and Recycling Strategy.
- 8.6. This will be managed through the effective implementation of an on-site plan that will focus on steps in the waste hierarchy:
- Prevention
 - Minimisation
 - Reuse
 - Recycling
 - Energy recovery
 - Disposal
- 8.7. 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

- 8.8. In line with the former Wokingham Borough Council guidance on the provision of household recycling and refuse waste collection services the applicant will encourage recycling by making suitable space for off-street storage space for wheeled bins and storage for recycling.
- 8.9. The site plan shows the location of the hard standing for bins and recycling as well as the 900mm wide access path.

Construction Waste

- 8.10. The Applicant will implement guidance on sustainable waste management. As a primary objective, and in accordance with the waste hierarchy, the Applicant will seek to prevent waste in the first instance. This will be achieved through a site waste management plan.
- 8.11. 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., 5m³ of waste per 100m² / tonnes waste per m².
- 8.12. 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.
- 8.13. The Applicant will work with a principal contractor for the Company in delivering the objective of reducing the proportion of waste diverted to landfill. The Applicant will monitor and review this commitment by defining the following:
 - Waste minimisation actions to be undertaken.
 - Procedures for minimising hazardous waste
 - Procedures for sorting, reusing, and recycling construction waste into defined waste groups, either on-site or through a licensed external contractor. The delivery of this target will be managed through the effective implementation of an on-site plan that will focus on steps in the waste hierarchy.
- 8.14. These approaches will ensure that waste from the site is minimised, and environmental impact is reduced.

9. Water Conservation

- 9.1. In line with Part G of Building Regulations 2021, water use will be managed effectively throughout the development through the incorporation of appropriate efficiency measures.
- 9.2. The water consumption of a dwelling has a significant impact on not only direct operational running costs (i.e. water consumption charges), but also indirectly through additional energy usage and the heating of water for domestic use. This is, in part, reflected in the SAP 10.2 methodology which assumes reduced energy consumption should a dwelling be compliant with Approved Document Part G 2013.
- 9.3. Table 14 shows a typical water demand calculation for a 2-3 bed house type and shows how the development could achieve a result less than the required 110 litres/occupier/day calculated in accordance Wokingham Borough Council Local Plan and carried out using Building Regulations 17.K methodology.
- 9.4. The calculation results in a total internal water consumption of 109.56/occupier/day for the intended specification, below the maximum of 110 litres/occupier/day in accordance with the higher water efficiency standard in the appendix to Building Regulations Approved Document Part G.

Table 14. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/occupier/day
WC (dual flush)	Full flush (l)	4.0	5.84
	Part flush (l)	2.7	7.99
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
Bath	Capacity to overflow (l)	160	17.6
Shower	Flow rate (l/min)	9	39.33
Kitchen sink taps	Flow rate (l/min)	6	13.00
Washing Machine	Litres/kg dry load	8.17	17.16
Dishwasher	Litres/place setting	1.25	4.5
Calculated Use			114.90
Normalisation Factor			0.91
Total Internal Consumption (L)			104.56
External Use			5.0
Building Regulations 17.K			109.56

10. Conclusions

- 10.1. This Energy and Sustainability Statement has been prepared by AES Sustainability Consultants on behalf of Crest Nicholson Operations Ltd to detail the proposed approach to sustainable construction to be employed at Former Arborfield Studios, (Parcels W, Y and Z) Arborfield Green.
- 10.2. A review of National Policy including the NPPF and relevant recent Government statements has established that the Building Regulations are now considered the appropriate method for setting standards relating to energy use and CO₂ emissions, giving consideration to building design and site-layout to further reduce energy consumption.
- 10.3. The standards contained within Approved Document L 2021 have therefore been reviewed, and a 'Fabric First' approach which prioritises improvements to the fabric of the dwellings to avoid unnecessary energy demand and consequent CO₂ reduction is proposed.
- 10.4. Improvements in insulation specification, efficient building services, a reduction in thermal bridging and unwanted air leakage paths and further passive design measures will enable the relevant standards to be met, whilst building in low energy design and future climate resilience to the design and construction of the dwellings.
- 10.5. Alongside the above, highly efficient ASHP will be installed to all dwellings to serve domestic hot water and space heating demand and domestic hot water (DHW) ASHP's to the flats combined with panel heaters to serve space heating demand.
- 10.6. Calculations based on a sample range of dwelling types demonstrates that through following the energy efficiency approach described, the calculated as-designed emissions are reduced by 62.37% over Part L 2021 requirements.
- 10.7. This significant reduction over the baseline is in line with the expected reductions required in the upcoming Future Homes Standard to be released later in the year as well as being future proofed for upcoming changes to the building regulations through the omission of on-site combustion.
- 10.8. It has also been determined that the calculated water consumption could equate to a maximum internal water consumption of no more than 110 litres/occupier/day, and therefore offer an improvement on the higher water efficiency standard in the appendix to Building Regulations Approved Document Part G.



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