Arborfield Parcel N

Crest Nicholson Chiltern

Energy and Sustainability Statement

AES Sustainability Consultants Ltd

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Crest NICHOLSON

This statement has been commissioned by Crest Nicholson Chiltern to detail the proposed approach to energy and CO_2 reduction to be employed in the development of Arborfield Parcel N. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved.

Contents

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1. Introduction

1.1. Written by AES Sustainability Consultants on behalf of Crest Nicholson Chiltern, this Energy Statement has been prepared in support of a planning application for Parcel N at Arborfield Green.

Development Description

1.2. The development site is located approximately 4 miles west of Wokingham and 4.5 miles southeast of Reading in the village of Arborfield, within the boundary of Wokingham Borough Council. The development detailed in this report is one phase (Phase N) of outline planning application O/2014/2280 for up to 2,000 new dwellings.

1.3. The Phase N proposal would deliver 67 dwellings across a mix of two to five bed detached, semi-detached and terraced houses and two bed apartments, with approx. 20% of the dwellings designated as affordable. The proposed site layout is shown in Figure 1.

Purpose and Scope of the Statement

1.4. This statement has been prepared to address relevant national and local policies relating to the sustainable design and construction of dwellings.

1.5. This statement will address relevant planning conditions contained within the outline planning permission, as well as national and local policies relating to sustainable development, including policies within the Wokingham Borough Core Strategy.

1.6. The statement will demonstrate that following a fabric first approach to demand reduction, the proposed development will deliver a level of energy performance beyond the current Building Regulation standards whilst addressing a range of additional sustainable design considerations.

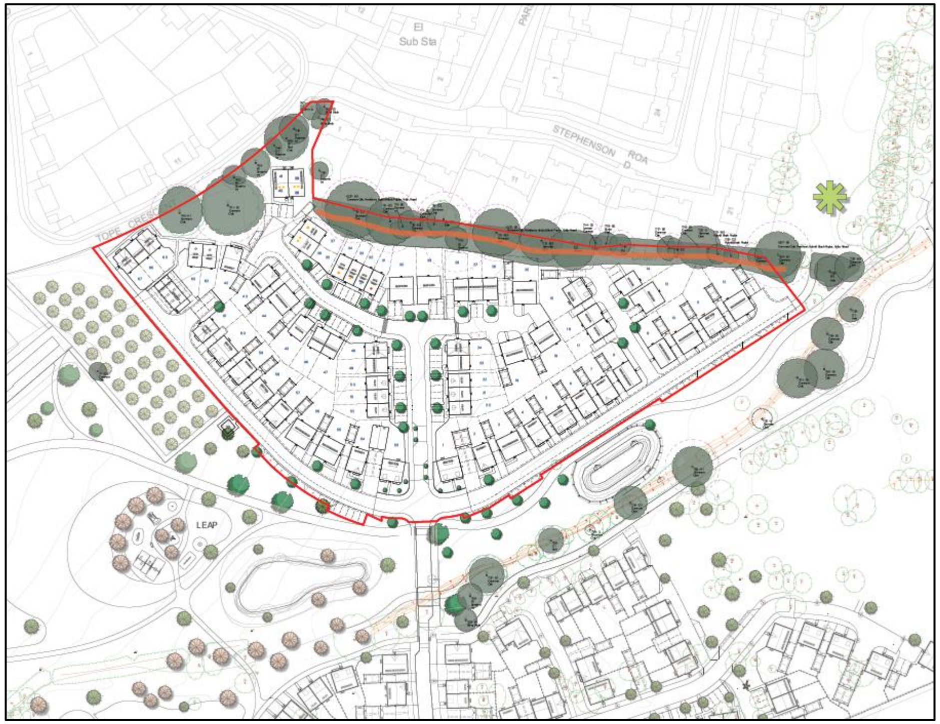

Figure 1. Arborfield Parcel N site plan.

2. Planning Policy

Local Planning Policy

2.1. This Energy Statement addresses local planning policy relating to sustainable design and construction, principally contained within the Wokingham Borough Local Development Framework Core Strategy, adopted in January 2010 and the associated Design and Sustainability Supplementary Planning Document (SPD). The relevant extracts from these documents are included below.

> Local Plan - Policy CP1
>
> 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 to design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.
>
> Design and Sustainability SPD
>
> 7.5 The Council therefore encourages all residential development schemes should seek to be built to full Code Level 4 or whatever the mandatory Code Level is higher. However, this is an aspirational (non-mandatory) target. Developments will need to be built in line with mandatory Code timetable. Local mandatory requirements for developments to exceed statutory requirements for sustainable buildings may be included within the emerging MDD DPD, as indicated in paragraph 4.8 of the adopted Core Strategy. Policy CP1 (Sustainable Development) of the Core Strategy requires development proposals to contribute towards the goal of reaching zero carbon developments as soon as possible.
>
> 7.6 The 10% renewable or low carbon energy requirement of Policy NRM11 of the South East Plan is required for major development. However, the Council considers that renewable energy/low carbon technology can be used as part of reaching the Code Levels. Zero Carbon Homes will be legally required by 2016.

2.2. It has been confirmed by the Council that Code for Sustainable Homes is now covered by the current Building Regulations and that any submission should show how that particular scheme will achieve this standard.

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:
>
> Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaption measures, including through the planning of green infrastructure; and
>
> Can help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

Current National Policy Standards

2.6. The NPPF requires that "local planning authorities should ...when setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards."[1]

2.7. The government introduced the next revision in Building Regulations, known as Part L 2021 in December 2021, to come into effect for buildings where construction is commenced after 15th June 2023. The new standards will require a 31% reduction in CO_2 emissions compared with the current Building Regulations standard. This therefore applies to this development.

[1] Department for Communities and Local Government, 2012, *NPPF, paragraph 95*

Proposed Strategy

2.8. This statement is intended to establish the proposed approach to sustainable construction and energy demand reduction to be delivered at the development.

2.9. It is proposed that the dwellings will be constructed following a fabric first approach to meet, and exceed where possible, the current Building Regulations, with insulation standards, thermal bridging and air leakage all improved beyond the minimum compliance levels.

2.10. In addition, consideration will be given to building design, passive solar design and energy efficient site-layouts where possible.

2.11. 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.

2.12. 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. Climate Change Resilience

3.1. Dwellings constructed today may be operating in a substantially different climate over the coming decades, and therefore should be designed to ensure that they are resilient to future climate change impacts such as increases in temperature, rainfall, wind and sea level. Climate resilience is important to home owners against a backdrop of increasingly extraordinary weather events.

3.2. Passive design measures will be considered and incorporated to enhance resilience to climate change impacts throughout the lifetime of the development.

Rising Temperatures and Overheating

3.3. With the risk of potentially higher summer temperatures and longer hot spells in the future, it is important to consider the thermal comfort of the dwelling. Passive design measures are proposed in order to mitigate future overheating.

Approved Document O

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

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

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

Addressing overheating risk

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

3.8. Within the development layout, orientation and massing has been considered to maximise useful passive solar gain. Glazing will be specified with a solar transmittance value (g-value) to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer.

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

4. Energy Consumption and CO_2 Emissions

4.1. 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.

4.2. 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.

4.3. As shown in Table 1, the CO_2 standards contained within Part L were increased in 2010 and 2013, reducing the TER by approximately 25% and a further 6% (9% for non-residential) respectively.

4.4. Part L 2021 will be mandatory from June 2023, which constitutes a much larger step change of a 31% reduction in emissions.

Table 1. CO_2 Emissions improvements from successive Part L editions

Building Regulations	CO_2 emissions improvements preceding regulations
L1A 2006	-
L1A 2010	25%
L1A 2013	6%
L1A 2021	31%

Energy Reduction Strategy – Fabric First

4.5. 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 L1A of the Building Regulations through fabric measures alone.

4.6. 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.

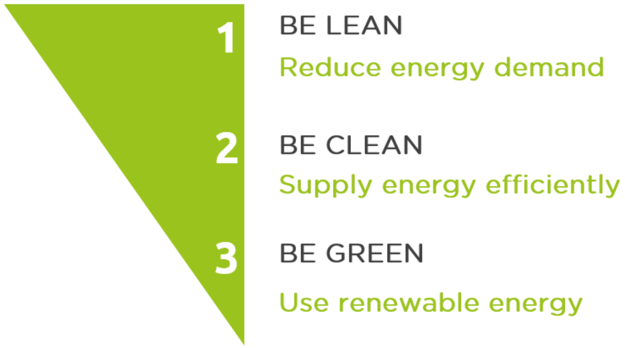

Figure 2. The Energy Hierarchy

Be Lean – reduce energy demand

4.7. 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

4.8. 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

4.9. 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

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

4.11. This approach has been widely supported by industry and government for some time, particularly in the residential sector, with the Zero Carbon Hub2 and the Energy Savings Trust3 having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.

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

Table 2. Benefits of the Fabric First approach

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

Building Regulations Standards – Fabric Energy Efficiency

4.13. In addition to the CO_2 reduction targets, the importance of energy demand reduction was further supported by the introduction of a minimum fabric standard into Part L1A 2013, based on energy use for heating and cooling a dwelling. This is referred to as the 'Target Fabric Energy Efficiency' (TFEE) and expressed in kWh/m2/year.

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

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

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

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

Proposed Fabric Specification

4.16. 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 L1A limiting fabric parameters in order to demonstrate the improvements delivered.

Table 3. Proposed construction specification – main elements

	Part L1a Limiting Fabric Parameters	Proposed Specification
External wall – u-value	0.26 W/m²K	0.20 W/m²K
Party wall – u-value	0.20 W/m²K	0.00 W/m²K
Plane roof – u-value	0.16 W/m²K	0.08-0.11 W/m²K
Ground floor – u-value	0.18 W/m²K	0.12-0.14 W/m²K
Windows – u-value	1.60 W/m²K	0.86 - 1.40 W/m²K
Doors – u-value	1.60 W/m²K	1.30 W/m²K
Air Permeability	8.00 m³/h.m² at 50 Pa	4.50 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = ≤ 0.036 (Calculated)

Thermal bridging

4.17. 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 CO_2 reduction targets.

4.18. 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.

Air leakage

4.19. 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 /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

4.20. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services. Currently it is assumed that all dwellings will be provided with modern gas-fired heating systems, fully insulated primary pipework, and controls including programmers, thermostats and Thermostatic Radiator Valves to avoid unnecessary heating of spaces when not required.

5. Low Carbon and Renewable Energy Systems

5.1. A range of technologies have been assessed for potential incorporation into the scheme in accordance with Regulation 25A of the Building Regulations (2013) and with the intent of delivering compliance with the carbon reduction targets contained within Part L 2021.

Combined Heat and Power (CHP) and District Energy Networks

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

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

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

Wind Power

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

5.6. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 5.1m/s 4. Wind turbines at this site are therefore unlikely to generate sufficient quantities of electrical energy to be cost effective5. For these reasons wind power is not considered feasible.

Building Scale Systems

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

- Individual biomass heating
- Solar thermal
- Solar photo-voltaic (PV)
- Air Source Heat Pumps (ASHPs)
- Ground Source Heat Pump (GSHPs)
- Hot water heat pumps

5.8. The advantages and disadvantages of these technologies are evaluated in Tables 4-9.

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

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

Table 4. Individual Biomass Heating feasibility appraisal

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

Table 5. Solar Thermal systems feasibility appraisal

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

Table 6. Solar Photovoltaic systems feasibility appraisal

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

Table 7. Air Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 250% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings • Very low carbon heating source based on Part L 2021 carbon factor of 0.136kgCO_2/kWh	• Air source heat pumps are powered by electricity, potentially increasing fuel bills for residents compared with gas heating systems • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved. Users must be educated in how heat pump systems should be operated for optimal efficiency • Air source heat pump plant should be integrated into the building design to mitigate concerns regarding the visual impact of bolt-on technology • Noise in operation may be an issue particularly when operating at high output
Estimated costs and benefits	
• Cost £5,000 - £7,000 for standard installation	
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme, however the potential increase in running costs compared with a gas heating alternative supplemented by solar PV systems means they are not considered a preferred option at this stage.	

Table 8. 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 • Very low carbon heating source based on Part L 2021 carbon factor of 0.136kgCO_2/kWh	• 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, potentially increasing fuel bills for residents compared with 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, however likely to 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. However, the cost and difficulty associated with vertical boreholes at this site means that they are not considered a preferred low carbon technology at this stage.	

Table 9. Hot Water Heat Pump Feasibility Appraisal

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

Renewables Summary

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

- Biomass heating systems would require significant storage space for fuel as well as regular deliveries at different times to all dwellings. Local NO_x and particulate pollution 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.

Low Carbon or Renewable Heating Systems Proposals

5.10. Solar PV is considered the most feasible option for incorporation in to the design to meet the desired EPC ratings and renewables contributions targets. The precise amount of PV at each dwelling will be determined at a later stage of design. Currently, the sampled units have a range of allotted PV amounts from 0.55 – 3.45 kWp.

6. Indicative As Designed CO_2 Emissions and Energy Demand

6.1. Part L1 compliance is assessed through the Standard Assessment Procedure (SAP), which uses the 'Target Emission Rate' (TER) – expressed in kilograms CO_2 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.

6.2. Calculations have been undertaken to all house types under a sampling basis for each unit type on site at the worst-case orientation to assess the carbon emissions of the development. The proposed carbon emissions are reported against the Part L 2021 baseline in Table 10.

Table 10. CO_2 emissions by house type

House type - GAS	DER CO_2 emissions ($kgCO_2/m^2/yr$)	TER CO_2 emissions ($kgCO_2/m^2/yr$)	% Reduction
AFR 2B3P	11.9	12.19	2.38
AFR3B4P	10.7	11.22	4.63
Buckingham	9.15	9.29	1.51
Burford	9.75	9.83	0.81
Chelmsford	10.68	11.08	3.61
Dromer	12.63	12.63	0
Filey	10.82	11.22	3.57
Maisonette-FF	11.99	12.41	3.38
Maisonette-GF	12.82	13.16	2.58
Marlbourgh	9.97	10.11	1.38
Redgrave	10.8	11.16	3.23
Romsey	10.63	10.79	1.48
Seaton	10.26	10.57	2.93
Walton	9.9	9.92	0.2

6.3. Table 11 shows the estimated site-wide emission reductions over a Part L 2021 baseline based on the approach described. The total savings estimated for the site are therefore 2.1% over Part L 2021.

Table 11. Estimated residential site-wide CO_2 emissions

	Part L 2021 CO_2 emissions ($kgCO_2/yr$)	
Part L compliant	77,515	
As Designed	75,885	
	$kgCO_2/yr$	%
Total savings	1,630	2.10%

6.4. Through a combination of the described fabric first approach to sustainable construction and the installation of solar PV panels, the development will exceed compliance with the standards to be adopted with Part L 2021, which in turn represents a 31% improvement on current Part L 2013 standards.

7. Resource Efficiency and Materials

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

Materials

7.2. The impacts of construction materials range from the depletion of natural resources to the greenhouse gas emissions and water use associated with their manufacture and installation.

7.3. Within the development choices will be made in order to reduce the consumption of primary resources and use 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

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

Household Waste

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

7.6. Wokingham Council currently offer kerbside collection for recycling, separated into two collections streams:

- paper, glass bottles and jars
- food and drink cans, aerosols, plastic bottles, cardboard, foil

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

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

Construction Waste

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

7.10. Wherever possible materials will be diverted from landfill through re-use on site, reclamation for re-use, returned to the supplier where a 'take-back' scheme is in place or recovered and recycled using an approved waste management contractor. A target to divert 85% by weight/volume of non-hazardous construction waste will be applied.

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 2013 Part G require water efficiency measures for all new dwellings:

> Water Efficiency
>
> G2. Reasonable provision must be made by the installation of fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water.
>
> Water Efficiency of New Dwellings
>
> 36. (1) The potential consumption of wholesome water by persons occupying a new dwelling must not exceed the requirement in paragraph (2)
>
> (2) The requirement referred to in paragraph (1) is either –
>
> (a) 125 litres per person per day; or
>
> (b) in a case to which paragraph (3) applies, the optional requirement of 110 litres per person per day,
>
> As measured in either case in accordance with a methodology approved by the Secretary of State.

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

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

9.5. The references provided in Part G Table 2.1 will be considered to ensure that efficient fittings are installed to each dwelling. Each new dwelling will minimise water usage to at least 110 litres/person/day in line with the current national optional standards.

9.6. Table 12 shows how the development could achieve a result of the standard 125 litres/occupier/day calculated in accordance with Building Regulations 17.K methodology.

Table 12. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/occupier/day
WC (dual flush)	Full flush (l)	6	8.76
	Part flush (l)	4	11.84
Taps (excluding kitchen taps)	flow rate (l/min)	4	7.90
Bath	Capacity to overflow (l)	181	19.91
Shower	Flow rate (l/min)	8	34.96
Kitchen sink taps	Flow rate (l/min)	6	13.00
Washing Machine	Litres/kg dry load	6.8	14.28
Dishwasher	Litres/place setting	1.04	3.74
Calculated Use			114.4
Normalisation Factor			0.91
Total Internal Consumption (L)			104.1
External Use			5.0
Building Regulations 17.K			109.1

10. Conclusions

10.1. This Energy Statement has been prepared by AES Sustainability Consultants on behalf of Crest Nicholson Chiltern to detail the proposed approach to sustainable construction to be employed at the Arborfield Parcel N development.

10.2. The development site is located between Wokingham and Reading in the village of Arborfield, within the boundary of Wokingham Borough Council. The proposal would deliver 67 dwellings across a mix of dwelling types.

10.3. A review of applicable local and national planning policy has been undertaken, concluding that energy standards should be encouraged and enforced through the applicable national regulations. Consideration will be paid to building design and site-layout to further reduce energy consumption, and a range of additional sustainable design considerations will be addressed.

10.4. This strategy sets out how the proposed development addresses relevant policies contained within the Wokingham Borough Local Development Framework. The strategy follows a 'fabric first' approach to constructing energy efficient buildings, with insulation standards, thermal bridging and air leakage all improved beyond the minimum compliance levels within the Building Regulations. Furthermore, PV arrays will be utilised to ensure that these standards are met.

10.5. Calculations undertaken based on a sample range of house types under the approved Standard Assessment Procedure demonstrate that Part L 2021 compliant emissions would equate to an estimated 1,630 kgCO_2/year. Through following the energy efficiency approach described, the calculated as-designed emissions are reduced by 2.10% over Part L 2021 requirements.

10.6. A range of additional sustainability measures have been given consideration including reduction of both construction and household waste.

10.7. Appropriate provision for internal waste and recycling storage will be provided to ensure that recycling can be split into the appropriate streams for collection.