Wombwell

Crest Nicholson Yorkshire

Energy Statement

AES Sustainability Consultants Ltd

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AES Sustainability Consultants

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This statement has been commissioned by Crest Nicholson Yorkshire to detail the strategic approach to energy and CO_2 reduction to be employed in the development known as Wombwell. It should be noted that the details presented, including the proposed specifications, are subject to change with Reserved Matters Applications, whilst ensuring that the overall commitments will be achieved.

Contents

List of figures & tables

1. Introduction

Preface

1.1. Written by AES Sustainability Consultants on behalf of Crest Nicholson Yorkshire, this statement has been prepared in support of the outline application for development known as Wombwell within

Development Description

1.2. The proposed development site is located at Pit Lane, Wombwell, west of Doncaster, and within the jurisdiction of Barnsley Metropolitan Borough. The proposed scheme is for 229 units, consisting of 2 to 5-bed houses, and 1-bed maisonettes.

Purpose and Scope of the Statement

1.3. This Energy Statement is in support of the outline planning application for the development and to outline the predicted CO_2 reductions to be delivered. It demonstrates that by following a fabric first approach and with the implementation of low carbon heating systems via renewable technology, the development will reduce carbon emissions significantly in excess of current regulatory and local policy standards, while according with relevant policies contained within the Barnsley Local Plan (2019).

1.4. Due to the outline nature of the development timescales, consideration has been made to future Building Regulations, namely the governments proposed Future Homes Standard and Future Buildings Standard. The statement will further detail how the development will seek to achieve the required CO_2 emissions reductions over a Part L 2021 compliant baseline in line with this proposed standard, delivering 'zero carbon ready' buildings fit for the future. However, this new set of Building Regulations has been delayed, regardless the site can be considered 'future homes standard ready' due to its usage of Air Source Heat Pump technologies.

Figure 1. Wombwell Illustrative Masterplan

2. Planning Policy and Conditions

National Planning Policy Framework

2.1. In February 2025, 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.

2.2. 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.

2.3. 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

2.4. The government introduced the latest revision in Building Regulations, known as Part L 2021 in December 2021, to come into effect for buildings where construction commenced after 15th June 2023. The new standards require a 31% reduction in CO_2 emissions for domestic buildings and an average 27% reduction in CO_2 emissions for non-domestic buildings, compared with the Part L 2013 Building Regulations standard. These reductions have been introduced alongside improvements to fabric standards and a focus on primary energy usage as a new compliance metric.

Local Planning Policy

2.5. Barnsley Metropolitan Borough Council have a Local Plan from 2019[1]. Relevant policies from this local plan have been extracted and copied below. These include Policies CC1 and CC2.

> Policy CC1 Climate Change
>
> We will seek to reduce the causes of and adapt to the future impacts of climate change by:
>
> Giving preference to development of previously developed land in sustainable locations;
>
> Promoting the reduction of greenhouse gas emissions through sustainable design and construction techniques;
>
> Locating and designing development to reduce the risk of flooding;
>
> Promoting the use of Sustainable Drainage Systems (SuDS);
>
> Promoting and supporting the delivery of renewable and low carbon energy; and
>
> Promoting investment in Green Infrastructure to promote and encourage biodiversity gain.

> Policy CC2 Sustainable Design and Construction
>
> Development will be expected to minimise resource and energy consumption through the inclusion of sustainable design and construction features, where this is technically feasible and viable.
>
> All non-residential development will be expected, to achieve a minimum standard of BREEAM 'Very Good' (or any future national equivalent). This should be supported by preliminary assessments at planning application stage.

[1] Local Plan

Proposed Strategy

2.6. The energy strategy for the development aims to align with the standard of Part L 2021, however, as the results from this report demonstrate in later sections, the proposed units go far above this.

2.7. This will firstly 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.

2.8. 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.

2.9. Low carbon and renewable energy sources have been explored as options and it has been determined that the units at the site will be heated via an Air Source Heat Pump heating system which is classified as a renewable technology.

2.10. The following sections of this statement set out the sustainable design considerations which will be applied to deliver low energy, comfortable and affordable development.

3. Energy and CO_2 Reduction Strategy

3.1. As one of the key areas of ongoing impact of any development, the energy demand of the buildings 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 (2021) form the minimum requirement in terms of energy performance.

3.3. 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.

3.4. Part L 2021 has been mandatory from June 2023, which constitutes a much larger step change of a 31% reduction for domestic buildings and an average 27% reduction in emissions for non-domestic buildings.

3.5. The Future Homes Standard is the Governments proposed next step in significantly reducing carbon emissions within the residential built environment, and is expected to be introduced in 2025, equating to a circa 75-80% improvement on Part L 2013, or a circa 70% uplift on current regulatory standards.

3.6. The above demonstrates that with every successive iteration of the building regulations that the standards become higher.

Table 1. CO_2 Emissions improvements from successive Part L editions

Building Regulations	CO_2 emissions improvements preceding regulations	
	Domestic	Non-Domestic
L1A 2006	-	-
L1A 2010	25%	25%
L1 2013	6%	9%
L1 2021	31%	27%
Future Homes/Buildings Standard	Circa 70%	TBC

Energy Reduction Strategy

3.7. 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.

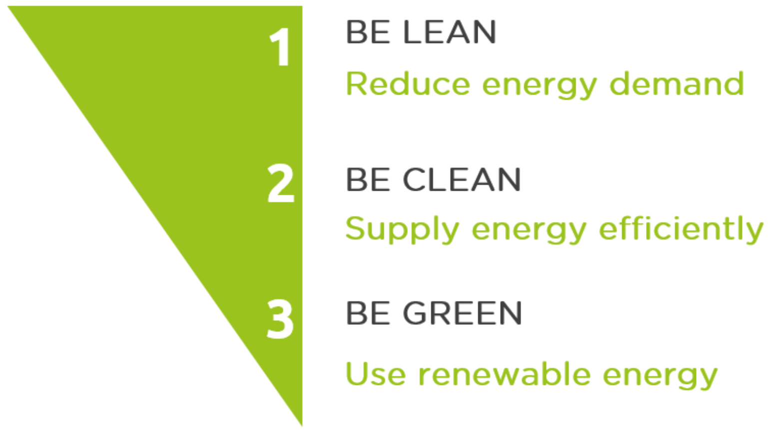

Figure 2. The Energy Hierarchy

Be Lean – reduce energy demand

3.8. 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

3.9. 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

3.10. 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

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

3.12. This approach has been widely supported by industry and government for some time, particularly in the residential sector, with the Zero Carbon Hub[2] and the Energy Savings Trust[3] having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.

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

[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

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 Hub[4] and the Energy Savings Trust[5] 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	✓	×

Proposed Fabric Specification

4.8. In order to ensure that the energy demand of the development is reduced, the dwellings and non-domestic spaces should be designed to minimise heat loss through the fabric wherever possible. Table 3 details the minimum fabric specification for the major building elements, setting out the current Part L 2021 limiting fabric parameters for domestic and non-domestic settings, in order to demonstrate the minimum performance which will be sought.

4.9. 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.

[4] Zero Carbon Hub, Zero Carbon Strategies for tomorrow's new homes, Feb 2014

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

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Table 3. Proposed construction specification – main elements for dwellings

	Part L1 2021 Limiting Fabric Parameters	Proposed Part L 2021 Domestic 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	4.5 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = ≤ 0.036 (Calculated)

Thermal bridging

4.10. 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.

4.11. 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

4.12. 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 4.50 m³/h.m² at 50Pa for dwellings, and 5.00 m³/h.m² at 50Pa for buildings other than dwellings, with pressure testing to be undertaken on completion to confirm that the design figure has been met.

Energy efficient heating and lighting

4.13. Heat generation and distribution systems will be designed to give the occupants a high level of control over their use, encouraging and allowing energy-efficient behaviour. Primary pipework should be fully insulated, and time and temperature zoning controls installed in all dwellings.

4.14. The occupant of the building should be provided with all necessary literature and guidance relating to the energy-efficient operation of fixed building services.

4.15. Internal lighting should be low energy wherever possible, and areas of infrequent use will be fitted with occupancy sensors. External security and space lighting should be low energy and fitted with PIR and daylight sensors where appropriate.

4.16. Photoelectric controls will be considered for appropriate rooms within the early year's childcare facility to ensure that the benefit of natural light is maximised.

4.17. Across the site external security and space lighting should be low energy and fitted with PIR and daylight sensors where appropriate.

Eliminate Performance Gap

4.18. The reasons why buildings do not perform in accordance with design are becoming increasingly understood. Part L1 2021 introduced a BREL (Buildings Regulations England Part L) 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.

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 fairly consistent baseload demand and allow for maximisation of plant efficiency.

5.3. The installation of heat networks are 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 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.

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 4.3m/s [6]. Wind turbines at this site are therefore unlikely to generate sufficient quantities of electrical energy to be cost effective[7]. 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)

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

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

[7] 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. Air quality concerns in addition to increased transport emissions for fuel delivery mean that it is not a preferred technology for the development.	

Table 5. 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 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 (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.	

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	• 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 circa £4,000 – 8,000 • Running cost linked to COP of heat pump, however likely to be higher than mains gas	
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.	

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	• 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 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 relatively low number of wetrooms and appropriate cylinder location to allow for duct runs to building façade. Hot water heat pumps are considered a preferred low-carbon technology at this stage.	

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.

Electrification of heat

5.10. In order 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.

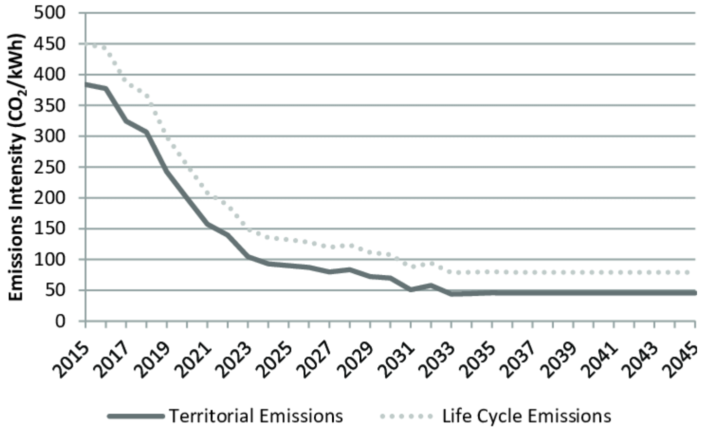

Figure 4. UK electricity grid emissions intensity projections

5.11. This approach will ensure that dwellings reduce emissions over time with no further intervention, alongside the electricity grid as it continues to rapidly decarbonise.

Low Carbon or Renewable Heating Systems Proposals

5.12. It is proposed that all buildings at 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. The specific model of ASHP will be decided at a later RIBA stage. Currently this has been modelled as the Daikin Altherma model with pre-plumbed cylinder.

5.13. It is also proposed that maisonettes at the scheme would have their hot water heat demands provided by Hot Water Heat Pumps (HWHPs), ensuring that the most significant heat demands are met through a renewable energy source and avoiding the need for external heat exchangers. The low level of space heating demand for these units would be provided by electric panel heaters, electric underfloor heating, or a direct electric boiler, ensuring that all heat benefits from ongoing grid decarbonisation.

5.14. Solar PV is also considered a feasible option for future incorporation into the design if required in order to meet the desired EPC rating of B. However, it is not considered a necessary commitment to meet renewable targets or compliance margins in accordance with Part L. Consideration of this technology will be handled at the reserved matters stage of planning in line with the design SAP assessments, or to meet the requirements of the forthcoming Future Homes Standard. It is considered likely that any unit utilising a Hot Water Heat Pump will have PV.

5.15. Furthermore, if the development does fall in line with the requirements under the Future Homes Standard, houses may also utilise PV to boost their CO2 reductions in line with these requirements with little effort.

6. Climate Change Resilience

6.1. Buildings constructed today may be operating in a substantially different climate over the coming decades, and therefore should be designed to ensure that they are able to adapt and reduce the risk of overheating with potentially higher summer temperatures and longer hot spells. Therefore, Passive design measures will be considered and incorporated to enhance resilience to climate change impacts throughout the lifetime of the development.

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

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

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

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

Cooling hierarchy

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

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

Addressing overheating risk

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

- A layout which incorporates significant green space around the units that benefits from shading from the tree canopy directly south of the site, reducing the potential for heat build-up in enclosed and low albedo external areas such as tarmac and dark roofs
- Glazing specification and areas which have been considered to balance the requirements for useful winter solar gain with unwanted summer gain in summer, assuming a g-value of 0.55 for residential units.
- Inclusion of mechanical ventilation where required to provide a consistent background air flow

6.6. 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.

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

Approved Document O

6.8. In order to address overheating risk more robustly, the Government has introduced a new Approved Document, 'Part O', into the Building Regulations. This document requires a more in-depth assessment of the risk of overheating, taking into account site location, residential unit orientation, glazing proportions and openable window areas for natural ventilation.

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

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7. Indicative CO2 Emissions

7.1. 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.

7.2. Calculations have been undertaken to a set of known Crest Nicholson house types on a sampling basis to provide an indicative and conservative assessment of the carbon emissions of the development. The proposed carbon emissions are reported against the Part L 2021 baseline in Table 10. The current massing of house types is unknown and therefore existing house types have been utilised to demonstrate the reduction easily achieved by Crest Nicholson under existing known house types.

7.3. The across house types in Table 10 have all been modelled with an ASHP (houses) and HWHP (maisonettes), the specific models of which will be determined at a later stage of planning.

7.4. 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 66.84% over Part L 2021.

Table 10. CO_2 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
AFR 2B3P-As/Opp-Semi	3.83	11.71	67.29
AFR 3B4P-As/Opp-Semi	3.32	10.81	69.29
AFR_4B5P-As/Opp-Semi	3.18	9.92	67.94
Burford-As-Det	3.46	9.56	63.81
Chesham-As-Semi	3.48	10.72	67.54
Cromer-As-Mid	3.37	10.62	68.27
Cromer-As-Semi	3.8	11.85	67.93
Dorking-As-Det	3.18	9.11	65.09
Evesham - Semi	3.46	10.72	67.72
Filey-As-Semi	3.4	10.88	68.75
Maisonette-FF	5.01	11.95	58.08
Maisonette-GF	5.36	12.58	57.39
Romsey-As-DET	3.54	10.47	66.19
Seaton-As-Det	3.64	11.07	67.12
Seaton-As-Semi	3.34	10.2	67.25
Whixley-As-Det	3.34	9.79	65.88
Windsor-As-Det	3.02	9.58	68.48
Winkfield-As-Det	3.35	9.75	65.64
Yorkley-As-Det	3.73	10.92	65.84

Table 11. Estimated residential site-wide CO_2 emissions

	Part L 2021 CO_2 emissions ($kgCO_2/yr$)	
Part L compliant	243,528	
As Designed	80,756	
	$kgCO_2/yr$	%
Total savings	162,772	66.84

8. Resource Efficiency

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

Materials

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

8.3. Within the development choices will be made in order to reduce the consumption of primary resources and using materials with fewer negative impacts on the environment, including but not limited to the following;

- Use fewer resources and less energy through designing buildings more efficiently.
- Specify and select materials and products that strike a responsible balance between social, economic and environmental factors.
- Incorporate recycled content, use resource-efficient products and give due consideration to end-of-life uses.
- Influence, specify and source increasing amounts of materials which can be reused and consider future deconstruction and recovery.

Embodied Carbon

8.4. As the operational energy use of buildings is reduced through design and specification as described, the embodied carbon in the building materials and process becomes a much greater proportion of the overall impact of a development.

8.5. There is currently no legislation governing embodied carbon, however this may come into effect through the proposed 'Part Z' of the building regulations in coming years. Best practice standards are being adopted through LETI and RIBA and will be considered when setting any targets for the development, with an aim to significantly improve on current practice.

8.6. Typical measures which may be implemented to reduce embodied carbon may include:

- Selection of materials with high natural content
- Selection of low embodied carbon option for all materials
- Recycled plastics in windows, pipework and cavity closers
- Recycled content in gypsum plasterboard
- Use of recycled (crushed) aggregate as hardcore
- Recycle elevation treatments where feasible i.e., rooftiles, bricks, architectural features.

Construction Waste

8.7. The development will additionally be designed to monitor and manage construction site waste effectively and appropriately. Target benchmarks for resource efficiency will be set in accordance with best practice – e.g., $5m^3$ of waste per $100m^2$ / tonnes waste per m^2.

8.8. 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.

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9. Water Efficiency

9.1. The UK Climate Change Risk Assessment 2017 identified risks of shortages in water supply as a future climate change impact. Therefore, the efficient use of water is an important factor when considering future resilience to climate change.

9.2. As well as aiming to minimise water usage through the materials used, water consumption of the end user will be considered in line with current national policy. Building Regulations 2021 Part G require water efficiency measures for all new residential units:

> 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 Residential units
>
> 36. (1) The potential consumption of wholesome water by persons occupying a new residential unit 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 residential units. The calculation methodology is to be used to assess compliance against the water performance targets in Regulation 36 to ensure that all new residential units meet the efficiency requirement.

9.5. Water efficiency measures including the use of efficient dual flush WCs, low flow showers and taps and appropriately sized baths will be encouraged with the aim to limit the use of water during the operation of the development.

9.6. Table 12 shows how the development could achieve a result less than the 125 litres/occupier/day target calculated in accordance with Building Regulations methodology Part G.

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. Conclusion

10.1. This Energy Statement has been prepared by AES Sustainability Consultants on behalf of Crest Nicholson Yorkshire to detail the proposed approach to energy and CO_2 reduction to be employed for development at the development known as Wombwell.

10.2. A review of National, regional and local policy has established that the Building Regulations are considered the appropriate method for setting standards relating to energy use and CO_2 emissions, considering building design and site-layout to further reduce energy consumption.

10.3. The development will be designed to meet national standards with respect to Building Regulations Part L 2021 requirements as a minimum and deliver additional carbon and energy reductions in line with local policy. Therefore, the development will meet Part L 2013 regulations by meeting Part L 2021 regulations.

10.4. The statement is intended to demonstrate that, following a fabric first approach to demand reduction, in combination with renewable sources of Energy in the form of ASHPs, the proposed residential development will deliver a level of energy performance in line with the proposed Future Homes Standard, currently scheduled to be introduced in 2026-2027.

10.5. This strategy focuses on a 'Fabric First' approach which prioritises improvements to the fabric of the dwellings to avoid unnecessary energy demand and consequent CO_2 production. Low carbon heating systems in the form of air source heat pumps and hot water heat pumps are proposed, delivering heat and hot water demand at very high efficiency, delivering a 'zero carbon ready' development.

10.6. Indicative SAP calculations show site-wide annual savings of circa 162,772 kgCO2/yr or 66.84% over a Part L 2021 baseline of 243,528 kgCO2/yr, having a total designed emission total of 80,756 kgCO2/yr.

10.7. Opportunities and strategies for waste reduction and the reduction of primary materials use have been detailed, along with the measures that will be taken to reduce the embodied carbon of the development.

10.8. Water efficiency measures including the use of efficient dual flush WCs, low flow showers and taps and appropriately sized baths will be encouraged with the aim to limit the use of water during the operation of the development to limit water use. Each new residential unit will minimise water usage to at least 125 litres/person/day in line with the current national standards.