

Land East of Wandleys Lane - Fontwell

Bellway Ltd – Wessex

Energy and Sustainability Statement

AES Sustainability Consultants Ltd

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This statement has been commissioned by Bellway Ltd - Wessex to detail the proposed approach to energy to be employed in development of Land East of Wandleys Lane, Fontwell. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved.

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1. Introduction

Preface

- 1.1. This Energy and Sustainability Statement has been prepared on behalf Bellway Ltd - Wessex in support of the application for development of the site at Land East of Wandleys Lane, Fontwell.

Development Description

- 1.2. The development is located to the East of the village of Fontwell, approximately 7 miles from Chichester within the boundary of Arun District Council.
- 1.3. The proposals would deliver 95 dwellings across a mix of two to four bed terraced, semi-detached and detached houses and one to two bed maisonettes. The proposed site plan is shown in Figure 1.
- 1.4. Outline planning permission was granted in April 2025 (ref: WA/35/23/OUT) for

“Outline planning permission is granted for up to 95 dwellings (including 30% affordable) with all matters reserved apart from access, at Land East of Wandleys Lane, Fontwell, West Sussex in accordance with the terms of the application”

Purpose and Scope of the Statement

- 1.5. The statement has been prepared to address Condition 22 of the outline planning permission (ref: A/40/18/OUT) and to address national and local policy relating to sustainable design and construction of dwellings, including relevant policies within the Arun Local Plan 2011-2031 adopted in July 2018.
- 1.6. The statement demonstrates that following a fabric first approach, the development will result in a significant energy reduction from Part L of the Building Regulations 2021 and further >10% energy reduction from renewables.

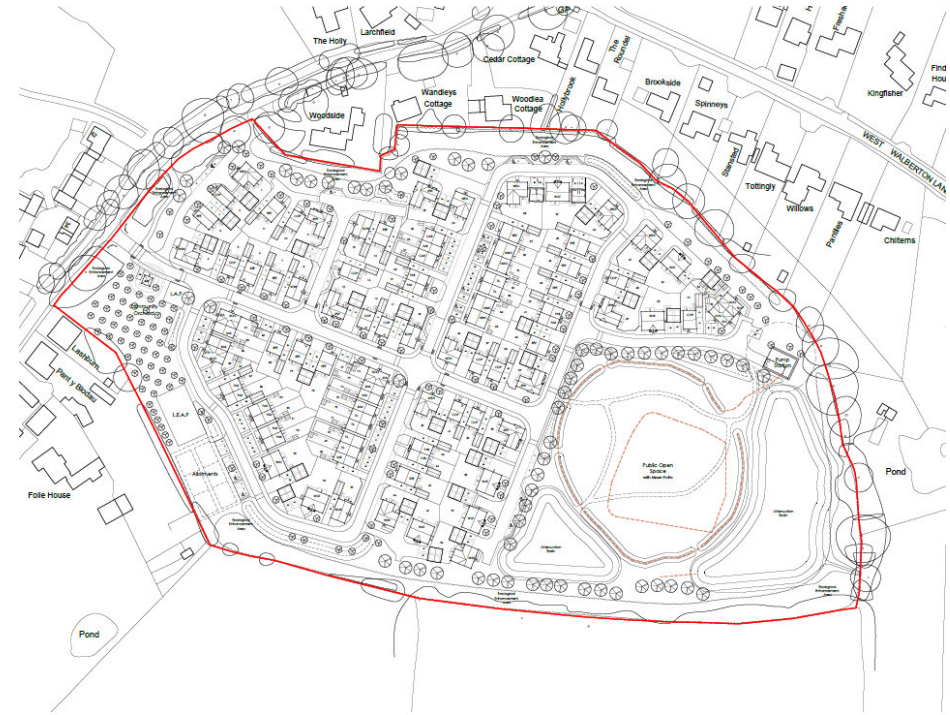


Figure 1. Proposed site plan

2. Planning Policy

Local Planning Policy

- 2.1. The Arun Local Plan 2011-2031 with Adoptions Arun Local Plan 2011-2031 (July 2018), and contains the following key policies relating to sustainable development:

Policy ECC SP1 Adapting to Climate Change

The Council will support development which is located and appropriately designed to adapt to impacts arising from climate change such as the increased probability of tidal and fluvial flooding; water stress; health impacts as a result of extreme temperatures and a decline in the quality of habitats and richness of biodiversity.

In order to achieve this, development must be design to take account of the following issues:

- a. Location (in relation to floor risk and vulnerability to coastal erosion;
- b. Water efficiency;
- c. Shade, cooling, ventilation, solar gain;
- d. Connectivity to the green infrastructure network;
- e. Layout and massing;
- f. Resilience of buildings and building materials to extreme weather events; and
- g. Capacity of drainage systems and incorporation of Sustainable urban Drainage systems (SuDs)

Policy ECC SP2

Energy and climate change mitigation

All new residential and commercial developments (including conversions, extensions and change of use) will be expected to be energy efficient and to demonstrate how they will:

- a. Achieve energy efficiency measures that reflect the current standards applicable at the time of submission;
- b. Use design and layout to promote energy efficiency and;

Policy ECC SP2 (Cont.)

- c. Incorporate decentralized, renewable and low carbon energy supply systems, for example small scale renewable energy systems such as solar panel:

All major developments must produce 10% of the predicted energy requirements from renewable or low carbon energy generation on site, unless it can be demonstrated that this is unviable. Energy efficiency measures will be taken into consideration when the total predicted energy requirements are calculated. The council will consider 'allowable solutions' where it is clearly demonstrated that the provision of the on site renewable or low carbon energy generation is unviable or not feasible.

Where planning permission is required to retrofit energy efficiency measures into existing developments, schemes will be permitted, subject to the design and built heritage policies.

In assessing the achievement of these standards the council will consider:

- Site Constraints;
- Technical viability
- Financial viability; and
- Delivery of additional benefits.

Policy W DM1 Water supply and quality

1. Water supply

Development will be permitted where:

- a. Sufficient water supplies can be provided prior to occupation to serve the development and;
- b. Provision of a water supply is not considered detrimental to existing abstractions, river flows, water quality, fisheries, amenity or nature conservation.

To ensure that all new development of two dwellings or more are water efficient and reduce pressure on water abstraction sites, it must include measures that meet the optional standards of 110 l/person/day.

Condition 43 of the outline planning permission (ref:WA/35/23/OUT)

Condition 43

To reduce carbon emissions from the scheme it is necessary to require a 10% energy supply reduction from renewable or low carbon sources, as required by the LP. Similarly, to manage water use, it is necessary to impose a condition limiting water consumption to 110 litres per person per day, as required by the LP. To safeguard the landscape and biodiversity it is necessary to secure details of external lighting. To secure a benefit it is necessary to impose a condition requiring the minimum quantum of open space by typology. To adhere to the LP it is necessary to trigger the optional Building Regulations M4(2) and M4(3) through the imposition of a condition.

National Planning Policy Framework

- 2.2. 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.
- 2.3. 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.
- 2.4. Paragraph 164 sets out what is expected from new developments when considering strategies to mitigate and adapt to climate change:

164. New development should be planned for in ways that:

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

Current National Policy Standards

- 2.5. 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
- 2.6. 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 CO₂ emissions compared with the current Building Regulations standard.

Proposed Strategy

- 2.7. This statement is intended to establish the proposed approach to sustainable construction and reduction in energy demand to be delivered at the development.
- 2.8. It is proposed that the development is designed to incorporate all applicable guidance contained within Policies EEC SP 1 and EEC SP2 of the Arun Local Plan 2011-2031 with Adoptions Arun Local Plan 2011-2031 (July 2018). Specifically, in relation to renewable energy provision and the construction of highly efficient buildings which seek to minimize water demand and energy use.
- 2.9. Due to developments timescales, it is assumed that 95 plots will be constructed under Part L 2021, Plots under Part L 2021 will deliver a 31% reduction. In order to meet the regulatory requirements, the fabric of the buildings will also be further improved over current typical standards.
- 2.10. The statement will demonstrate that an equivalent to at least 10% of predicted energy will be generated from low-carbon energy sources, in line with Policy EEC SP2 of the Arun Local Plan 2011-2031 with Adoptions Arun Local Plan 2011-2031 (July 2018).
- 2.11. The statement will also demonstrate how reduced water use can be achieved through water efficiency measures, in line with Policy EEC SP2.
- 2.12. The following sections of this document set out the specific measures to be incorporated and an assessment of appropriate technologies and methods in meeting the requirements of the relevant policies.

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

3. Baseline CO₂ Emissions

- 3.1. The development is to be designed and constructed to meet the requirements of Part L1 of the Building Regulations 2021, therefore, compliance with these standard forms the first stage in the sustainable construction approach.
- 3.2. Part L1 compliance is assessed through the Standard Assessment Procedure (SAP), which uses the 'Target Emission Rate' (TER) – expressed in kilograms CO₂ per meter squared of total useful floor area, per annum – as the benchmark. The calculated performance of the dwelling as designed – the Dwelling Emission Rate (DER) – is required to be lower than this benchmark level.
- 3.3. Calculations have been undertaken to assess the carbon emissions of the development. The Part L1 2021 compliant calculated baseline carbon emissions are reported in Table 1.

Table 1. Part L compliant CO₂ emissions by house

House Type	CO ₂ emissions (kgCO ₂ /yr/m ²)
Arkwright	9.55
Baker End	11.36
Bookbinder	10.62
Bowyer	10.35
Cartographer	10.35
Faber	10.8
Jeweller	9.08
Reedmaker	10.23
Stationer	16.73
Tillman	10.48
Watchmaker	9.28

- 3.4. Based on these calculations, the estimated site-wide Part L compliant CO₂ emissions are shown in Table 2.

Table 2. Part L compliant baseline CO₂ emissions for the site

	Part L Compliant CO ₂ emissions (kgCO ₂ /year)
Site-wide energy demand (kWh/year)	104,998
Site-wide emissions baseline	101,361

4. Energy Consumption and CO₂ 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 3, 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.
- 4.4. Part L 2021 will be mandatory from June 2023 and constitutes a much larger step change of a 31% reduction in emissions.

Table 3. CO₂ 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 overshadowing and wind sheltering
 - Landscaping – control daylight, glare and mitigate heat island effects
 - Building design – minimise energy demand through fabric specification

Be Clean – supply energy efficiently

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 4.

Table 4. 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 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), expressed in kWh/m²/year.

4.14. 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.

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

Fabric Standards

- 4.16. 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 5 details the proposed delivered.

Table 5. Proposed construction specification – main elements

	Part L1 Limiting Fabric Parameters	Proposed Specification
External wall – u-value	0.26 W/m ² K	0.24-0.26 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
Ground floor – u-value	0.18 W/m ² K	≤ 0.13 W/m ² K
Windows – u-value	1.60 W/m ² K	1.30 W/m ² K
Doors – u-value	1.60 W/m ² K	1.40 W/m ² K
Air Permeability	8.00 m ³ /h.m ² at 50 Pa	4.00-5.00 m ³ /h.m ² at 50 Pa

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 CO₂ reduction targets.
- 4.18. The specification and design of junctions seeks 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.

Energy efficient heating and lighting

- 4.19. 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. It is currently proposed that houses and apartments will benefit from very efficient gas boilers. Primary pipework should be fully insulated, and time and temperature zoning controls installed in all dwellings.
- 4.20. 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.

Passive design measures and overheating risk mitigation

- 4.21. 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.
- 4.22. Due to these measures to reduce internal heat gain, natural ventilation provided through window openings and the opportunity for cross ventilation will allow sufficient air exchange rates to purge any heat build-up. Active cooling systems are therefore not proposed.
- 4.23. By following these principles, the development will be designed to build in resilience to a potentially changing climate over the lifetime of the buildings and minimise overheating risk, which can be exacerbated by the drive to build better insulated, more airtight homes if not considered within the design and construction process.

Air leakage

- 4.24. 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 ≤ 4.00 – 5.00 m³/h.m² at 50Pa, with pressure testing of all dwellings to be undertaken on completion to confirm that the design figure has been met.

Fabric Energy Efficiency

4.26. Table 6 demonstrates that the dwellings will improve upon the uplifted Fabric Energy Efficiency targets within Part L 2021 through the proposed specification.

Table 6. Fabric Energy Efficiency of proposed dwellings

	Target Fabric Energy Efficiency (kWh/m ² /year)	Design Fabric Energy Efficiency (kWh/m ² /year)	Improvement %
Arkwright	39.83	39.65	0.45
Baker	36.78	36.5	0.77
Bookbinder	32.39	31.34	3.23
Bowyer	42.11	41.78	0.78
Cartographer	36.86	36.65	0.58
Faber	36.43	35.88	1.51
Jeweller	41.84	41.59	0.6
Reedmaker)	39.45	39.19	0.66
Stationer	40.37	39.42	2.34
Tillman	35.75	35.28	1.31
Watchmaker	42.21	42.17	0.08

5. Climate Change Resilience

- 5.1. 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 homeowners against a backdrop of increasingly extraordinary weather events.
- 5.2. 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

- 5.3. 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

- 5.4. In order to more robustly address overheating risk, the Government has introduced a new Approved Document, 'Part O', into the Building Regulations.
- 5.5. This document requires a more in-depth assessment of the risk of overheating, considering site location, dwelling orientation, glazing proportions and openable window areas for natural ventilation.
- 5.6. This assessment will be undertaken at the start of detailed design and any mitigation measures that may be required will be built in.

Overheating Risk and Passive Design

- 5.7. 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 able to adapt and reduce the risk of overheating with potentially higher summer temperatures and longer hot spells.
- 5.8. 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
- 5.9. 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

- 5.10. 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

- 5.11. 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.
- 5.12. 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.
- 5.13. Where possible, dwellings will be able to benefit from cross-ventilation to effectively purge warm air from the properties during periods of hot weather. Window opening areas will be considered and guided by the Part O assessment, with increased opening areas being designed in as required.

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 a 10% reduction in site-wide energy demand, in accordance with Policy EEC SP2 of the Arun Local Plan 2011-2031 with Adoptions Arun Local Plan 2011-2031 (July 2018).

Combined Heat and Power (CHP) and District Energy Networks

- 6.2. 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.
- 6.3. 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.
- 6.4. 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

- 6.5. 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.
- 6.6. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 5.0m/s⁴. 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

- 6.7. 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 Photovoltaic (PV)
 - Air Source Heat Pumps (ASHPs)
 - Ground Source Heat Pump (GSHPs)
- 6.8. The advantages and disadvantages of these technologies are evaluated in Tables 7-11.

⁴ NOABL Wind Map (<http://www.rensmart.com/Weather/BERR>)

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

Table 7. Individual Biomass heating feasibility appraisal

Potential Advantages	Risks & Disadvantages
- Potential to significantly reduce CO₂ emissions as the majority of space and water heating will be supplied by a renewable fuel - Decreased dependence on fossil fuel supply	- A local fuel supply is required to avoid increased transport emissions - Fuel delivery, management and security of supply are critical - Space is required to store fuel, a thermal store and plant - A maintenance regime would be required even though modern systems are relatively low maintenance - Building users or a management company must be able to ensure fuel is supplied to the boiler as required. Local environmental impacts potentially include increased NO_x and particulate emissions
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. However, the potential impact on local air quality from regular fuel deliveries and the combustion of fuels on site means they are not considered an appropriate technology.	

Table 8. Solar Thermal systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
- Mature and reliable technology offsetting the fuel required for heating water (typically gas) - Solar thermal systems require relatively low maintenance - Typically, -50% of hot water demand in dwellings can be met annually	- Installation is restricted to favourable orientations on an individual building basis - The benefit of installation is limited to the water heating demand of the building - Safe access must be considered for maintenance and service checks - Buildings need to be able to accommodate a large solar hot water cylinder - Distribution losses can be high if long runs of hot water pipes are required - Visual impact may be a concern in special landscape designations (e.g. AONB)
Estimated costs and benefits	
- 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 9. 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 - 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 £1,500 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.	

Table 10. Air Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
- Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle - Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 250% - Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings	- Air source heat pumps are powered by electricity, potentially leading to an increase in running costs - It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved. Users must be educated in how heat pump systems should be operated for optimal efficiency - Air source heat pump plant should be integrated into the building design to mitigate concerns regarding the visual impact of bolt-on technology - Noise in operation may be an issue particularly when operating at high output
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.	

Table 11. Ground Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
- Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle - Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 320% - Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings	- Low temperature heating circuits (underfloor heating) would be required to maximise the efficiency of heat pumps - A hot water cylinder would also be required for both space and water heating - Ground source heat pumps are powered by electricity potentially leading to an increase in running costs, however this is mitigated by the high efficiency of the 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+ - 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 considered technically feasible for buildings in this scheme.	

Proposed Renewable Energy Systems

6.9. Following this feasibility assessment, it is considered that as biomass heating systems would require significant storage space for fuel as well as regular deliveries at different times to all dwellings, they are not appropriate for this development.

6.10. A range of technologies are considered potentially appropriate, including

- Solar thermal systems
- Solar photovoltaics
- Air source heat pumps
- Ground source heat pumps

6.11. In order to deliver the requirements of EEC SP2, Solar photovoltaics have been selected to be implemented on the scheme.

7. As-Designed Performance

- 7.1. Through following the strategy described, the dwellings will reduce energy demand and consequent CO₂ emissions beyond a Part L 2021 compliant level of performance through the dwelling fabric and the incorporation of low-carbon renewable energy systems.
- 7.2. A sample range of dwellings have been assessed under Part L 2021 to establish the baseline, with the proposed fabric and renewables strategy applied to provide an overview of the typical as-designed carbon performance. The results of these calculations are shown in Table 12.

Table 12. Proposed as-designed CO₂ emissions – (Part L 2021)

	Part L compliant emissions (kgCO ₂ /year/m ²)	As-designed emissions (kgCO ₂ /year/m ²)	Improvement %
Arkwright)	12.73	12.32	6.68
Baker	12.94	12.26	5.26
Bookbinder	11.90	11.58	2.69
Bowyer	12.50	12.12	3.04
Cartographer	10.79	10.35	4.11
Faber	11.10	10.95	1.35
Jeweller	10.61	10.36	2.36
Reedmaker	9.84	9.64	2.03
Stationer	9.41	9.40	0.11
Tillman	12.87	13.75	26.50
Watchmaker	12.46	10.57	15.17

- 7.3. Based on these calculations, the estimated site-wide as-designed CO₂ emissions are shown in Table 13.

Table 13. Part L compliant baseline CO₂ emissions for the site

	CO ₂ emissions (kgCO ₂ /year)
Part L Compliant Baseline	104,998
As-Designed Emissions	101,361
Saving	3,637
%	3.00%
% Saving on 2013	33.10%

- 7.4. Table 14 demonstrates energy demand met through renewables.

Table 14. Estimated Energy generated from Renewables

	kWh/year	%
Energy from Renewables	173,160	22.43%

- 7.5. It should be noted that at this stage all calculations have been carried out based on samples of the proposed house types, and as such the calculations do not account for plot specific variations such as orientation and shelter from surrounding buildings. Full design SAP calculations will be carried out to determine the exact CO₂ emissions and ensure that the site will be compliant with Part L Regulatory Standards and specific site targets.
- 7.6. All dwellings constructed beyond the implementation of the Future Homes Standard, which is expected to be introduced in 2026, will meet a 75-80% reduction in CO₂ emissions compared with Part L 2013. It will be ensured as design progresses that revised calculations will be undertaken on a plot-by-plot basis under the relevant Part L to accurately represent the final CO₂ emissions of the development.

8. Efficient Use of Natural Resource

Materials

- 8.1. The impacts of construction materials range from the depletion of natural resources to the greenhouse gas emissions and water use associated with their manufacture and installation.
- 8.2. Within the development choices will be made 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.
 - All insulating materials will have a Global Warming Potential (GWP) of < 5 in manufacture and installation.
 - All materials used in construction will be responsibly sourced, with certification obtained wherever possible. Materials with a low environmental impact as per the BRE Green Guide will be preferred.

Waste

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

Construction Waste

- 8.4. 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. m3 of waste per 100m2 / tonnes waste per m2.
- 8.5. 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 Conservation

- 9.1. Policy DM1 of the Arun Local Plan 2011 - 2031 requires measures to limit water use to no more than 110 litres/person/day and external water use of no more than 5 litres/person/day.
- 9.2. In line with Policy DM1 and Building Regulations 2021, water use will be managed effectively throughout the development through the incorporation of appropriate efficiency measures.
- 9.3. 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.
- 9.4. Table 15 shows how the development could achieve a result less than the required 110 litres/occupier/day calculated in accordance with Building Regulations 17.K methodology.
- 9.5. The calculation results in a total water consumption of 105.9 Litres/Person/Day for the intended specification, including external use, well below the maximum of 110 Litres/Person/Day required by Policy DM1.

Table 15. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/Person/Day
WC (dual flush)	Full flush (l)	6	8.76
	Part flush (l)	4	11.84
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
Bath	Capacity to overflow (l)	181	19.91
Shower	Flow rate (l/min)	6	26.22
Kitchen sink taps	Flow rate (l/min)	6	13.00
Calculated Use			110.9
Normalisation Factor			0.91
Total Internal Consumption (L)			100.9
External Use			5.0
Building Regulations 17K			105.9

10. Conclusions

- 10.1. This Energy and Sustainability Statement has been prepared by AES Sustainability Consultants Ltd on behalf of Bellway Ltd Sussex to detail the proposed approach to sustainable construction to be employed at Land East of Wandleys Lane, Fontwell.
- 10.2. The development site is located to the East of the village of Fontwell, approximately 7 miles from Chichester. The proposals would deliver 95 dwellings across a mix of two to four bed terraced, semi-detached and detached houses and one to two bed maisonettes.
- 10.3. The primary purpose of this statement is to address the requirements of Policy EEC SP2 of the Adoption Arun Local Plan 2011-2031 (July 2018) and Condition 43, which requires that there be a renewable energy scheme in place which must achieve a 10% reduction in energy use, achieved using energy production from renewable or low carbon sources.
- 10.4. A range of potentially appropriate technologies have been assessed for feasibility in delivering energy reductions from renewable energy technologies in accordance with Policy EEC SP2, concluding that Solar Photovoltaic systems constitute both the preferred and viable technology for this site.
- 10.5. Calculations demonstrate that P.V used to achieve compliance with Part L 2021 would deliver circa 21 % of the developments overall energy demand, exceeding the requirements of Policy EEC SP2.
- 10.6. In line with Policy DM1, this statement also demonstrates how the water conservation target can be achieved. Water will be managed effectively throughout the development through the incorporation of appropriate efficiency measures to achieve a maximum internal water consumption of 105 litres/person/day.