Energy Statement

Land at Church Raike, Chipping

Chipping Homes Ltd

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Revision	*Note*	*Issue Date*
0	*Initial issue*	*28.03.18*
1	*Amendment to site description*	*11.04.18*

This Strategy has been commissioned by Chipping Homes Ltd to detail the proposed approach to sustainable construction to be employed at the Land at Church Rake site, Chipping. 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 Written by AES Sustainability Consultants on behalf of Chipping Homes Ltd, this Statement has been prepared in support of the application for development of the site at Land at Church Raike, Chipping.

Development Description

1.2 The development site is located on the north west of the village of Chipping, within the Ribble Valley, Lancashire. Permission for development was granted in April 2016 following appeal, ref APP/T2350/W/15/3119224.

1.3 The wider consented development consists of a change of use of the existing Kirk Mill to a hotel and restaurant, works to the barn to create holiday cottages and other uses to be provided across the site. The permission additionally allows for 60 dwellings to be constructed across 2 sites (comprising a maximum of 56 and 4 units respectively).

1.4 The proposal considered within this statement consists of 39 dwellings, with a mix of 7 bungalows and 3-5 bedroom detached houses to be provided on the former cricket ground site. Vehicular access to the site is to be provided onto Church Raike at the northern boundary.

Purpose and Scope of the Strategy

1.5 This Energy & Sustainability Statement is an addendum to the previously submitted strategy, setting out an alternative approach to delivering significant energy demand reductions in order to address Condition 7.

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2 Planning Policy

2.1 The key planning Condition relevant to this Energy and Sustainability Statement is Condition 7 from APP/T2350/W/15/3119224, as extracted below:

> **Schedule 1; Conditions for Planning Permission**
>
> Conditions solely relating to the Outline aspects of the permission for land parcels 3 and 4 on DWG No 05024_MP_00_105 Site Wide Planning Guide.
>
> 7. Prior to the commencement of development a scheme (including a timetable for implementation) to secure at least 10% of the energy supply of the development hereby permitted within that phase from renewable or low carbon energy sources or a scheme that demonstrates that alternative measures will achieve at least 10% less energy consumption than similar development constructed in accordance with the current Building Regulations standards shall be submitted to and approved in writing by the Local Planning Authority. The approved scheme/details shall be implemented as part of the development as approved and retained as operational thereafter.

Local Planning Policy

2.2 The Ribble Valley Core Strategy was adopted in December 2014 and sets out a number of 'key statements' to aid delivery of the overall strategy and objectives. Of principal relevance to the sustainable construction proposals is Key Statement EN3:

> **Key Statement EN3: Sustainable Development and Climate Change**
>
> The Council will seek to ensure that all development meets an appropriate recognised sustainable design and construction standard where viable to do so, in order to address both the causes and consequences of climate change. In particular, all development will be required to demonstrate how it will contribute towards reducing the Borough's carbon footprint. The Council will assess applications against the current Code of Sustainable Homes, Lifetime Homes and Buildings for Life and BREEAM standards, or any subsequent nationally recognised standards.
>
> In adapting to the effects of climate change it is expected that proposals for development will demonstrate how sustainable development principles and sustainable construction methods, such as the use of sustainable drainage systems, will be incorporated.
>
> All development should optimise energy efficiency by using new technologies and minimising the use of energy through appropriate design, layout, material and landscaping and address any potential issues relating to flood risk.

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National Policy

2.3 Key Statement EN3 makes reference to the standards set out within the Code for Sustainable Homes (the Code). The Code was a scheme sponsored by the Government intended to promote and support the transition to more sustainable homes. The Code was withdrawn following the conclusion of the Housing Standards Review on 25th March 2015 and it is the Government's view updates to the Building Regulations are now the appropriate mechanism to be used to drive standards further.

2.4 The ministerial statement to Parliament[1] following the Housing Standards Review advised:

"*From the date the Deregulation Bill 2015 is given Royal Assent, local planning authorities…should not set… any additional local technical standards relating to the construction, internal layout or performance of new dwellings. This includes any policy requiring any level of the Code for Sustainable Homes to be achieved by new development; the Government has now withdrawn the Code, aside from the management of legacy cases.*"

Proposed Policy Responses

2.5 The sustainable construction strategy will seek to meet the requirements of Condition 7 and deliver at least 10% of the energy from low carbon or renewable energy systems.

2.6 Further details are provided in the following sections of this statement.

[1] DCLG, March 2015 - Planning update 25th March 2015 - written Ministerial Statement

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3 Baseline CO_2 Emissions & Energy Demand

3.1 The energy performance of dwellings is assessed using the Standard Assessment procedure. SAP calculations have been undertaken for a representative sample of all dwellings across the site in order to establish the Part L compliant energy demand and establish the baseline energy performance of the development.

3.2 The Part L baseline compliant energy and CO_2 emissions for the development are reported in Table 1.

Table 1. Part L Compliant Energy Demand and CO_2 emissions

Part L 2013 compliant development	
Total Energy Demand – kWh/year	341,679
Total CO_2 Emissions - kgCO_2/year	120,673

3.3 The total regulated energy demand of the baseline Part L compliant development is calculated as 341,679 kWh/year.

4 Energy and CO_2 Reduction Strategy – Fabric First

4.1 The proposed construction specification and sustainable design principles to be applied to the development will ensure that each dwelling meets the carbon dioxide reductions mandated by Part L1A of the Building Regulations through fabric measures alone.

4.2 It is proposed that the CO_2 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 1).

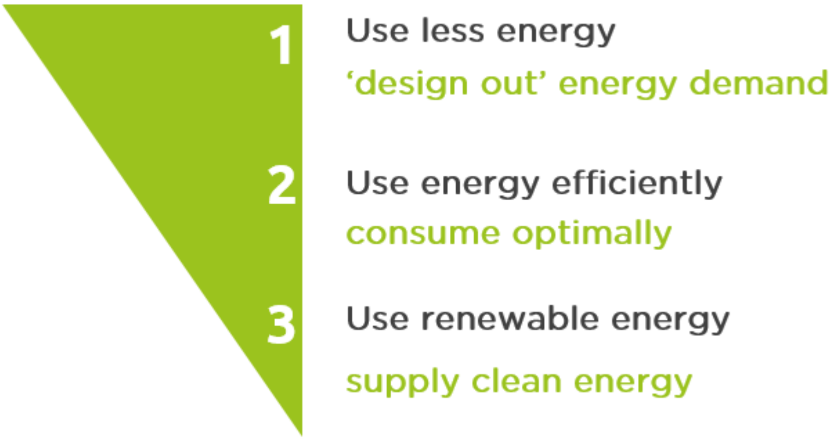

Figure 1. The Energy Hierarchy

4.3 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 of new housing, 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.

4.4 This approach has been widely supported by industry and government for some time, with the Zero Carbon Hub[1] and Energy Saving Trust[2] having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy homes.

4.5 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 Saving Trust, Fabric first: Focus on fabric and services improvements to increase energy performance in new homes, 2010

Table 2. Benefits of the Fabric First approach

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

Building Regulations Standards – Fabric Energy Efficiency

4.6 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/m^2/year.

4.7 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.

4.8 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.

Improved fabric specification

4.9 In order to ensure that the energy demand of the development is reduced, the dwellings will be designed to minimise heat loss through the fabric wherever possible. Table 3 details the design 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 that have been made.

Table 3. Construction specification – main elements

	Part L1a Limiting Fabric Parameters	Design Specification
External wall – u-value	0.30 W/m²K	0.29 W/m²K
Party wall – u-value	0.20 W/m²K	0.0 W/m²K
Plane roof – u-value	0.20 W/m²K	0.11 W/m²K
Ground floor – u-value	0.25 W/m²K	≤ 0.15 W/m²K
Windows – u-value	2.00 W/m²K	1.4W/m²K
Doors – u-value	2.00 W/m²K	1.5 W/m²K
Air Permeability	10 m³/h.m² at 50 Pa	5 m³/h.m² at 50 Pa

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 Accurate calculation of these heat losses forms an integral part of SAP calculations undertaken to establish energy demand of the dwellings. The specification as proposed minimises unnecessary bridging of the insulation layers - for example independent or thermally broken lintels will be specified to reduce heat loss at this key junction.

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 proposal adopts an airtightness standard of 5 m³/m²@50Pa, a significant enhancement on Part L1A minimum requirements. Pressure testing of all dwellings on completion will be undertaken to confirm that the design figure has been met.

Passive design measures and overheating risk mitigation

4.13 In order to further reduce energy demand, where practical dwellings have been designed with regard to the principles of passive design, including consideration of building orientation and site placement to maximise the potential for solar gain.

4.14 Within the development layout, orientation and massing will be designed to maximise (within reason) 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.

4.15 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. Time and temperature zoning controls will be included with fully insulated primary pipework being installed throughout.

4.16 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.

4.17 These measures will serve to ensure that the development builds in resilience to a potentially changing climate over the lifetime of the buildings and minimises the overheating risk that can be exacerbated by the drive to build better insulated, more airtight homes if not considered within the design and construction process.

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5 Renewable Energy Systems

5.1 Condition 7 requires the development to deliver 10% of the energy demand of the development from low carbon or renewable energy systems.

5.2 A range of potential technologies have been assessed for potential incorporation into the scheme in accordance with Regulation 25A of the Building Regulations.

Combined Heat and Power (CHP) and District Energy Networks

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

5.4 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 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 to this solely residential development.

5.5 Due to the low heat density and small scale of the proposed development, it is considered that a new network to serve the area is not viable, and there are currently no heat networks which extend near the proposed development. High network heat losses associated with distribution to individual houses and small apartment blocks, as opposed to large high-rise apartment blocks and commercial developments additionally mean that the provision for future connection to a district heating system is not proposed.

Wind Power

5.6 A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 5m/s[3]. Wind turbines at this site are therefore unlikely to generate sufficient quantities of electrical energy to be cost effective[4].

5.7 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. For these reasons wind power is not considered feasible.

[3] NOABL Wind Map (http://www.rensmart.com/Weather/BERR)
[4] CIBSE TM38:2006. Renewable energy sources for buildings.

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Building Scale Systems

5.8 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
- Ground source heat pumps

5.9 The advantages and disadvantages of these technologies are evaluated in Tables 4-8.

Table 4. Air Source Heat Pump feasibility appraisal

Air Source Heat Pumps	
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% upwards • Grid electricity has been significantly decarbonised since the carbon factor in SAP2012 was set, and is proposed to be reduced by 23% in the next revision of the calculation methodology, increasing the assessed benefit of heat pump systems significantly.	• Air source heat pumps are powered by electricity. The current carbon factor of electricity as stated in SAP2012 is 0.519 $kgCO_2/kWh$, higher than other potential fuel sources in the short term. • 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
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme.	

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Table 5. Ground Source Heat Pump feasibility appraisal

Ground Source Heat Pumps	
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% upwards • Grid electricity has been significantly decarbonised since the carbon factor in SAP2012 was set, and is proposed to be reduced by 23% in the next revision of the calculation methodology, increasing the assessed benefit of heat pump systems significantly. • Ground source heat pumps can deliver high efficiency due to the seasonal stability of the heat source	• Ground source heat pumps are powered by electricity. The current carbon factor of electricity as stated in SAP2012 is 0.519 $kgCO_2/kWh$, higher than other potential fuel sources in the short term. • 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. • Signficant space is required for horizontal loop heat exchangers, and boreholes for vertical loops may be expensive
Conclusions	
Ground source heat pumps are technically feasible for the buildings in this scheme.	

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Table 6. Biomass Heating feasibility appraisal

Biomass Heating	
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. This may have a negative impact on marketing of buildings • Local environmental impacts potentially include increased NO_x and particulate emissions
Conclusions	
Biomass heating is considered technically feasible in large dwellings provided sufficient space can be accommodated for fuel supply, delivery and management. It is not considered feasible in smaller houses or apartments.	

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Table 7. Solar Thermal systems feasibility appraisal

Solar Thermal	
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)
Conclusions	
Solar thermal systems are considered technically feasible on all buildings with suitable roof orientations and space to accommodate hot water cylinders.	

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Table 8. Solar Photovoltaic systems feasibility appraisal

Solar Photovoltaic (PV)	
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 • 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 • Occupiers could benefit from Feed in Tariff payments	• Poor design and installation can lead to lower than expected yields (e.g. from shaded locations) • Installation is restricted to favourable orientations • Occupiers may not benefit from Feed in Tariff payments where the contract is held by a landlord • Safe access must be considered for maintenance and service checks • Visual impact may be a concern in special landscape designations (e.g. AONB) • Reflected light may be a concern in some locations
Conclusions	
PV panels are considered technically feasible for all buildings with suitable roof orientations.	

5.10 Following the appraisal of renewable and low carbon technologies a range of technologies are considered to be technically feasible to some of the plots on this scheme;

- Biomass heating to the larger houses that have space to store fuel and a thermal store.
- Solar thermal collectors to the houses that have space to incorporate a hot water cylinder and have suitable roof orientations.
- Solar photovoltaic panels to the dwellings that have suitable roof orientations.
- Air source heat pumps

5.11 The proposed strategy for this Energy Statement has been the incorporation of Air Source Heat Pumps to all units on the proposed development. These systems are a flexible and cost effective method of incorporating low carbon heating, without impact on local air quality or visual impacts of roof-mounted technologies.

5.12 The carbon offset of these systems will continue to increase compared with other fuel sources as the grid decarbonises over the coming years – National Grid projections[5] estimate that grid

[5] National Grid, 2016, Future Energy Scenarios

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electricity will be approximately equal to mains gas in the first half of the 2020s, therefore heat pumps will be capable of delivering heating with less than half the emissions of standard gas-fired heating systems.

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6 Energy from Low Carbon Technologies

6.1 As Detailed in Table 9, the saving in kWh/year gained from the Air Source Heat Pumps is over the required 10% reduction in energy demand. Due to the inherent efficiency of these systems, the total energy demand is substantially lower than the Part L compliant baseline

Table 9. Energy from low carbon sources

Total energy demand (Part L compliant)	341,679 kWh/year
Total energy requirement using air source heat pumps	193,733 kWh/year
% reduction in total demand	43.30%
Delivered energy from low carbon source	167,658 kWh/year
% energy from low carbon sources	86.54%

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7 Conclusions

7.1 This Statement has been prepared in support of the application for development of the site at Land at Church Rake, Chipping.

7.2 The proposals considered within this statement consists of 39 dwellings, with a mix of bungalows and 3-5 bedroom detached houses to be provided on the former cricket ground site. The proposals form part of a wider development consented at appeal ref APP/T2350/W/15/3119224 in April 2016, subject to a number of Conditions.

7.3 This Energy Statement updates the previously submitted statement and sets out the proposed approach to sustainable construction to be applied in relation to the development of the dwellings, prioritising energy demand reduction as the first stage of the energy hierarchy.

7.4 Calculations undertaken in accordance with the Standard Assessment Procedure for ADL1A compliance have been conducted to all of the dwellings proposed, and the baseline energy demand of the development is assessed as 341,678kWh/year.

7.5 A range of low and zero carbon technologies have been assessed for suitability, concluding that air source heat pumps are the most appropriate for the development. These systems deliver highly efficient low carbon heating whilst minimising visual impacts which arise from roof-mounted systems and avoiding air quality issues which can be an issue with biomass fuels.

7.6 These highly efficient systems will be capable of delivering a high proportion of the energy demand of the development, whilst also reducing the energy demand by over 40%. The systems will deliver space heating and hot water which account for approximately 86% of the total regulated energy demand of the dwellings, far exceeding the requirements of Condition 7.

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