



Energy Statement

Worthing Honda,
Littlehampton Road, Worthing

21st February 2018

Quality Management



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1.0 EXECUTIVE SUMMARY

- 1.1 This report outlines the estimated energy/emissions performance of the construction of a new car showroom, offices and associated workshop at Worthing Honda, Littlehampton Lane, including features that have been incorporated to the building design and building systems to minimise energy demand, energy use and resultant carbon dioxide emissions.
- 1.2 In addition to demand management and energy efficient equipment, the proposed development has assessed the opportunity to generate energy through on-site low or zero carbon (LZC) technologies in accordance with Arun District Council Local Plan Policy SP15.
- 1.3 The proposed development has applied the Energy Hierarchy to prioritise emissions reductions from the building fabric and energy efficiency before the proposed incorporation of low and zero carbon technologies.
- 1.4 The proposed development has targeted meeting the energy demand as efficiently as possible as the main component of the energy strategy. This will be done in conjunction with key measures including improved fabric U-values, the use of accredited construction detailing and improved levels of air-tightness.
- 1.5 In addition to building fabric improvements, installed building systems will be fit for purpose, and energy efficient to ensure energy demand is minimized from the outset, prior to the application of Low Carbon Energy systems to meet a proportion of the demand generated.
- 1.6 The proposed development achieves a **10.02%** annual CO₂ saving against the baseline Part L2a (2013) threshold, and **28.57%** of the predicted energy demand for the building will be delivered by a Low Carbon Energy Source (ASHP), meeting the requirements of Arun District Council Local Plan Policy SP15, of producing a minimum 10% of the total predicated energy requirements from renewable or low carbon energy generation on site.

2.0 BACKGROUND

INTRODUCTION

- 2.1 Redsix were commissioned to prepare an Energy Statement and LZC Feasibility Study for the proposed Worthing Honda development at Littlehampton Road, Worthing.
- 2.2 This report presents the outcome of the energy appraisal of the proposed development and details the approach that the applicant and the design team have collectively taken towards achieving a high standard of operational energy performance. This report outlines the features that have been incorporated into the design proposals which aim to reduce the energy demand, energy use, resultant carbon dioxide emissions and therefore environmental impact of the scheme. In addition to demand reduction and energy efficient design the report assesses the application of low or zero carbon technologies (LZCs) to the proposed development.
- 2.3 The purpose of the Energy Statement is to provide an independent verification that the design of the proposed development is in accordance with objectives of relevant planning policy at all levels and is an example of good practice in low energy design. This Statement reports the performance of the proposed development using local, regional and national level guidance on energy performance.
- 2.4 The Statement includes:
- A brief description of the proposed development;
 - A definition of the energy hierarchy applied to the development;
 - A summary of the relevant national, regional and local energy planning policy drivers;
 - An examination of the performance of the scheme in accordance with key energy policy of the Arun District Council Local Plan Policy SP15.
 - A review of the proposed development's performance against appropriate BREEAM measures relating to passive design, energy and CO₂ reduction.
- 2.5 The energy appraisal has been undertaken at an early stage to directly inform building design and ensure that the building can achieve optimal energy performance. The Energy Statement, therefore, also provides a framework for the team to monitor the scheme's performance throughout its development and operation.

THE PROPOSED DEVELOPMENT

- 2.6 The application site is found at Littlehampton Road, Farring, Worthing, and the proposed development comprises the construction of a new car showroom, with associated workshop and office accommodation.

3.0 POLICY & LEGISLATIVE CONTEXT

- 3.1 There are a number of national policy drivers for energy efficiency and reduced carbon dioxide (CO₂) emissions, which have been introduced to address the issue of global warming and the implications of climate change including the Energy White Paper, National Planning Policy Framework (NPPF), Building Regulations Approved Document Part L (2013 edition), and the BREEAM Assessment methodology. On a Local level, the Arun Local Plan provides the policy drivers for developments within the Arun Local Planning Authority Area (LPA).

National Policy Drivers

National Planning Policy Framework

- 3.2 The National Planning Policy Framework (NPPF) was adopted in March 2012, setting out a key part of the Government's reforms to make the planning system less complex and more accessible, whilst protecting the environment and promoting sustainable growth. The NPPF supersedes the previous national planning guidance, namely the Planning Policy Statements and Planning Policy Guidance Notes.
- 3.3 At the heart of the NPPF is a 'presumption in favour of sustainable development', which requires Local Authorities as part of any plan-making or decision-making to provide clear guidance on how the presumption should be applied locally. In addition, the NPPF sets out twelve core land-use planning principles that the Government has identified that underpin both plan-making and decision-making. Of these, the following has been identified as being relevant to energy:

'Support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy).'

Local Policy Drivers

Arun District Council Local Plan

- 3.4 The Arun Local Plan is the local strategy for Arun District Council. It sets out the Council's long-term vision, spatial strategy and core policies for shaping the future development of Arun to 2031 and beyond.

Policy SP15 'Energy and Climate Change Mitigation'

'All new residential and commercial development (including conversions, extensions and changes of use) will be expected to be energy efficiency and to demonstrate how they will:

- *Achieve energy efficiency measure that meet code Level 3 or 4 Code for sustainable Homes or 'Very Good' BREEAM rating. Energy efficiency measures should reach the equivalent of Level 5 or 6 Code for Sustainable homes or 'Excellent' BREEAM rating by 2016;*
- *Use design and layout to promote energy efficiency*

- *Incorporate decentralised, renewable and low carbon energy supply systems, for example small scale renewable energy systems such as solar panels.*
- *All major developments must produce 10% of the total predicated 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 predicated energy requirements are calculated....'*

BUILDING REGULATIONS

- 3.5 Building Regulations exist to ensure the health, safety, welfare and convenience of people in and around buildings, and the energy efficiency of buildings. The regulations apply to most new buildings and many alterations of existing buildings in England, whether new residential, or non-residential.
- 3.6 The development at Littlehampton Road will be constructed to be compliant with Building Regulations Part L2a (2013), which represent the current Regulations at the time of construction and are appropriate of the proposed works.
- 3.7 The Building Regulations were updated on 6th April 2014, and the following relevant Approved Documents have been used in relation to complying with the energy efficiency requirements. This represents the appropriate compliance standards in relation to the proposed development:
- Approved Document Part L2a (2013) 'Conservation of fuel and power in new building other than dwellings'.

BREEAM

- 3.8 The proposed development is being assessed under the Building Research Establishment's Environmental Assessment Method (BREEAM), a nationally recognised means of reviewing and improving the environmental performance of buildings. BREEAM considers a wide range of key global and local environmental issues, and the internal environment for building occupants under various categories including energy.
- 3.9 The initial project has been assessed by an accredited, licensed BREEAM Consultant, and a maximum potential BREEAM score of 71.70% has been established, equivalent to an overall BREEAM rating of 'Excellent', under the BREEAM New Construction 2014 methodology. Please refer to the BREEAM pre-assessment report for further information on the outline measures currently targeted for the development.

4.0 ENERGY ASSESSMENT

- 4.1 In order to assess the likely energy demands of the proposed development, the emissions have been calculated using drawings produced by HNW Architects Limited of the proposed development.
- 4.2 An energy modelling exercise has been undertaken to determine the anticipated Building Regulations baseline, which indicates the minimum regulatory performance for the regulated emissions and energy demand of the proposed development.
- 4.3 The methodology used to estimate the energy demand from the building has been informed by the National Calculation Methodology (NCM) modelling guide, and the software used to generate the Regulation baseline is approved by the DCLG as being compliant with the NCM.

CO₂ EMISSIONS BASELINE

- 4.4 The regulated emissions baseline for the proposed development is taken as the baseline compliance figures generated by the calculation software to achieve regulatory (Part L) compliance:

CO ₂ Emissions Baseline (kgCO ₂ /m ² /yr)	Baseline CO ₂ Emissions (tonnesCO ₂ /yr)
24.90	30.93

ENERGY DEMAND BASELINE

- 4.5 In accordance with Policy SP15 of the Arun Local Plan, the energy demand baseline (or 'total predicted energy requirements') must include energy efficiency measures. These are discussed in more detail in Section 4 where the energy demand baseline for Policy SP15 is also established.

In relation the BREEAM Measure Ene04 'Passive Design' the baseline energy demand figure for the proposed development is taken as the compliance figures generated by the calculation software to achieve regulatory (Part L) compliance:

BREEAM Measure Ene04 – Passive Design	
Energy Demand Baseline (kWh/m ² /yr)	Energy Demand Baseline (MWhCO ₂ /yr)
58.00	72.06

5.0 'BE LEAN' – PASSIVE DESIGN MEASURES

THE ENERGY HIERARCHY

5.1 The Energy Hierarchy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. This can be summarized into three key stages:

- Using less energy, in particular by adopting sustainable design and construction measures (passive design measures);
- Supplying energy efficiency, in particular by prioritising decentralised energy generation; and
- Using renewable or low carbon energy sources.

5.2 Consequently, the first stage in the energy strategy for the proposed development is the consideration of passive energy efficiency measures to ensure that the base energy demand is minimised.

PASSIVE DESIGN ANALYSIS

5.3 A model was constructed using the IESVE software and populated with data to represent the local climate, building type, building fabric, occupants, building services and use profiles according to the NCM (National Calculation Methodology) developed for building regulations compliance analysis.

5.4 An assessment has been carried out to identify which items from the list of passive design analysis variables in BREEAM compliance notes CN3 would be applicable for the proposed project. Important factors which limit the scope of potential passive design measures were the characteristics of the area, occupancy type and that the shape, form and orientation were fixed, due to the site vernacular.

5.5 Following the assessment of available passive design variables for the project, the following improvement parameters were determined:

Passive Design Variables		
Variable	Original Value	Improved Value
External walls u-value	0.30 W/m ² k	0.25 W/m ² k
Ground Floor u-value	0.25W/m ² k	0.23 W/m ² k
Roof u-value	0.25 W/m ² k	0.17 W/m ² k
Windows	1.8 W/m ² k	1.75 W/m ² k
Air Permeability	7 m ³ /hr.m ² @50Pa	5m ³ /hr/m ² @50Pa

The model was then recalculated using the improved passive design variables and the following resulting energy demand was achieved.

Energy Demand Baseline (kWh/m ² /yr)	Energy Demand Baseline (MWh/yr)
50.78	63.09

'BE LEAN' EMISSIONS PERFORMANCE

- 5.6 Based upon the energy modelling of the proposed development, incorporating the improved passive design variables, a resulting energy demand of 63.09 MWh/yr is achieved. This figure represents the baseline energy demand requirement in respect of Policy SP15.

In relation to BREEAM Measure Ene04 'Passive Design' at total annual regulated energy demand reduction of 12.4% is achieved, which represents a meaningful reduction in the total energy demand as a result of the improves measures incorporated into the design.

6.0 'BE CLEAN' - SUPPLYING ENERGY EFFICIENTLY

DECENTRALISED ENERGY NETWORK

- 6.1 In response to the second tier of the Energy Hierarchy a preliminary investigation into the adjacent heat loads and infrastructure has been undertaken. The proposed development is located in an area of moderately low heat demand, with no proposed or existing heat networks in the area. It is therefore currently not feasible to consider connection to an existing district heating network.

COMBINED HEAT & POWER OPTION

- 6.2 The Energy Hierarchy identifies combined heat and power (CHP) as a method of producing heat and electricity with much lower emissions than separate heat and power. However, CHP, although highly desirable, does have practical limitations. The principle requirement is that to be effective, all of the energy produced must be utilised, with annual operating hours of at least 5000hrs/yr. This means that all the electricity must be used in a financially sound manner and all the waste heat must be put to good use –preferably to meet a heat demand –and not dumped.

It expected the simultaneous demand for heat and power for the development will be less than 5,000 hours per annum, therefore CHP has not been considered a viable option.

7.0 'BE GREEN' - LZC TECHNOLOGIES ASSESSMENT

- 7.1 An initial outline assessment of feasible renewable and low carbon energy sources has been carried out and the results are detailed below. The renewable energy feasibility study for the proposed development has assessed the use of solar thermal collectors, biomass heating, ground & air source heat pumps and photovoltaic modules.

WIND TURBINE GENERATORS

- 7.2 The wind speeds and frequencies in urban areas such are not expected to yield any significant carbon reductions. For these reasons the application of a wind turbine for the project has not been considered.

SOLAR WATER

- 7.3 Solar thermal panels are used to produce hot water and consist of roof mounted collector panels that make use of heat energy from the sun to heat water circulating in a closed loop. Usually this heat is then transferred via a heat exchanger into a hot water storage tank that is also heated by a gas or other boiler.

Two main types of solar water heating system are used in the UK; flat plate collectors and evacuated glass heat tubes. Flat plate collectors circulate water around a black coloured receiver plate that is heated by direct sunlight and to some extent by indirect light; heat being retained by a thermally glazed panel above. Evacuated glass heat tubes are more efficient, particularly in the UK, as they can work more effectively at low solar radiation levels. They are however, more expensive than flat plate collectors. They consist of rows of parallel transparent glass tubes, each containing an absorber tube which converts the sunlight into heat energy.

At the proposed development solar hot water systems could be installed, however to achieve the required reduction in CO₂ and meet the required energy demand a significant number of panels would be required, therefore it is not recommended to install a solar hot water system at the proposed development.

GROUND SOURCE HEATING

- 7.4 Ground source heat pumps (GSHP) extract heat from the ground. GSHPs work on the principle that the below ground temperature is more constant compared to above ground. In the winter months, the below-ground temperature is warmer than above ground and the heat carrier fluid circulating within the absorber pipes absorbs the heat. This heat energy is then raised by a compressor (using the compression cycle) and through a heat exchanger, distributed via a low temperature distribution system such as under floor heating, to satisfy a proportion of space heating requirements. GSHP systems are not suitable for satisfying high temperature hot water demands.

In the summer months, the below-ground temperature is colder than above ground and heat carrier fluid circulating within the buried pipes rejects building heat. This heat rejecting capacity is then raised by a compressor (using the compression cycle), and

through a heat exchanger, is then distributed via a chilled water distribution system to satisfy a proportion of space cooling requirements.

There are a number of configurations for GSHP systems, however the installation of a vertical collector system or horizontal collector system is not considered technically feasible for the project, given the restricted areas available for their installation.

Given the expense of installation, the number of boreholes required to meet the load requirements of the proposed development, along with a limited installation area for collectors (horizontal and vertical) it is not recommended to install a ground coupling at the proposed development.

AIR SOURCE HEATING

- 7.5 Air source heat pumps (ASHPs) utilise the outside air as a heat source or heat sink. Heat can be used to warm water for radiators or underfloor heating systems, or to warm the air within a dwelling. ASHPs work on a similar principle to a fridge, which extracts heat from its inside. An evaporator coil, mounted outside absorbs or expels the heat; a compressor unit then drives refrigerant through the heat pump and compresses it to the right level to suit the heat distribution system. Finally, a heat exchanger transfers the heat from the refrigerant for use, depending on which of the two main types of systems (identified below) is installed:

As with GSHPs, ASHPs could be technically be installed and given their potential of meeting a significant amount of the required energy demand for the building, they are a feasible low carbon energy system for the project.

BIOMASS

- 7.6 Biomass boilers replace conventionally powered boilers with an almost carbon neutral fuel such as wood pellets or wood chips. The fuel is classed as almost carbon neutral because the CO₂ released during the burning of biomass is balanced by that absorbed by the plants during their growth.

The existing site layout does allow for the adequate biomass fuel storage and safe delivery.

Although many biomass burners will meet Clean Air Act requirements, combustion of wood biomass releases higher quantities of NO_x, SO_x and particulates (PM10 and PM2.5) compared to a comparable system fuelled by natural gas, which can adversely affect local air quality.

Biomass could technically be burned at the application site but is not preferred given site spatial limitations, the management burden of fuel deliveries and removal of ash and the potential impact on local air quality given the proximity of existing residential dwellings. For these reasons Biomass has been deemed unfeasible for the project.

PHOTOVOLTAIC CELLS

- 7.7 Solar Photovoltaics (PVs) are solar panels which generate electricity through photon-to-electron energy transfer, which takes place in the dielectric materials that make up the cells. The cells are made up from layers of semi-conducting silicon material which, when illuminated by the sun, produces an electrical field which generates an electrical current. PVs can generate electricity even on overcast days, requiring daylight, rather than direct sunlight. This makes them viable even in the UK, although peak output is obtained at midday on a sunny summer's day. PVs offer a simple, proven solution to generating renewable electricity.

The main types of commercially available PV panels on offer in the UK are constructed from cells as described below:

- Monocrystalline silicon cells are the most efficient of the PV technologies with a conversion efficiency of between 15-18% (available solar energy to electricity produced). They are cut from single ingots of silicon, have an unbroken crystal lattice and are the most expensive of PVs;
- Polycrystalline silicon cells have a conversion efficiency of between 13-16%. They are less expensive than monocrystalline cells, are constructed of a number of smaller crystals and are recognisable from a visible 'grain' on the panel; and

A solar PV array would technically be feasible for the project, however it is unlikely to meet the quantity of energy demand required, when compared with the potential of the ASHP system.

LZC APPRAISAL SUMMARY

- 7.8 To summarize, the technologies considered to be feasible for the proposed project and a subject to detailed review are limited to:
- Air Source Heat Pump

A more detailed assessment follows in section 7.0, which determines the potential energy yield, carbon emission reduction, cost, payback and revenue generation associated with this technology. Other LZC technologies assessed were shown in the preliminary study to be unfeasible on this development.

8.0 DETAILED REVIEW – AIR SOURCE HEAT PUMPS

The following section aims to provide a more detailed assessment in relation to the potential energy yield, carbon emission reduction, cost, payback and revenue generation associated with this technology. Please note all data is based on preliminary analysis and should be considered approximate and not used for system sizing/design:

ENERGY GENERATED FROM LZC ENERGY SOURCE PER YEAR

- 8.1 Based on the feasible parameters outlined in sections 5.0 and 7.0, the following energy demand results have been calculated:

- Annual output: 18MWh electricity
- Would serve: 28.57% of the total annual energy demand of the building.

CARBON DIOXIDE SAVINGS FROM LZC ENERGY SOURCE PER YEAR

- 8.2 Based on the feasible parameters outlined in sections 5.0 and 7.0, the following CO₂ results have been calculated:

- Baseline CO₂ emissions: 30.93 tCO₂/year
- Proposed CO₂ emissions: 27.83 tCO₂/year
- Annual savings: 3.1 tCO₂/year (10.02%)

LIFE CYCLE COST AND SIMPLE PAYBACK

- 8.3 Based upon a Life Cycle Cost period of 30years and assumed maintenance cost of £1000.00/year, it is expected the ASHP system would achieve simple payback in approximately 55years and would have a total Life Cycle Cost of approx. £112,000.00.

LOCAL PLANNING CRITERIA, INCLUDING LAND USE AND NOISE

- 8.4 There are no planning issues surrounding the installation of ASHP systems.

ASHP's require an external condenser located externally, although the unit is relatively small, the spatial requirements and its location need to be carefully considered at the design stage.

ASHP's do generate some external noise and this should be considered, although the overall effect of the noise is likely to be in the region of 55 dBA so not significant.

FEASIBILITY OF EXPORTING HEAT/ELECTRICITY FROM THE SYSTEM

- 8.5 It is not feasible to export any heat from the system, as all heat generated will be used and the ASHP system does not produce electricity.

ANY AVAILABLE GRANTS

- 8.6 The Renewable Heat Incentive is a payment for generating heat from renewable sources. Like the Feed-In Tariffs, it is set by Government and administered by the official regulator Ofgem.

Up to 18p/kWhr will be paid for the hot water and heat generated and used. However the tariff level will depend on the type and size of systems installed. The payments will be made quarterly to the owner of the heat installation

According to the Government, which has set the tariff levels, the average user will earn a return of around 8 to 12% per annum with higher band tax payers seeing almost double that.

The tariffs apply to all the following technologies:

- Air source heat pumps
- Anaerobic digestion to produce biogas for heat production
- Biomass heat generation and CHP
- Ground source heat pumps
- Solar thermal heat and hot water

CONNECTION TO LOCAL COMMUNITY CHP

- 8.7 Our assessment showed that no opportunity to connect to a local CHP district energy system exists and therefore this option is considered unfeasible.

9.0 CONCLUSION

- 9.1 This report has shown how the proposed Worthing Honda development at Littlehampton Road, Worthing, will be designed using the Energy Hierarchy and will deliver significant carbon dioxide and energy demand savings, as compared to a Part L 2013 compliant, 'business as usual' building, applicable BREEAM standards and relevant Local Planning Policy.
- 9.2 The introduction of Passive Design measures have allowed a significant reduction in predicted energy demand of 12.4% to be achieved (beyond the Part L2a regulatory minimum).
- 9.3 Following the energy hierarchy has enabled significant CO₂ reductions to be calculated for the proposed development. A total overall site-wide carbon reduction of 3.1 tCO₂/year equivalent to 10.02% can be achieved through the energy strategy demonstrated in this report.
- 9.4 Site analysis and calculations have determined the project would benefit from the installation of an Air Source Heat Pump system, which could meet 28.57% of the total energy demand of the development. As a result, the current proposals meet the requirements of Arun District Council Local Plan Policy SP15, of a producing a minimum 10% of the total predicated energy requirements from renewable or low carbon energy generation on site.



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