

Planning Statement

Energy Assessment

Bourne Court

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Executive Summary

Energy Assessment

Bourne Court

Introduction:

The proposed scheme at Bourne Court is required to make carbon emission reductions in accordance with the London Plan's energy hierarchy. In addition, the Borough of Hillingdon requires the scheme achieves a Code for Sustainable Homes Level 4 rating; the strategy for this is detailed in a separate report.

The scheme comprises the construction of 39 flats across 2 blocks, and 10 semi-detached houses.

Aim of this study:

This report demonstrates how the site has followed the London Plan's energy hierarchy of: reducing energy demand through passive design, energy-efficiency measures, generating heat using a clean and efficient system and by using on-site renewable energy systems to further reduce the overall carbon emissions of the development.

Methodology:

The methodology followed in this report follows the guidance set out by the Greater London Authority (GLA) for developing energy strategies as detailed in the document "GLA Energy Team Guidance on Planning Energy Assessments", 2013 version. In particular, the London Plan's Energy Hierarchy has been observed (see page 8) along with the new target of a 40% improvement on the Building Regulations 2010.

Under the GLA's guidance and the London Borough of Hillingdon's policy document CPG3, applications for major developments should be accompanied by an energy statement, which provides information as set out below:

- A calculation of the baseline energy requirements and CO₂ emissions, including regulated emissions (i.e. space heating, hot water, fixed electricity);
 - Baseline regulated emissions equal the emissions identified by the modelling of the current scheme. The modelling has been calculated using SAP (Standard Assessment Procedure) 2009 software;
 - A demonstration of how the Mayor's energy hierarchy has been followed (i.e. being 'lean, clean, green') including consideration of passive design and decentralised energy options (including CHP/CCHP). Description of proposed energy efficiency measures includes details of these measures (e.g. U-values, air permeability, percentage of energy efficient light fittings, heating efficiencies, etc);
 - Calculation of the 'energy efficient' baseline (i.e. the reduced energy demand and CO₂ emissions after the application of energy efficient measures and decentralised energy provision) and predicted target for CO₂ reduction through renewables.
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Methodology (continued):

An assessment of the feasibility of different renewable technologies on the site and the potential contribution to CO₂ reduction from each option, explaining which technologies have been investigated and why any technologies have been ruled out (i.e. technical limitations, costs, etc).

Energy consumption figures for the scheme are based on SAP modelling data produced under NHER Building Regulations software, version 5.4.2.

These findings are subject to detailed analysis from a services engineer and quantity surveyor.

Recommendation:

The proposed scheme will implement energy efficiency measures where feasible, to achieve carbon emission reductions. The measures within this report have followed the GLA's Energy Hierarchy and meet a 46.5% carbon emissions savings in total through a combination of fabric energy efficiency measures and low / zero carbon technologies.

The baseline carbon emissions for the scheme are 68,115 kgCO₂/yr. Following implementation of measures within this report a total saving of 31,640 kgCO₂/yr will be made. These measures include:

- **Be Lean** (10.8% savings over baseline): Energy efficiency measures to improve the building fabric and services: high performance U-Values, good air tightness and the use of mechanical ventilation with heat recovery within the flats.
 - **Be Clean** (0% savings over Lean case): Clean energy generation not deemed feasible for this scheme.
 - **Be Green** (40.0% savings over Clean case): Green energy generation from photovoltaic panels.
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Executive Summary

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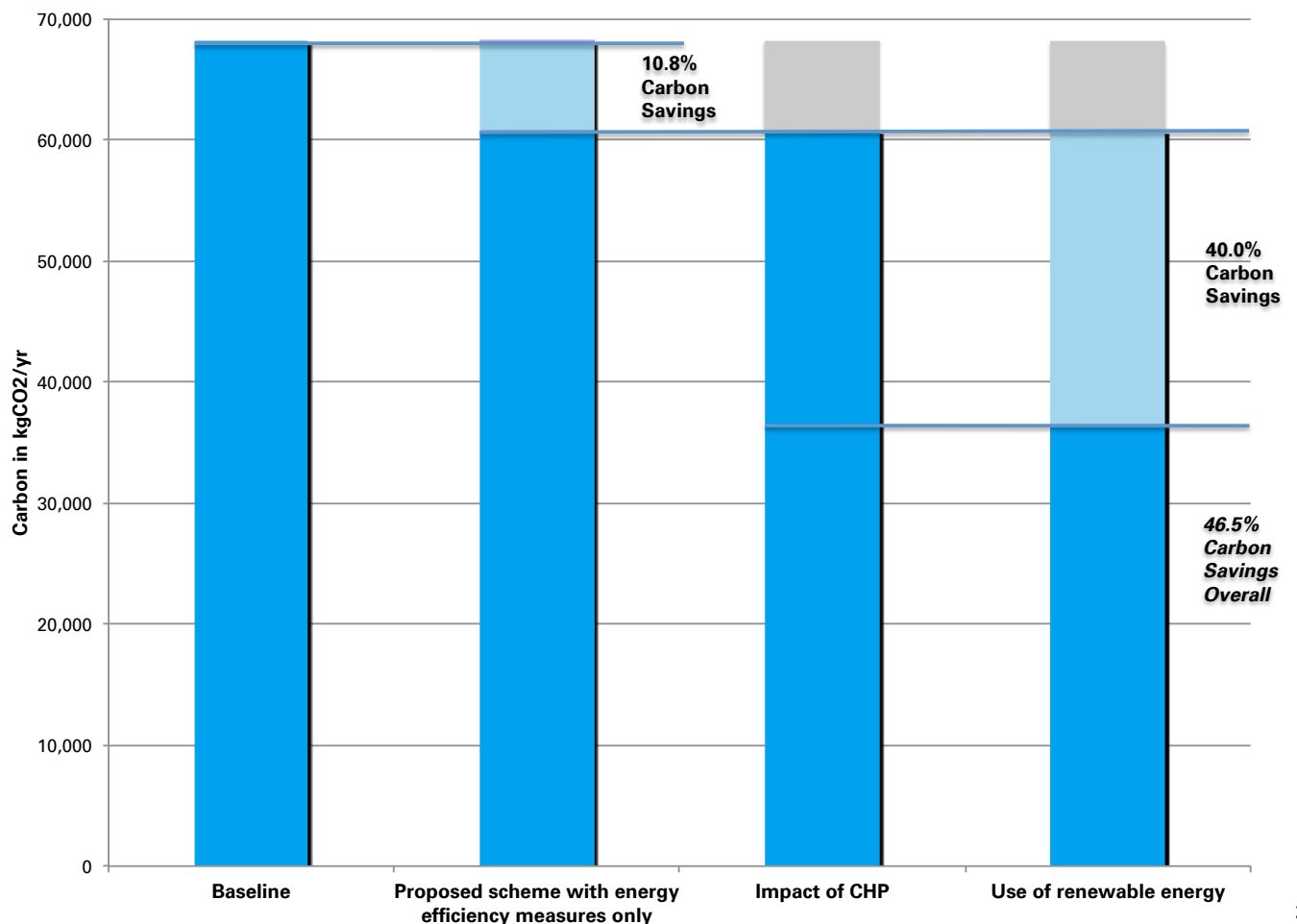
Bourne Court

GLA's Energy Hierarchy

	Baseline	Be Lean: Energy Efficiency Measures	Be Clean: CHP	Be Green: Renewable
Carbon emissions in kgCO ₂ /yr	68,115	60,749	-	36,475
Carbon emission savings in kgCO ₂ /yr	-	7,367	-	31,640
Percentage reduction in carbon emissions over the previous stage	-	10.8%	-	40.0%

46.5 % Carbon emissions over Part L1A of Building Regulations 2010 overall across the scheme

Energy Hierarchy



Energy Hierarchy

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London Plan Energy Hierarchy:
Taken from GLA Energy Team Guidance
on Planning Energy Assessments, Version
2013

The London Plan's energy hierarchy takes a 'whole energy' approach and addresses energy efficiency use, energy supply efficiency and use of renewable energy. The purpose is to demonstrate that climate change mitigation measures are integral to the scheme's design and evolution, and that they are appropriate to the context of the development.

Baseline calculations:
Section 5.2 - 5.9

The baseline calculations are taken from the Target Emission Rate (TER) worksheet from the SAP modelling.

Energy modelling using the Standard Assessment Procedure (SAP 2009) has been undertaken with NHER software to define the baseline energy demands and carbon emissions of the proposed scheme. This has identified the building to have the energy profile outlined in the following pages.

Be Lean:

Demand reduction (Be Lean) measures specific to the scheme are encouraged at the earliest design stage of a development and aim to reduce the demand for energy. Measures typically include passive design: both architectural and building fabric measures, and active design: energy efficient services. It is possible to exceed Building Regulations requirements (Part L 2010) through demand reduction (Be Lean) measures alone.

Be Clean:

A 'clean' energy supply refers to the energy efficiency of heating, cooling and power systems. Planning applications should demonstrate how the heating, cooling and power systems have been selected to minimise CO₂ emissions in accordance with the order of preference in Policy 5.2, such as through high-efficiency low NO_x gas boilers.

Be Green:

Use of renewable energy in developments is encouraged at the 'Be Green' third stage. Each renewable energy technology in Policy 5.7 of the London Plan are technically feasible in London and each should be considered in the Energy Assessment. An assessment of what is achievable and compatible with the measures implemented in Be Lean and Be Clean is also required.

Energy Profile

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Introduction:

Energy modelling allows designers to explore the performance of a scheme in terms of the likely energy usage and related carbon emissions. Through this understanding it is possible to reduce energy usage, use renewable energy and supply energy efficiently.

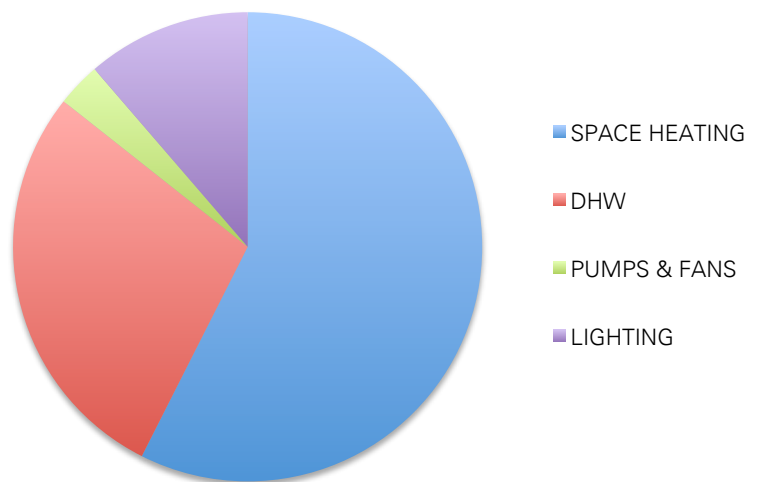
The graph below shows the site's carbon emissions breakdown in terms of heating, hot water, cooling and lighting, fans and appliances over the course of a year.

Carbon Emissions in kgCO₂/yr

Baseline:

Heating	Cooling	Hot Water	Fans and Pumps	Lighting
39,132	0	19,205	2,066	7,711

Energy Breakdown



'Be Lean': Energy Efficiency Measures Energy Assessment Bourne Court

Energy efficiency targets:

Energy efficiency measures through optimising the building fabric will be incorporated to reduce the energy demand and carbon footprint of the proposed scheme. The measures outlined below result in an annual carbon emission saving of 10.8% or 7,367 kgCO₂/yr over baseline.

U-values modelled:

Element	Building Regulations minimum U-Value (W/m ² K)	Proposed U-Value Indicative build-up (W/m ² K)
Roof	0.20	0.13
Walls	0.30	0.20
Floors	0.25	0.14
Windows	2.00	1.20

Air-Tightness and Thermal Bridging:

A high performance building with good air tightness levels is to be achieved such that the proposed scheme does not exceed an air permeability level of 3 m³/hr/m² at 50 Pascals during testing. This will be achieved through ensuring that sensitive areas are accounted for in the design and construction phases to make certain that a tightly sealed building is constructed and all punctures through the seal are airtight. In particular, attention will be paid to major openings as well as minor openings such as services and downlighters at roof level.

Thermal Bridges will be designed to achieve an average γ -value of 0.08 W/m²K.

Ventilation:

Mechanical ventilation with heat recovery will be installed, this has been modelled indicatively with an efficiency of 90% and SFP of 0.60. Serving max 3 wet rooms.

Heating:

Heating will be provided by a high efficiency gas-condensing boiler with a minimum efficiency of 90%, and will have time and temperature zone controls and a weather compensator. The heat will be distributed via underfloor heating.

Lighting:

A minimum 100% of all fittings will be dedicated low energy fittings.

Cooling:

No cooling is specified for the scheme.

'Be Clean': Use of Combined Heat and Power Energy Assessment Bourne Court

Use of Combined Heat and Power:

The inclusion of gas combined heat and power (CHP) within the energy strategy has been considered as an option to reduce the carbon footprint of the building. This section demonstrates how decentralised energy generation has been considered in accordance with the Mayor's London Plan section 4A.1. The following guidance hierarchy was followed:

Option One - Connection to existing CCHP/CHP networks

This option is not deemed feasible in this instance due to the lack of an existing CCHP/CHP network in the vicinity of the proposed development.

Option Two – Site-wide CCHP/CHP generation powered by renewables

CCHP/CHP generation powered through renewables such as biomass is not considered feasible in this instance due to issues relating to air quality.

Option Three - Gas CCHP/CHP accompanied by renewables

A communal heating and hot water system will not be provided in this scheme. Carbon emissions reductions will be achieved with individual systems.

Site-wide Combined Heat and Power (CHP) generation:

A communal heating and hot water system that serves the dwellings will not be provided in this scheme. Carbon emissions reductions will be achieved with individual systems.

The load profile of the dwellings is not considered to be suitable enough for CHP. CHP systems are best utilised where there is a consistent and high demand for heat. With the implemented fabric improvements from the 'Be Lean' scenario the energy demand is very low at times of relatively limited space heating, therefore if the CHP system was to serve the dwellings as well it would be somewhat oversized, less efficient and therefore less economic than the proposed services strategy.

Feasible Renewable Energy Technologies Energy Assessment Bourne Court

Feasible renewable energy technologies:

A reduction in carbon emissions through the use of on-site renewable energy can be achieved through several technologies to generate either heat or power. Following the analysis of the carbon emissions related to the scheme, the objective of this section is to determine the feasible renewable energy options that provide cost-effective and practical emissions reductions. The renewable energy options for the proposed scheme are provided in the table below. Each technology is also assessed as either feasible or rejected based on its implications for the scheme in terms of their implementation, cost-effectiveness, site-related constraints, planning issues or other issues. The following sections will explore the feasible technologies in depth and explain why certain technologies have been rejected.

Technology and feasibility	Rationale
Biomass: Rejected	Biomass would be able to provide a 20% overall reduction in carbon emissions. However, this technology would have a significant impact on local air quality in the Borough and development access restraints preclude the possibility of biomass pellet delivery.
Ground Source Heat Pump (GSHP): Rejected	A ground source heat pump could supply heating and hot water to the proposed scheme. However, there is no room to allow for horizontal closed loop pipes; therefore, boreholes would be required at a depth of approximately 20-50m. This option is capital intensive, is subject to uncertainty with regards to the ground conditions, consequently the most effective solution would be another form of renewable technology.
Air Source Heat Pump (ASHP): Rejected	Air source heat pump units could supply heating and hot water to each dwelling. However, given the carbon intensity of grid electricity and the efficiency of heat pumps, this technology performs similar to gas-fired boilers. Therefore, ASHP are being rejected due to gas boilers providing a more efficient solution.
Photovoltaic (PV): Accepted	Roof mounted PV units could be a possible solution on the roof space. This system is capital intensive, but there are significant subsidies for selling electricity back to the grid. The PV will be discretely located and an access perimeter will exist around the panels, which will provide easy access.
Solar Hot Water (SHW): Rejected	Roof-mounted SHW units could be located on the roof space. However, due to the relatively low hot water demand of the dwellings this technology will not be able to meet a 20% carbon reduction as a stand-alone measure.
Wind Turbine: Rejected	Turbulence created from surrounding listed buildings makes this an inefficient solution.

Solar Photovoltaic Energy Assessment Bourne Court

Roof-mounted Solar Photovoltaic:

Roof-mounted panels can be used to utilise the sun's energy for conversion into electricity. When exposed to light, the cells generate electrical energy (DC current) that is conducted away to an inverter to create mains electricity (AC current).

Power would then be exported to the national grid at times of low demand in order to 'store' the unused 'green' energy and would be credited against the electricity bought from the grid. There are several different types of solar panels differentiated by the type of crystalline medium used. They have different efficiencies and relative merits.

The panels will need to be connected to an inverter and then to the grid in order to sell electricity when usage on-site is low and power generation is high.

Site-specific considerations:

A total of 57.5 kWp (approximately 391m²) can be suitably accommodated across all of the roofs. 25 kWp for Block A, 20 kWp for Block B and 12.5 kWp for the houses.

The panels have indicative dimensions of 1m x 1.6m (1.6 m²) and would be fixed on rails. Typical rating for PV panels would be 250 - 333W per panel. The panels would lie at the roof pitch of 30 degrees and would be south facing.

PV area on the roof has been optimised and no further renewable technology is practically appropriate for the site.

Grants:

The current "Feed-in-tariff" generation rate for systems of the order <4 kW (per dwelling) is 14.90 p per kWh of electricity generated.

Performance Calculations for Photovoltaic Panels

Solar PV – 57.5 kWp

PV Predicted Annual Energy
Production (kWh/yr)

45,885 kWh/yr

Annual Carbon Emissions
Reductions (kgCO₂/yr)

24,273 kgCO₂/yr

% CO₂ Emissions Reduction

40.0%

Conclusion

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Recommendation:

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