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Doherty Design & Planning Limited

ENERGY STATEMENT

(To Accompany Detailed Planning Application)

Site

120 KINGSGATE ROAD, LONDON NW6 2AE

Proposal

ERECTION OF A FOUR STOREY WITH BASEMENT DWELLING HOUSE

Applicant

MR D GRAHAM

9th JUNE 2011

Ref. E152-KR-EA-00

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1.0 SUMMARY OF RECOMMENDATIONS

a) This development is for the erection of a four storey dwelling house, with a basement, at 120 Kingsgate Road, London NW6 2AE.

b) It is proposed that in order to meet the requirements of policy this development will adopt a high standard of design with regard to energy efficiency principles. It will also achieve a reduction of at least 20% in the carbon emissions by on site renewable energy generation.

c) This development is in the early stages and detailed design has not been undertaken, therefore initial stage SAP calculations and procedures provided in the London Renewables Toolkit, have been used to estimate that the total baseline carbon emissions of this development as 3,965kgCO_2/yr.

d) This report has demonstrated using initial SAP calculations that it is possible to achieve a minimum 20% reduction in carbon emissions by incorporating a photovoltaic system on the roof.

e) It is suggested here that in order to ensure the best possible reduction in carbon emissions after consent is granted, that a planning condition is added requiring accurate carbon emission calculations and detailed proposals to be prepared and submitted prior to commencement on site.

2.0 INTRODUCTION

a) Doherty Design and Planning Limited have been instructed by Mr D Graham to prepare an Energy Statement to support the submission of the planning application for the development at 120 Kingsgate Road, London NW6 2AE. This report must be read in conjunction with the application forms, certificates, detailed plans and other supporting documents submitted to the Local Authority as part of the application.

b) The Application is for the erection of a four storey dwelling house, with a basement, at 120 Kingsgate Road, London NW6 2AE.

c) London Borough of Camden's Local Development Framework Core Strategy Policy CS13 - *Tackling Climate change through promoting higher environmental standards* encourages developments to meet the highest feasible environmental standards that are financially viable during the construction and occupation. Paragraph 13.11 states that developments will be expected to achieve a 20% reduction in carbon emissions from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible.

d) The objectives of this Energy Assessment are to make an appraisal of the carbon emissions of the proposed development, the various methods of generating and using renewable energy at source, and to suggest the most appropriate means by which the development can contribute towards the aspiration of policy relating to renewable energy provision. The Assessment shall follow the principles set out in the London Renewable Energy Toolkit.

e) The London Renewable Energy Toolkit is the system developed by the Greater London Authority in 2004 to assist Planners, Developers and Consultants with the assessment of the appropriateness of renewable energy resources and technologies.

f) In addition, the Camden Council's Development Policy DP22 – Promoting Sustainable design and construction, there is a requirement for new dwellings to meet the Code for Sustainable Homes Level 3.

g) The Code for Sustainable Homes is an environmental assessment method for rating and certifying the performance of new homes. The design has been developed incorporating the principles set out in the Code to ensure that the proposed dwelling is of a high standard.

h) Further details of how the proposed development shall meet the requirements of the Code for Sustainable Homes Level 3 can be found in the Code for Sustainable Homes Pre-Assessment Report.

i) At this stage in the design of the dwelling, the detailed working drawings have not been prepared and therefore accurate calculations cannot be undertaken to produce the energy requirements and carbon emissions.

j) The Assessment shall be carried out following the principles set out in the Mayor's "Energy Hierarchy" which is implemented through the London Plan. These principles can be summarised as follows:

- Be Lean –use less energy
- Be Clean – supply energy efficiently
- Be Green – use renewable energy

k) In order to demonstrate this, it is proposed to use the Standard Assessment Procedure 2009 (SAP) for the calculations to obtain initial baseline carbon emissions figures for the development. Further SAP calculations will be used to demonstrate the potential carbon emission savings from the initial calculations by enhancements to the building fabric, plant and controls – BE LEAN. A suitability of supplying energy, both heat and power, through the use of a combined heat and power system shall be assessed – BE CLEAN. Finally, the carbon emission saving by the use of renewable energy shall be assessed through the outputs from the SAP calculation – BE GREEN.

l) As these calculations are based on the initial design at planning stage, it is suggested here that in order to ensure the best possible reduction in carbon emissions after consent is granted, that a planning condition is added requiring carbon emission calculations and detailed proposals to be prepared and submitted after detailed design and prior to commencement on site.

3.0 RENEWABLE ENERGY AND LOW CARBON ENERGY SYSTEMS

3.1 Introduction

a) The London Renewables Toolkit (LRT) is the system developed by the Greater London Authority in 2004 to assist Planners, Developers and Consultants with the assessment of the appropriateness of renewable energy resources and technologies. It offers advice on which renewable technologies are suitable including aesthetic issues, risks, reliability and gives an insight into the cost benefit analysis of installing renewable.

b) It also provides guidance on how to comply with the requirements of the London Plan and relevant borough development documents. Typical detailed calculations are provided to help determine the most appropriate renewable technology for each scheme.

c) Within Section 4 of the LRT – 'Including Renewables in the Development Proposals', a route map is provided to help consider the feasibility of renewable technologies and how to include them in the development proposals.

d) The dwelling emissions have been estimated using the Standard Assessment Procedure 2009, including section 16 for the unregulated supplies. A second set of SAP calculations have been undertaken to demonstrate an improvement in the carbon emissions by incorporating better fabric constructions, better windows and doors, improved ventilation systems and enhanced air tightness.

3.2 Baseline Carbon emissions

a) In order to assess the carbon emissions of the development, the delivered energy demand needs to be estimated. At this stage in the design of the dwelling, the detailed working drawings have not been prepared and therefore detailed energy and carbon emission calculations cannot be undertaken to produce the energy requirements and carbon emissions.

b) However, the dwellings carbon emission estimates can be based on initial stage SAP calculations. In this case, a SAP calculation has been prepared for each of the flats.

c) Table 1 below shows that the results for the standard dwellings of the same sized and bulk, constructed to comply with the current Building Regulations.

		House
Total Floor Area	m^2	143.8
Target Emissions Rate	$kgCO_2/m^2/yr$	17.59
SAP Regulated CO_2 Emissions		
Space Heating	$kgCO_2/yr$	1,414.59
Hot Water	$kgCO_2/yr$	515.26
Pumps, fans	$kgCO_2/yr$	90.48
Lighting	$kgCO_2/yr$	291.41
Total Regulated CO_2 Emissions	$kgCO_2/yr$	2,311.74
Total Regulated CO_2 Emission per floor area	$kgCO_2/m^2/yr$	16.1
Unregulated CO_2 Emissions (Based on SAP section 16)		
Cooking	$kgCO_2/m^2/yr$	12.89
Appliances	$kgCO_2/m^2/yr$	1.44
Total CO_2 Emissions Regulated and Unregulated	$kgCO_2/m^2/yr$	30.4
Total Floor Area	m^2	143.8
Total Estimated Residential CO_2 emissions from Regulated and Unregulated Energy	**$kgCO_2/yr$**	4,372

Table 1 – Baseline Carbon Emissions

3.3 Improved Baseline Carbon emissions – BE LEAN

a) Following the principles set out in the Mayor's "Energy Hierarchy" which is implemented in the London Plan and the Local Policy, the design has been improved to use less energy - BE LEAN.

b) This has been achieved by improving the thermal performance of the various constructions, like the walls, roof, floors, windows, doors etc and incorporating mechanical ventilation heat recovery and improving the air tightness of the dwellings.

c) The SAP calculations have been used with the improved performances and these are listed in Table 2.

		House
Total Floor Area	m^2	143.8
Target Emissions Rate	$kgCO_2/m^2/yr$	17.59
SAP Regulated CO_2 Emissions		
Space Heating	$kgCO_2/yr$	1,003.93
Hot Water	$kgCO_2/yr$	518.12
Pumps, fans	$kgCO_2/yr$	90.48
Lighting	$kgCO_2/yr$	291.41
Total Regulated CO_2 Emissions	$kgCO_2/yr$	1,903.94
Total Regulated CO_2 Emission per floor area	$kgCO_2/m^2/yr$	13.2
Unregulated CO_2 Emissions (Based on SAP section 16)		
Cooking	$kgCO_2/m^2/yr$	12.89
Appliances	$kgCO_2/m^2/yr$	1.44
Total CO_2 Emissions Regulated and Unregulated	$kgCO_2/m^2/yr$	27.6
Total Floor Area	m^2	143.8
Total Estimated Residential CO_2 emissions from Regulated and Unregulated Energy	**$kgCO_2/yr$**	3,965

Table 2 – Improved Baseline Emissions

3.4 Supplying Energy Efficiently – BE CLEAN

a) Following the principles set out in the Mayor's "Energy Hierarchy" which is implemented in the London Plan and the Local Policy, the second step is to reduction the carbon dioxide emissions by supplying energy efficiently - BE CLEAN.

b) Combined Heat and Power typically generates electricity on site as a by-product of generating heat. It uses fuel efficient energy technology that, unlike traditional forms of power generation, uses the by-product of the heat generation required for the development. Normally during power generation, the heat is discharged or wasted to atmosphere. A typical CHP plant can increase the overall efficiency of the fuel use to more than 75%, compared to the traditional power supplies of 40%, which uses inefficient power stations and takes into account transmission and distribution losses.

c) The use of this development is residential and it will be built to the current building regulations. The aim of these regulations is minimise the base heating load and electrical loads. The site base heating and electrical loads is key to the sizing and operation of any CHP system.

d) Due to the high levels of insulation and energy efficiency measures that will be incorporated into this development, there is no year round heat load for the CHP plant and therefore, a CHP system would not be viable on this development. If a CHP system were to be incorporated, it would not operate efficiently and therefore NOT BE CLEAN.

3.5 Renewable Technologies Considered – BE GREEN

a) Taking into account the requirements of planning policy set out in the London Borough of Camden Local Development Framework Core Strategy Policy CS13, the annual carbon emission reduction target of 20% for the development from renewable energy production on site has been calculated as 792.9kgCO2/year.

b) The final step in the Mayor's "Energy Hierarchy" is to reduction the carbon dioxide emissions by the use of renewable technologies - BE GREEN.

c) In accordance with the toolkit the following renewable energy resources have been assessed for availability and appropriateness in relation to the site location, building occupancy and design.

- Combined Heat and Power
- Biomass Heating
- Biomass CHP
- Heat Pumps
- Solar Photovoltaics
- Domestic Solar Hot Water Systems
- Wind Power

d) A preliminary assessment has been carried out for each renewable energy technology and for those appearing viable a further detailed appraisal has been undertaken.

e) The preliminary study considered the site location and the type of building in the development and surroundings and produced a shortlist of renewable energy technologies that will be the subject of a further feasibility study.

f) Table 3 below provides a summary of the assessment.

3.6 Renewables Toolkit Assessment

Energy System	Description	Comment
Combined Heat and Power (CHP)	Combined Heat and Power systems use the waste heat from an engine to provide heating and hot water, while the engine drives an electricity generator. These systems uses gas or oil as the main fuel and therefore can not truly be considered as renewable technology however, it is recognised that they have a significant reduced impact on the environment compared to conventional fossil fueled systems.	As CHP systems produce roughly twice as much heat as they generate electricity, they are usually sized according to the base load heat demand of a building, to minimise heat that is wasted during part-load operations. Therefore, to be viable economically they require a large and constant demand for heat, which make their use in new energy efficient housing, with high insulation, not really suitable. The efficiency of small scale CHP is relatively low and is unlikely to result in CO_2 emission savings. Economic viability relies on 4000 hours running time, which is unlikely to be achieved in this scheme. As policy requires a reduction in carbon emissions via true renewable sources this would not assist in achieving the policy objectives.
Combined Heat and Power		**Feasible - NO**
Biomass Heating	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating. Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and is used commercially in the form of wood chips or pellets, although traditional logs are also used. Other forms of Biomass can be used, e.g bio-diesel.	Wood pellet or wood chip fired or dual bio-diesel/gas-fired boilers could be considered. As this redevelopment consists of a new building, it offers the opportunity to accommodate such a system. The flue can be discharged to atmosphere above roof level. However, concerns raised by Envrionmental Health regarding the pollutants and particles would have to be addressed. The fuel storage silo/tank could be located in the basement area with a filling point located adjacent to the refuge collections area. It is felt that fuel handling in this site in a built up area, together with the particle discharge, would be enough to rule this technology out.
Biomass Heating		**Feasible – NO**

Energy System	Description	Comment
Biomass CHP	CHP as above, but with biomass as the fuel.	Biomass CHP overcomes the issue of the reduction in carbon emissions via true renewable sources, however, the lack of a year round base load is still a problem. In addition, problems with fuel handling and storage on an inner city site would mean that this technology would not be suitable for this site.
Biomass CHP		**Feasible - NO**
Ground Source Heat Pumps (GSHP) - heating	The ground collector can be installed, either as a loop of pipe, in the piles or using a borehole and a compressor offer efficient heating of a space in winter, as the temperature of the ground (below approx 2m) remains almost constant all year round.	Ground source heat pumps are most efficient when supplying heat continuously and in areas where a mains gas supply is not available. In dwellings, GSHPs are capable of supplying the majority of the total space heating and pre heat for the hot water demand. This site consists entirely of an existing basement and has no external space for the installation of ground loops for the collection of heat.
Ground Source Heat Pumps		**Feasible - NO**
Solar Photovoltaics (PV)	Building Integrated Photovoltaics (BIPV) or Roof mounted collectors provide noiseless, low maintenance, carbon free electricity.	As there is a reasonable amount of flat roof area, which faces south, it may be feasible to incorporate PV panels into the scheme. These could be mounted on frames and orientated south for optimal performance. Careful consideration must be given to the chosen roof finish to ensure compatibility. Access would be required to the roof.
Solar PhotoVoltaics		**Feasible – YES**
Solar Thermal Hot Water	Solar collectors for low temperature hot water systems require direct isolation, so the chosen location, orientation and tilt are critical.	This solution could be utilized to generate hot water using the energy from the sun. The area of flat roof could be used for the installation of solar thermal collectors. These could be mounted on frames and orientated south for optimal performance. These would have to be installed at a pitch of 30-40 degrees and ideally as close to the dwelling served as possible.
Solar Thermal Hot Water		**Feasible –YES**

Energy System	Description	Comment
Wind Power	Most small (1-25kW) wind turbines can be mounted on buildings, but larger machines require foundations at ground level and suitable site location	It could be viable to install some form of wind turbines on this site, however due to built up nature of the site and the visual impact it is not considered to be the most sensitive system of providing energy via renewable resources in this built up location. There are also concerns that the wind across the site would be turbulent because of the surrounding buildings and trees.
Wind Power		**Feasible – NO**

Table 3 – Renewable Technology Feasibility Assessment

a) From the above it has been established that there are two potential ways of providing energy via renewable sources appropriate for inclusion in this scheme, these being the use of Solar Photovoltaics and Domestic Solar Hot water or a combination thereof.

b) Any form of Biomass is not considered feasible due to this being the development of an existing building in a built up area.

c) As this development is reusing an existing building which covers the entire site, there is no access to the ground for the installation of heat collectors. In addition, there are no suitable external areas for the installation of air source heat pump systems.

d) CHP and Micro CHP are considered not feasible as the economic viability relies on at least 4,000 hours runtime which is unlikely to be achieved in this development.

e) Wind has been considered not viable for this site as it is in a built up area surrounded by buildings which are likely to cause disruption to air flows.

3.7 Solar Photovoltaics

a) Photovoltaics (PV) is a technology that allows the production of electricity directly from sunlight. The term originates from “Photo” referring to light and “voltaic” referring to voltage. This type of technology has been developed for incorporation within building design to produce electricity for either direct consumption or re-sale to the National Grid.

b) PV panels come in modular panels which can be fitted on the top of roofs or incorporated in the finishes like slates or shingles to form integral part of the roof covering. PV cells can be incorporated into glass for atria walls and roofs or used in the cladding or rain screen on a building wall.

c) When planning to install PV panels, it is important to consider the inherent cost of installation in comparison to possible alternatives. The aesthetic impact of the PV panels also requires careful consideration.

d) Roof mounted PV panels should ideally face south-east to south-west at an elevation of about 30-40°. However, in the UK even flat roofs receive 90% of the energy of an optimum system.

e) PV installations are expressed in terms of the electrical output of the system, i.e. kilowatt peak (kWp). The Department of Trade and Industry estimate that an installation of 1kWp, could produce approximately 700-850 kWh/yr, which would require an area of between 8-20m^2, depending on the efficiencies and type of PV panel used. It is also estimated that a gas heated, well insulated typical dwelling would use approximately 1,500kWh/year electricity for the lights and appliances, therefore the 1kWp system could save approximately 45% of a single dwellings electrical energy requirements.

f) Although often not unattractive, and possible to integrate into the building or roof cladding system PV systems are still considered likely to have visual implications, therefore careful sighting of the panels is required.

g) As this installation will be contained on the roof of the proposed dwelling, it involves no additional land use.

h) With regard to noise and vibration, a PV system is completely silent in operation.

i) Care must be taken with the design and installation of PV systems as they need to meet standards for electrical safety.

	Total Emissions ($kgCO_2/yr$)	Reduction in Carbon Emissions (%)
Development with no Renewables	3,965	-
Reduction by including 1.75 kWp of PV	794.66	20.04%

Table 4 – Photovoltaic Carbon Emissions

j) As can be seen from Table 4 above, the incorporation of 1.75 kWp of Photovoltaics could reduce the carbon emissions by 20.04% which exceeds policy requirements.

k) Manufacturers information suggests that an area of approximately $20m^2$ would be required for the installation of a system of this size, which would include installation on frames and positioned to avoid shading of adjacent panels.

3.8 Domestic Solar Hot Water System

a) This system uses the energy from the sun to heat water, most commonly to provide the hot water demands of the development. The system uses heat collectors, generally mounted on the roof, in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate cylinder or a twin coil hot water cylinder inside the dwelling. The system works very successfully in the UK, as it can operate in diffused light conditions.

b) As with PV panels, the collectors should be mounted facing in a southerly direction, from south-east through to south-west and at an elevation of 10 to 60°. The panels can be installed on the roof, either on the slope of the roof, on a frame, or they can be integrated into the roof finishes.

a) This system would be best suited on sites where the solar thermal collectors can be located close to the hot water storage vessel within the dwelling and therefore any losses can be minimised.

b) Approximately 2-4m^2 of solar thermal collectors could provide the hot water requirements of a typical dwelling. These could be used to feed twin coil hot water cylinders positioned within the dwelling, allowing the water to be heated by the sun when possible whilst retaining the back up of the main heating system when required.

c) This system would be relatively easy to install. However, the visual impact needs to be given consideration.

d) Although often not unattractive, and possible to integrate into the building or roof cladding system domestic solar thermal collectors are still considered likely to have visual implications, therefore careful sighting of the panels is required. On this development, the panels could be installed on frames on the flat roof and orientated to face south.

e) As this installation will be contained on the roof of the proposed dwelling, it involves no additional land use.

f) With regard to noise and vibration, a domestic solar hot water system is completely silent in operation.

g) Incorporating a 3m^2 evacuated tube system, mounted southeast/southwest at a 30 degree pitch with a twin coil cylinder in the dwelling, into the SAP calculations, the reduction in carbon emissions can be estimated.

	Total Emissions ($kgCO_2/yr$)	Reduction in Carbon Emissions (%)
Development with no Renewables	3,965	-
Reduction by including 2 x 3m^2 DSHW	178	4.50%

Table 5 – Domestic Solar Hot Water Carbon Emissions

h) As can be seen from Table 5 above, the installation of two domestic solar hot water systems incorporating 3m^2 of evacuated tube solar collectors each would reduce the carbon emissions by 4.50% which would fail to meet the requirements of policy.

3.9 Annual Carbon Emission Reduction

a) From the above, it can be seen that the Photovoltaic system could be used by itself to achieve the 20% reduction in carbon emissions required by Planning Policy.

b) Based on the initial SAP calculations for the dwellings, it has been calculated that the baseline carbon emissions figure for the development is 3,965kgCO_2/year. Therefore to meet the requirements of policy and the target reduction in the carbon emissions of 20%, a minimum of 792.9kgCO_2/year must be saved by the use of renewable technologies.

c) A number of options have been considered and the potential carbon dioxide reductions calculated using the SAP calculations and a summary of the results is provided in Table 6 below.

	Total Emissions (kgCO_2/yr)	Reduction in Carbon Emissions per Technology (%)
Development with no Renewables	3,965	-
PV (1.75 kWp) Reduction	794.66	20.04%
DSHW (3m^2) Reduction	178	4.50%

Table 6 – Summary of Reduction in Carbon Emissions by Renewable Technology

d) CHP, Biomass heating, Biomass CHP, ground source heat pumps and wind power have been analysed but are considered not feasible for this development.

e) Using the SAP assessments, calculations have been carried out and in order to achieve the 20% via PV panels, an area of 20m^2 of roof, with a southerly aspect would be required to achieve the reduction.

f) With regard to the installation of domestic solar hot water (DSHW), the calculations shown that if 3m^2 of southerly facing solar collector was installed for the dwelling, this could provide a carbon reduction of around of around 4.5%.

g) Detailed calculations of the total carbon emissions compared to the estimated carbon reduction from these systems can be undertaken once the detailed design has progressed to working drawing stage. For the purpose of planning and based on the figures provided by initial SAP calculations, this report has demonstrated that it is feasible, with the incorporation of PV panels, a minimum of 20% reduction in the developments carbon emissions could be achieved.

4.0 CONCLUSION

a) London Borough of Camden's Local Development Framework Core Strategy Policy CS13 - *Tackling Climate change through promoting higher environmental standards* encourages developments to meet the highest feasible environmental standards that are financially viable during the construction and occupation. Paragraph 13.11 states that developments will be expected to achieve a 20% reduction in carbon emissions from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible.

a) This development is for the erection of a roof extension and works of conversion of offices to create two new residential units at 120 Kingsgate Road, London NW6 2AE.

b) It is proposed that in order to meet the requirements of policy this development will adopt a high standard of design with regard to energy efficiency principles. It will also achieve a reduction of at least 20% in the carbon emissions by on site renewable energy generation.

c) Using SAP calculations and the calculation procedures provided in the London Renewables Toolkit, it is estimated that the total baseline carbon emissions of this development would be in the region of 3,965kgCO_2/yr.

d) At planning stage it is not possible to produce detailed reports on the energy demand, carbon emissions or financial appraisals of the appropriate systems. However, this report has demonstrated using figures from the initial SAP calculation that it is possible reduce carbon emissions by more than 20% for this development.

e) It is suggested that in order to ensure the best possible reduction in carbon emissions after consent is granted, that a planning condition is added requiring detailed carbon emission calculations and proposals to be prepared and submitted prior to commencement on site.