Energy Statement

36 Lancaster Grove

For Nicholas Taylor and Associates

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XCO2 energy

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About us:
XCO2 Energy are a low-carbon consultancy working in the built environment. We are a multi-disciplinary company consisting of both architects and engineers, with specialists including CIBSE low carbon consultants, Code for Sustainable Homes, EcoHomes and BREEAM assessors and LEED accredited professionals.

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Executive Summary

This report assesses the predicted energy performance and carbon dioxide emissions of the proposed development at 36 Lancaster Grove, based on the information provided by the design team.

The site is located between Lancaster Grove Road, Lambolle Place and Eton Ave within the London Borough of Camden, just north of Primrose Hill. The proposed scheme comprise the change of use, refurbishment and extension of the Grade II Listed former Belsize Park Fire Station Building into 12 units of apartment accommodation. The existing 7 units of residential accommodation will not form part of this application.

As the former Belsize Park Fire Station is a Listed Building located within the Belsize Park conservation area, all of the existing facades, roof, windows and floors will be retained and re-used as far as possible to maintain the character of the existing building.

In line with the 'GLA Guidance on preparing energy assessments' (April 2015) Sections 8.11-8.14, the existing building with it's current fabric and building services systems are used as the baseline condition for the scheme in this Energy Statement. The 7 no. existing residential accommodation, which do not form part of this application, has not been included in this assessment.

The methodology used to determine the CO_2 emissions is in accordance with the London Plan's three-step Energy Hierarchy (Policy 5.2) outlined below.

1. Be Lean - use less energy
The first step deals with the reduction in energy use, through the adoption of sustainable design and construction measures. In accordance with this strategy, this development will incorporate a range of energy efficiency measures including the provision of a new and highly efficiency space heating and hot water system, electrical rewiring to include provision of low energy lighting throughout the scheme, and insulation levels meeting Part L1B targets for the any new thermal elements. The improvements in the building systems and fabric have reduced regulated CO_2 emissions by 41.4% in comparison to the existing building, thus exceeding the requirements outlined by the Camden Council and London Plan 2015.

2. Be Clean - supply energy efficiently
The second strategy takes into account the efficient supply of energy, by prioritising decentralised energy generation. The feasibility study showed that no district heating network currently exists within close proximity of the site. Due to the nature of the development, a CHP unit would not be an economically viable option. Hence, high efficiency boilers where installed to provide space heating and hot water to each apartment.

3. Be Green - use renewable energy
The third strategy covers the use of renewable technologies. The feasibility study analysed a number of renewable technologies for their suitability for the site. The analysis included a biomass heating system, ground-source heat pumps, air-source heat pumps, photo voltaic panels, solar thermal and wind turbines.

The analysis demonstrated that due to the conservation requirements of the existing Grade II listed building, it will not be feasible to install renewable technologies without considerable construction and alterations to the former Belsize Park Fire Station.

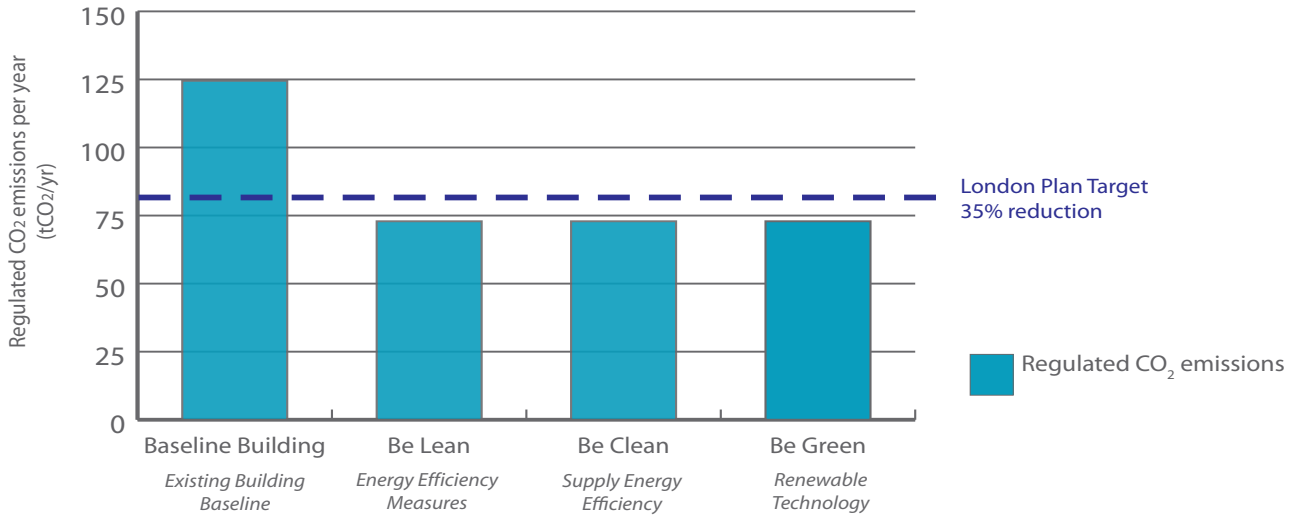
In total, the development is expected to reduce regulated CO_2 emissions by 41.4% when compared to the existing baseline building. This meets the London Plan CO_2 reduction target of 35% set out for all major developments.

Conclusion

The graph below provides a summary of the regulated CO_2 savings at each stage of the London Plan Energy Hierarchy. The table below and on the following page detail the regulated and unregulated emissions at each stage of the hierarchy.

It can be seen on the graph below that the development at 36 Lancaster Grove will achieve a regulated CO_2 saving exceeding the required 35% beyond the existing baseline building.

36 Lancaster Grove Energy Hierarchy



CO_2 Emissions Breakdown from each stage of the energy hierarchy

	Carbon Dioxide Emissions (tonnes CO_2 per annum)	
	Regulated	Total
Existing building baseline	124.5	141.9
After energy demand reduction	72.9	90.3
After efficient energy supply	72.9	90.3
After renewable technologies	72.9	90.3

CO_2 Savings Breakdown from each stage of the energy hierarchy

	Regulated Carbon Dioxide Savings	
	Tonnes CO_2 / year	% over baseline
Savings from energy demand reduction	51.6	41.4%
Savings from efficient energy supply	0.0	0.0%
Savings from renewable energy	0.0	0.0%
Cumulative savings	51.6	41.4%

Introduction

The proposed Belsize Park Fire Station development located at Lancaster, is a five-storey high Grade II listed building. It is a change of use development from a fire station to domestic units.

The site is located between Lancaster Grove Road, Lambolle Place and Eton Ave within the London Borough of Camden, just north of Primrose Hill. The proposed scheme comprise the change of use, refurbishment and extension of the Grade II Listed former Belsize Park Fire Station Building into 12 units of apartment accommodation. The existing 7 units of residential accommodation will not form part of this application.

This document demonstrates how the proposed development addresses the relevant energy policies of the London Plan 2015 (Further Alterations to the London Plan) and the requirements of Camden Council as outlined in their Core Strategy 2010-2025.

In particular this report responds to the energy policies of section 5 in the London Plan, including:

- Policy 5.2 Minimising Carbon Dioxide Emissions
- Policy 5.3 Sustainable Design and Construction
- Policy 5.5 Decentralised Energy Networks
- Policy 5.6 Decentralised Energy in Development proposals
- Policy 5.7 Renewable Energy where feasible.

and the Policy CS13 of the Camden's Core Strategy 2010-2025, which states the following in relation to sustainable redevelopment in the local area:

Camden Core Strategy 2010-2025: CS13 - Tackling climate change through promoting high environmental standards

Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

- *ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;*
- *promoting the efficient use of land and buildings;*
- *minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:*

1. *ensuring developments use less energy,*
2. *making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks;*
3. *generating renewable energy on-site; and*

- *ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.*

The Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions

Local energy generation

The Council will promote local energy generation and networks by:

- *working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of:*

1. *housing estates with community heating or the potential for community heating and other uses with large heating loads;*
2. *the growth areas of King's Cross; Euston; Tottenham Court Road; West Hampstead Interchange and Holborn;*
3. *schools to be redeveloped as part of Building Schools for the Future programme;*
4. *existing or approved combined heat and power/ local energy networks;*

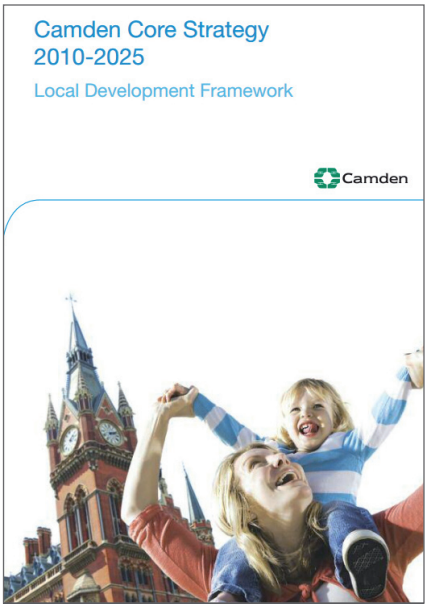
and other locations where land ownership would facilitate their implementation.

- *protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);*

Camden's carbon reduction measures

The Council will take a lead in tackling climate change by:

- *taking measures to reduce its own carbon emissions;*
- *triallng new energy efficient technologies, where feasible; and*
- *raising awareness on mitigation and adaptation measures*



Furthermore, the Camden Core Strategy recommends that:

Given the large proportion of development in the borough that relates to existing buildings, we will expect proportionate measures to be taken to improve their environmental sustainability, where possible.

The methodology employed in this Energy Statement to determine the potential CO_2 savings for this development, is in accordance with the three step Energy Hierarchy outlined in the London Plan:

- Be Lean - Improve the energy efficiency of the scheme
- Be Clean - Supply as much of the remaining energy requirement with low-carbon technologies such as combined heat and power (CHP)
- Be Green - Offset a proportion of the remaining carbon dioxide emissions by using renewable technologies.

It should be noted that due to the change-of-use and refurbishment nature of the proposed development, the baseline conditions for the development are calculated based on the existing fabric and services of the retained building.

Energy calculations were carried out using the SAP (Standard Assessment Procedure) methodology. This is in line with Building Regulations Part L 2013.

Demand Reduction (Be Lean)

Passive Design Measures

Enhanced Building Fabric

The heat loss of different building elements is dependent upon their U-value. The lower the U-value, the better the level of insulation of a particular element. A building with low U-values has a reduced heating demand during the cooler months.

The extended portions of the development at 36 Lancaster Grove will incorporate insulation meeting building regulation Part L1B threshold U-values and high efficiency glazing where possible in order to reduce the demand for space heating (see tables below).

However, it must be noted that since the building is a Grade II listed structure of heritage interest, alteration of the existing fabric elements (external walls, floors, roofs and such) will impact the original character of the building, thus no changes will be made to the existing fabric elements.

Air Tightness

Heat loss may also occur due to air infiltration. Although this cannot be eliminated altogether, good construction detailing and the use of best practice construction techniques can minimise the amount of air infiltration into a building.

Current Part L Building Regulations (2013) sets a maximum air permeability rate of $10m^3/m^2$ at 50Pa for new build dwellings. The development will achieve this air tightness as a minimum, through draught proofing and the application of best practice construction techniques.

Daylight

The development will aim to maintain the existing good sized windows to provide satisfactory levels of daylighting in all habitable spaces such as living rooms, as a way of improving the health and wellbeing of its occupants.

Active Design Measures

High Efficacy Lighting

The development intends to incorporate low energy lighting fittings throughout the dwellings and communal spaces. All light fittings will be specified as low energy lighting to minimise energy demand. Internal and external areas which are not frequently used will be fitted with occupant sensors, whereas daylit areas will be fitted with daylight sensors and timers.

Energy Demand

The table below shows a breakdown of energy demand for space conditioning and electricity. These figures indicate baseline and Lean demand after energy efficiency measures have been applied.

The table below demonstrates the energy savings achieved through energy efficiency measures (Lean stage of the Energy Hierarchy).

Breakdown of Energy Consumption and CO_2 Emissions

	Baseline Building			Lean		
	Energy (kWh/year)	CO_2 emissions ($kgCO_2$/year)	CO_2 ($kgCO_2$/m^2)	Energy (kWh/year)	CO_2 emissions ($kgCO_2$/year)	CO_2 ($kgCO_2$/m^2)
Hot Water	91,230	19,710	18.9	49,450	10,680	10.3
Space Heating	461,210	99,620	95.7	272,700	58,900	56.6
Cooling	0	0	0.0	0	0	0.0
Auxiliary	2,410	1,250	1.2	1,980	1,030	1.0
Lighting	7,550	3,920	3.8	4,440	2,300	2.2
Equipment (not incl. in Part L)	33,490	17,380	16.7	33,490	17,380	16.7
Total Part L	562,400	124,500	119.6	328,570	72,910	70.0
Total (incl. Equip)	595,890	141,880	136.3	362,060	90,290	86.7

CO_2 Emissions

The table below shows the regulated and unregulated carbon dioxide emissions for the baseline scheme and the emissions after the passive and active lean measures have been implemented. A saving exceeding the required 35% is expected from the regulated CO_2 emission over the existing building.

CO_2 Emissions Breakdown at Lean stage

	Carbon Dioxide emissions (tonnes CO_2 per annum)		
	Regulated	Unregulated	Total
Baseline building	124.5	17.4	141.9
After energy demand reduction (Lean)	72.9	17.4	90.3

	Carbon dioxide savings (tonnes CO_2 per annum)		Carbon dioxide savings from baseline (%)	
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	51.6	51.6	41.4%	36.4%

Heating and Cooling Infrastructure (Be Clean)

Energy System Hierarchy

The energy system for the development has been selected in accordance with the London Plan decentralised energy hierarchy. The hierarchy listed in Policy 5.6 states that energy systems should consider:

1. Connection to existing heating and cooling networks
2. Site wide CHP network
3. Communal heating and cooling

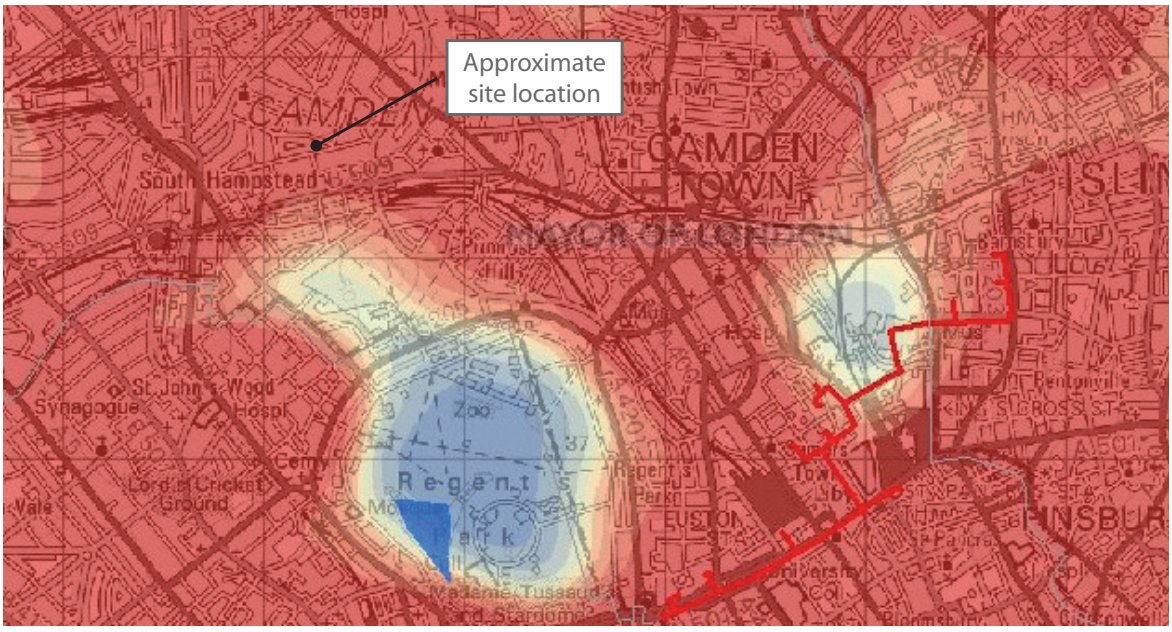
Local supply of heat and power minimise distribution losses, thereby achieving a greater efficiency and reducing CO_2 emissions, when compared to the individual systems.

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network to surrounding residencies and commercial units.

Connection to Existing Low Carbon Heat Distribution Networks

The London Heat Map identifies existing and potential opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study. An excerpt from the London Heat Map below shows the energy demand for different areas. Darker shades of red signify areas where energy demand is high. The map also highlights any existing and proposed district heating network (DHN) within the vicinity of the development.

A review of the map shows that the closest existing or proposed heat networks approximately 1.4 miles to the south-east of the site. The scale of the development does not make it economically viable for connection with networks located at a distance from the site. For this reason connection to district heat networks are not currently considered feasible.



London Heat Map with proposed district heat network outlined in red

Combined Heat and Power (CHP)

CHP, or Co-generation is the production of electricity and useful heat from a single engine. Unlike conventional electricity generation, heat is re-used in a CHP system, primarily for hot water, thereby improving the overall energy conversion from 25-35% to around 80%.

Due to the type and size of the development, this technology would not be suitable for this site. The hot water load of the site would not be sufficient to justify the use of this technology.

Hence, this technology is deemed to be unsuitable for the development at 36 Lancaster Grove.

There will be no further reduction in CO_2 emissions at the Clean Stage.

An example of a CHP engine (courtesy of Baxi)

CO_2 Emissions Breakdown at Clean stage

	Carbon Dioxide emissions (tonnes CO_2 per annum)		
	Regulated	Unregulated	Total
Baseline building	124.5	17.4	141.9
After energy demand reduction (Lean)	72.9	17.4	90.3
After district heating system (Clean)	72.9	17.4	90.3

	Carbon dioxide savings (tonnes CO_2 per annum)		Carbon dioxide savings from baseline (%)	
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	51.6	51.6	41.4%	36.4%
Savings from clean technologies	0.0	0.0	0.0%	0.0%

Renewable Energy (Be Green)

Once the energy demand has been minimised, methods of generating low and zero carbon energy can be assessed. The renewable technologies to be considered for the development are:

- Biomass
- Photovoltaic panels
- Solar thermal panels
- Ground/water source heat pumps
- Air source heat pump
- Wind energy

The table below summarises the factors taken into account in determining the appropriate renewable technology for this project. This includes estimated lifetime, level of maintenance, and level of impact on external appearance. The final column indicates the feasibility of the technology in relation to the site conditions (10 being the most feasible and 0 being infeasible).

The analysis demonstrated that due to the conservation requirements of the existing Grade II listed building, it will not be feasible to install renewable technologies without considerable construction and alterations to the former Belsize Park Fire Station building.

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		Comments	Lifetime	Maintenance	Impact on External Appearance	Site Feasibility
Biomass		Not adopted -burning of wood pellets releases high NOx emissions and there are limitations for their storage and delivery within an urban location.	20yrs	High	High	1
PV		Not adopted - PV panels mounted on the pitched roof would significantly alter the appearance and character of the Listed Building.	25yrs	Low	Med	3
Solar Thermal		Not adopted - Solar thermal array mounted on the pitched roof would significantly alter the appearance and character of the Listed Building.	25yrs	Low	Med	3
GSHP		Not adopted -the installation of ground loops require significant space, additional time at the beginning of the construction process and very high capital costs.	20yrs	Med	Low	1
ASHP		Not adopted -ASHP evaporator units are located externally and produce noise which can be an issue in a residential location, especially at night.	20yrs	Med	Med	3
Wind		Not adopted - Wind turbines located at the site will have a significant visual impact on the existing building within the Conservation Area.	25yrs	Med	High	1

CO_2 Emissions

The table below shows the regulated and unregulated carbon dioxide emissions for the baseline scheme and the emissions after the lean, clean and green measures have been implemented.

The proposed Energy Strategy outlined in this document achieved significant CO_2 savings for this development. The savings achieved through sustainable design measures alone are significant.

The figures below show a CO_2 reduction in regulated emissions exceeding the required 35% when compared to the building with its existing fabric and systems.

CO_2 Emissions Breakdown

	Carbon Dioxide emissions (tonnes CO_2 per annum)		
	Regulated	Unregulated	Total
Baseline building	124.5	17.4	141.9
After energy demand reduction (Lean)	72.9	17.4	90.3
After efficient technology (Clean)	72.9	17.4	90.3
After PV (Green)	72.9	17.4	90.3

CO_2 Savings Breakdown at all stages for the energy hierarchy

	Carbon dioxide savings (tonnes CO_2 per annum)		Carbon dioxide savings over baseline (%)	
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	51.6	51.6	41.4%	36.4%
Savings from clean technology	0.0	0.0	0.0%	0.0%
Savings from PV	0.0	0.0	0.0%	0.0%
Cumulative savings	51.6	51.6	41.4%	36.4%

Conclusion

In line with the London Plan's three step energy hierarchy, the regulated CO_2 emission savings for this development will exceed 35% when energy efficiency measures are taken into account.

The tables on the following page provide a breakdown of the CO_2 savings made at each stage of the Energy Hierarchy. The reductions made through each step have been outlined below:

1. Be Lean - use less energy
In accordance with this strategy, this development will incorporate a range of energy efficiency measures including the provision of a new and highly efficiency space heating and hot water system, electrical rewiring to include provision of low energy lighting throughout the scheme, and insulation levels meeting Part L1B targets for the any new thermal elements. The improvements in the building systems and fabric have reduced regulated CO_2 emissions by 41.4% in comparison to the existing building, thus exceeding the requirements outlined by the Camden Council and London Plan 2015.

2. Be Clean - supply energy efficiently
The feasibility study showed that no district heating network currently exists within close proximity of the site. Due to the nature of the development, a CHP unit would not be an economically viable option. Hence, high efficiency boilers where installed to provide space heating and hot water to each apartment.

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The feasibility study analysed a number of renewable technologies for their suitability for the site. The analysis included a biomass heating system, ground-source heat pumps, air-source heat pumps, photo voltaic panels, solar thermal and wind turbines.

The analysis demonstrated that due to the conservation requirements of the existing Grade II listed building, it will not be feasible to install renewable technologies without considerable construction and alterations to the former Belsize Park Fire Station.

In total, the development is expected to reduce regulated CO_2 emissions by 41.4% when compared to the existing baseline building. This meets the London Plan CO_2 reduction target of 35% set out for all major developments.

CO_2 Emissions Breakdown at all stages for the energy hierarchy

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CO_2 Savings Breakdown at all stages for the energy hierarchy

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Savings from district heating system	0.0	0.0	0.0%	0.0%
Savings from PV	0.0	0.0	0.0%	0.0%
Cumulative savings	51.6	51.6	41.4%	36.4%