Sustainable and energy efficiency design report

for

Hornsey Town Hall - Renaissance

Haringey, London

FEBUARY 2010

Job n˚: CS/026506

CAPITA SYMONDS

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Sustainable and energy efficiency design

Report

for

Hornsey Town Hall - Renaissance

Haringey, London

Section			Verified		
Ref	Title	by	by	Date	Signed
0.0	Introduction – Hornsey Town Hall	PB/HP	TM	03/11/09	TM
1.0	Building regulation Part L - Compliance	PB/HP	TM	03/11/09	TM
2.0	Part L compliance – New Build Residential Only	PB/HP	TM	03/11/09	TM
3.0	Planning requirements	PB/HP	TM	03/11/09	TM
4.0	Energy Profile Studies	PB/HP	TM	03/11/09	TM
5.0	Combined Heat and Power analysis (new build only)	PB/HP	TM	03/11/09	TM
6.0	Renewable Technologies Target Study	PB/HP	TM	03/11/09	TM
7.0	Site wide Combined Heat and Power analysis	PB/HP	TM	03/11/09	TM
8.0	Conclusion	PB/HP	TM	03/11/09	TM

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Draft	03/11/09	**Initials**	PB/HP	TM	TM	Incorporating comments from JMP/CS discussions
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Issued	19/02/10	**Initials**	HP	TM	TM	Amendments through document incorporating CS/JMP comments
		Sign	HP	TM	TM	

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CONTENTS

Executive Summary

This energy strategy report has prepared by Capita Symonds sustainability team for the London Borough of Haringey.

The report illustrates the possible low to zero carbon technologies to potentially be implemented to achieve the carbon reduction targets set out by the London Borough of Haringey and in accordance with The London Plan.

The energy profiles have been established using dynamic simulation and the low to zero carbon technologies have been sized on these profiles. The data used are bona fide information from supplies and manufactures alike.

Currently the cost calculation do not account for funding incentives.

During 2009 London Borough of Haringey adapted their policy on energy efficiency and sustainability in line with the Mayor of London's Plan. The Plan uses a hierarchy to assess applications and it is interpreted that all new developments should adopt this hierarchy:

1. Use of energy efficient features to the design and construction of the development (BE LEAN)
2. Use of clean carbon efficient technologies (BE CLEAN)
3. Use of low to zero carbon technologies (BE GREEN)

The Strategy has been developed using this hierarchy identified above and sets out the following:

1. Be Lean: The current proposals for both the Town Hall and Facilitating development seek to comply with the minimum requirement of Part L of the 2002 Building Regulations and for the affordable housing component, Level 3 of the Code for Sustainable Homes. LBH representatives have advised that the scheme should 'aspire' to meet Level 4 Code for Sustainable Homes and environmentally friendly infrastructure. The planning department advised that all housing, affordable and private, should meet code Level 3.

2. Be Clean: The sustainable and energy efficiency report prepared by Capita Symonds sustainability consultants suggested that Combine Heat and Power (CHP) systems are technically feasible. The costs and implications of this system are summarised further within the main Report.

3. Be Green: The Mayor of London Plan sets out developments should achieve a reduction in carbon dioxide emissions of 20% by the use of onsite renewable energy generation unless it can be demonstrated that it is not technically or financially feasible. LBH sets out that each project must demonstrate that it is aiming to achieve 20% carbon reductions by the use of onsite renewables. CHP is not deemed to be a renewable technology but in line with GLA hierarchy it should be considered prior to the implementation of other renewable.

The sustainable and energy efficiently report investigated a number of renewable technologies and each was assessed under the following criteria:

a. Technically feasible
b. CHP Compliant Technologies
c. Financially feasible

A combined Heat and Power system was found to be both technically and financially feasible to Blocks A and B new building developments. Further opportunities are available to link into the refurbished East Wing and Link building residential units should a develop wish to do so.

The following technologies were not deemed to be technically feasible for the development after the consideration of a CHP:

- Ground Source Heat Pumps
- Solar Thermal
- Wind Power
- Biomass

Photovoltaics have emerged as the preferred renewable technology as it is both technically feasible and compatible with a CHP. The payback period had a 65 year payback period and therefore this technology did not prove to be financially viable.

A site wide CHP was found to be technically viable but not financially viable under the present project parameters. In order to safeguard the project viability it is recommended that a site wide CHP is not proposed at this stage therefore is not included in the planning application.

It has therefore been recommended that a site wide CHP remains a project aspiration which can be implemented following more detailed investigation into the financial viability and controlled through a suitable planning condition. . It is recommended that the Council commission an Energy Service Company (ESCO) to undertake a detailed viability appraisal. This piece of work cannot be meaningfully progressed until the business plan for the Town Hall is adopted and the key stakeholders are consulted e.g. the Council, the Hornsey Town Hall Creative Trust, the Library and a potential Developer Partner.

Note: This report has been based on drawings as scheduled out in Appendix A. Since the first issue of this report, the scheme has been updated to include for residential components to the existing link block and Broadway Annex and a revision to the number of residential units to Block A & B. Since they are existing developments, they shall not be subjected to the renewable energy and carbon reduction target policies (applicable to new build developments only). With the inclusion of these two revised building components, this shall not materially affect the proposed energy strategy of the CHP to the new buildings Blocks A & B.

0.0 Introduction – Hornsey Town Hall

This report has been prepared by Capita Symonds to review the proposed energy provisions to the development and the compliance requirements under Part L – Building Regulations and Haringey Council – Unitary development plan.
The report aims to:-

(i) Describe an energy strategy that has been developed in accordance with the guidance documentation from the Greater London Authority (GLA) and London Borough of Haringey.
(ii) Assess the feasibility of using a centralised combined heat and power plant (CHP).
(iii) Assess the feasibility of renewable technologies to the new build components of the development.
(iv) Provide a cost analysis on the technically viable renewable technologies to meet the renewable targets on the new build developments

The development comprises of the following building components:

(i) A grade II listed Hornsey Town Hall to undergo extensive refurbishment
(ii) Conversion of the East Wing of the Town Hall into residential apartments
(iii) A new build residential apartment block
(iv) A new build stand alone residential apartment block
(v) Refurbishment of the existing Broadway Annex
(vi) New build four houses on the Mews site
(vii) Hornsey Town Hall library

Section 2.0 of the report is structured to address the interpretation of the Part L of the building regulations to the development.

Section 3.0 reviews the planning requirement for the new build components.

Section 4.0 describes the energy demand analysis carried out to the whole site with a view of using the data to undertake a combined heat and power system feasibility study.

Section 5.0 reviews the combined heat and power analysis for the new build components

Section 6.0 reviews the renewable technologies feasible for the new build components.

Section 7.0 provides a technical and financial analysis of a site wide CHP system with a simple payback analysis of a CHP system.
The report concludes with a summary in section 8.0 followed by Appendix.

The calculations for this report have been undertaken for feasibility studies only using Government National Calculation methodology database. Further detailed calculations shall need to be undertaken at a later stage to confirm system selection and capacities. This shall be dependent upon the preferred strategy energy approach by the client (i.e. whether a site wide centralised combined heat and power system or a decentralised system).

1.0 Building regulation Conservation Part L - Compliance

The building components that have been included for review in this section are:

(i) Existing Town Hall Building Refurbishment
(ii) East wing Residential Refurbishment
(iii) Link Building Residential Refurbishment
(iv) Block B Residential New Build
(v) Block A Residential New Build
(vi) Broadway Annex East retail/office Refurbishment
(vii) Broadway Annex West retail /residential refurbishment

1.1 Existing Town Hall Building

Under regulation 9 of the Part L – Building regulations the following clauses suggests that the Building exempt from the energy efficiency laws of the building regulations.

(5) The categories referred to in paragraph (4) (c) are:

a.) buildings which are:

- *Listed in accordance with section 1 of the Planning (Listed buildings and conservation areas) Act 1990;*
- *In conservation area designated in accordance with section 69 of that act; or*
- *Included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979,*

where compliance with the energy efficiency requirements would unacceptably alter their character or appearance;

b.) buildings which are used primarily or solely as places of worship

c.) temporary buildings with planned time of use of two years or less, industrial sites, workshops and non-residential agricultural buildings with low energy demand;

d.) stand-alone buildings other than dwellings with a total useful floor area of less than 50 m2

ADL2A – Para 9

Also in accordance with Clauses CSV2 from the Haringey Unitary Development Plan July 2006, the importance of preserving the original appearance of the building is recognized and therefore the compatibility with the building structure is recognized.

HISTORIC BUILDINGS

8 *Special considerations apply if the building on which the work is to be carried out has special historic or architectural value and compliance with energy efficiency requirements would unacceptably alter the character or appearance.*

9 *When undertaking work on or in connection with buildings with special and historic or architectural value, the aim should be improving energy efficiency where and to the extent that is practically possible. This is provided that the work does not prejudice the character of the host building or increase the risk of long term deterioration to the building fabric or fittings. The guidance given in the English Heritage publication should be taken into account in determining appropriate energy performance standards for such building works. Particular issues relating to work in historic buildings that sympathetic treatment and where advice from others could therefore be beneficial include:*

restoring the historic character of a building that has been subject to previous inappropriate alteration, e.g. replacements windows, doors and roof lights;
rebuilding a former building;
making provisions enabling the fabric of historic buildings to "breathe" to control moisture and potential long term decay problems.
10 *In arriving at a balance between historic building conservation and energy efficiency improvements, it would be appropriate to take into account the advice of the local authority's conservation officer.*

As discuss in the feasibility report (Feb 2009). Guidance was sought after the interim Building Regulations and historic buildings by English Heritage. The following measures were incorporated into the design.

(i) Limit heat loss pipes and ducts

Heat loss would be limited from the heating system by using appropriate thermal insulation materials. Attention would especially be paid to unheated spaces where ducts/pipes would be routed.

(ii) Provision of energy efficient space heating

Since the historic nature of the refurbishment works is to be maintained and it is suggested that the least disruptive heat provision would be gas fired boilers.

Gas fired boilers would be of the highly efficient type with optimised weather compensator controls. The building would have appropriate single zone control.

(iii) Use/retrofit of thermostatic Radiator valves

To improve controllability of the heating system, we would purpose the installation (or addition to retained radiators where applicable) of thermostatic radiator valves to gain better energy management.

(iv) High efficient ventilation and air conditioning plant

All mechanical plant would meet the minimum (if not better) efficiency standards as per PartL2A Building Regulations.

Heat recovery heating and ventilation systems would be included where appropriate.

The plant would be strategically located to minimize visual impact and noise disturbance

(v) Automatic lighting control

Automatic lighting control and presence detection units would be proposed to reduce lighting electrical energy.

Daylight controls to certain area would also be included with appropriate zoning of lighting circuits.

1.2 East Wing Residential, Link Building and Broadway Annex West Refurbishments

The East Wing and link building shall undergo refurbishment works to convert it from office and civic accommodation to a residential accommodation. The Broadway Annex West building shall have refurbishment of retail at ground floor and residential units on the first and second floor.

However, since the residential units are housed within a listed building envelope, it is interpreted that this portion of the building is exempt from adhering to the energy efficiency laws of the building regulations – PartL2B – Conservation of fuel and power in existing buildings other than dwellings.

In keeping within the spirit of energy efficiency, for the residential part high efficient building services plant and equipment shall be specified so that the design flexibility limits are achieved in accordance with paragraph 35-41 of the Building Regulation Part L1B - Conservation of fuel and power in existing dwellings.

1.3 Block B Residential – New Building

This development comprises of approximately 26 apartments in a new build development.

This would be subjected to Part L1A of the Building Regulations – Conservation of fuel and power in new dwellings.

The common areas within the building development shall comply with PartL2A of the building regulations in accordance with Paragraph 14 of the Approved document Building Regulations Part L1A.

Any areas of building containing multiple dwellings are not classified as dwellings, and therefore fall outside the scope of the five criteria outlined above. For such areas, reasonable provision would be:

a) If they are heated, to follow the guidance in Approved Document L2A; or
b) If they are unheated, to provide fabric elements that meet the fabric standards set out in paragraph 33 to 36

1.4 Block A Residential – New Building

This development comprises of approximately 66 apartments in a new build development. This would be subjected to Part L1A of the Building Regulations.

The common areas within the building development shall comply with Part L2A of the building regulations in accordance with Paragraph 14 Approved document Building Regulations Part L1A.

1.5 Broadway Annex East Retail/Office - Refurbishment

This development shall be undergoing refurbishment and is a listed building; therefore, this shall be subjected to Part L2B of the Building Regulations.

However, due to the development being listed, this would suggest exemption from the energy efficiency requirements of Part L2B.

1.6 Summary

To summarize, the table below indicates which parts of the Building regulations – Part L are applicable to the development.

Building component	Status	Building regulation	Further comments
Existing Town hall	Refurbishment	Part L2B	Exempt from energy efficiency measures
East Wing – Residential	Refurbishment	Part L1A/L2B	Exempt from energy efficiency measures
Link Building - Residential	Refurbishment	Part L1A/L2B	Exempt from energy efficiency measures
Residential – Block B	New Build	Part L1A	Part L2A to common part
Residential – Block A	New Build	Part L1A	Part L2A to common part
Broadway Annex West – Retail/Residential	Refurbishment	Part L2B	Exempt from energy efficiency measures
Broadway Annex – East Retail/Residential	Refurbishment	Part L1A/L2B	Exempt from energy efficiency measures

2.0 Part L Compliance – New Build (Residential Only)

The following two building areas were required to comply with Part L2A of the building regulations

(i) Common parts to Block A
(ii) Common parts to Block B

The five criteria required for compliance are:

- Criterion 1 – Achieving an acceptable building CO2 emission rate
- Criterion 2 – Limits on design flexibility
- Criterion 3 – Limiting the effects of solar gains in summer
- Criterion 4 – Quality of construction and commissioning
- Criterion 5 – Providing information

To assess the energy profile of the buildings, the licensed computer software package TAS NG 9.1 Part L2 dynamic simulation modelling was used. Drawings as scheduled in Appendix A were used for the modelling exercise.

Calculation of the Target Emissions Rating (TER) and Building Emissions Rating (BER)

The buildings data and geometry was inputted into the program and the building emission rates were calculated for a notational building $C_{notional}$, which has the same geometry as the actual building but uses standardised building design parameters from the National Calculation Methodology database.

The Target Emission Rate (TER) is calculated using the following formula:

$TER = C_{notional} \times [(1\text{-Factor}) \times (1\text{-LZC})]$

where '*Factor'* is the Improvement Factor and '*LZC'* is the Low to Zero Carbon Factor.

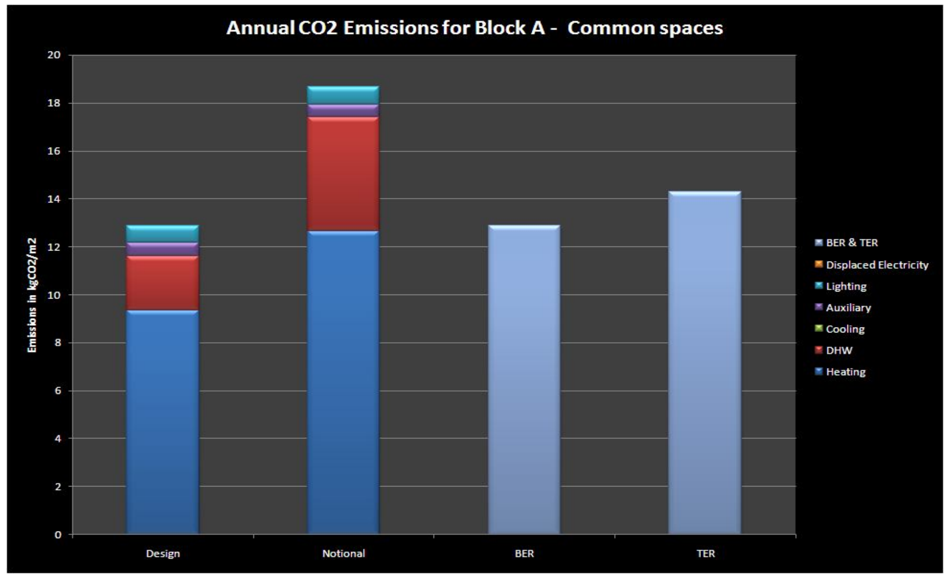
The Building Emission Rate (BER) is also calculated by the software program based on the actual building design, which has a lower emission rating than the target, meaning that the building is more energy efficient than required by PART L2A.

The results were then updated to calculate the required carbon emission savings and resulting energy provision to be met by renewable technologies.

2.1 Building Simulation Methodology

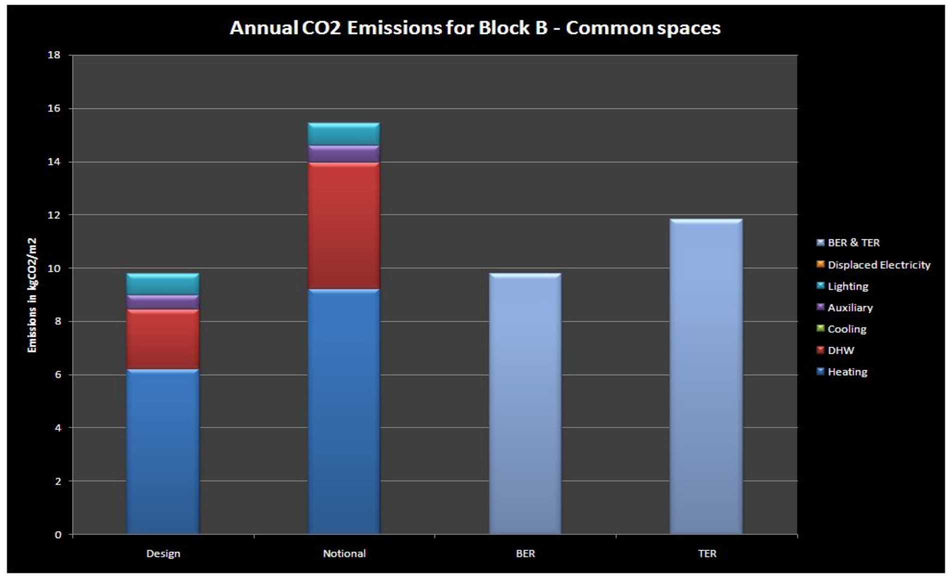
A 3D geometric model of the building was created in TAS. Each building part was zoned in accordance with guidelines for calculating the energy model for Part L2A compliance.

2.2 Common parts – Block A



From the above, it was found that the TER>BER, therefore the common parts of the building complied with Criterion 1 of part L2A.

2.3 Common parts – Block B



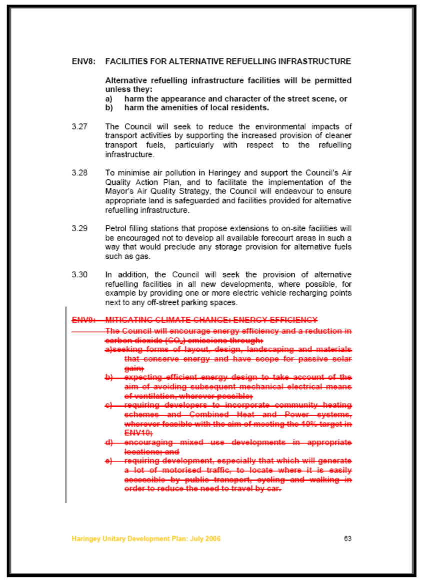
From the above, it was found that the TER>BER, therefore the common parts of the building complied with Criterion 1 of part L2A.

	Target Emission Rate (kgCO2/m2/yr)	Building Emission Rate (kgCO2/m2/yr)
Block A	14.2	12.5
Block B	11.8	9.8

3.0 Planning requirements

Local Planning Authority – Haringey Council

In accordance with the local planning Authority Unitary Development Plan ENV 9 and 10, these clauses have been deleted as they not conform to the London plan.



ENV8: FACILITIES FOR ALTERNATIVE REFUELLING INFRASTRUCTURE

Alternative refuelling infrastructure facilities will be permitted unless they:
a) harm the appearance and character of the street scene, or
b) harm the amenities of local residents.

3.27 The Council will seek to reduce the environmental impacts of transport activities by supporting the increased provision of cleaner transport fuels, particularly with respect to the refuelling infrastructure.

3.28 To minimise air pollution in Haringey and support the Council's Air Quality Action Plan, and to facilitate the implementation of the Mayor's Air Quality Strategy, the Council will endeavour to ensure appropriate land is safeguarded and facilities provided for alternative refuelling infrastructure.

3.29 Petrol filling stations that propose extensions to on-site facilities will be encouraged not to develop all available forecourt areas in such a way that would preclude any storage provision for alternative fuels such as gas.

3.30 In addition, the Council will seek the provision of alternative refuelling facilities in all new developments, where possible, for example by providing one or more electric vehicle recharging points next to any off-street parking spaces.

~~ENV9: MITIGATING CLIMATE CHANGE: ENERGY EFFICIENCY~~
~~The Council will encourage energy efficiency and a reduction in carbon dioxide (CO_2) emissions through:~~
~~a) seeking forms of layout, design, landscaping and materials that conserve energy and have scope for passive solar gain;~~
~~b) expecting efficient energy design to take account of the aim of avoiding subsequent mechanical electrical means of ventilation, wherever possible;~~
~~c) requiring developers to incorporate community heating schemes and Combined Heat and Power systems, wherever feasible with the aim of meeting the 10% target in ENV10;~~
~~d) encouraging mixed use developments in appropriate locations; and~~
~~e) requiring development, especially that which will generate a lot of motorised traffic, to locate where it is easily accessible by public transport, cycling and walking in order to reduce the need to travel by car.~~

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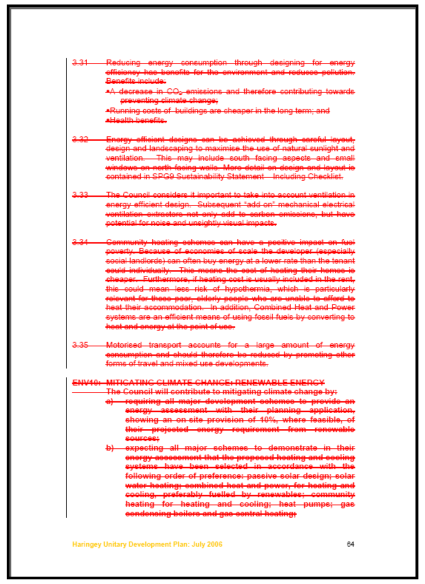

~~3.31 Reducing energy consumption through designing for energy efficiency has benefits for the environment and reduces pollution. Benefits include:~~
~~• A decrease in CO_2 emissions and therefore contributing towards preventing climate change;~~
~~• Running costs of buildings are cheaper in the long term; and~~
~~• Health benefits.~~

~~3.32 Energy efficient designs can be achieved through careful layout, design and landscaping to maximise the use of natural sunlight and ventilation. This may include south facing aspects and small windows on north facing walls. More detail on design and layout is contained in SPG9 Sustainability Statement – Including Checklist.~~

~~3.33 The Council considers it important to take into account ventilation in energy efficient design. Subsequent "add on" mechanical electrical ventilation extractors not only add to carbon emissions, but have potential for noise and unsightly visual impacts.~~

~~3.34 Community heating schemes can have a positive impact on fuel poverty. Because of economies of scale the developer (especially social landlords) can often buy energy at a lower rate than the tenant could individually. This means the cost of heating their homes is cheaper. Furthermore, if heating cost is usually included in the rent, this could mean less risk of hypothermia, which is particularly relevant for those poor, elderly people who are unable to afford to heat their accommodation. In addition, Combined Heat and Power systems are an efficient means of using fossil fuels by converting to heat and energy at the point of use.~~

~~3.35 Motorised transport accounts for a large amount of energy consumption and should therefore be reduced by promoting other forms of travel and mixed use developments.~~

~~ENV10: MITIGATING CLIMATE CHANGE: RENEWABLE ENERGY~~
~~The Council will contribute to mitigating climate change by:~~
~~a) requiring all major development schemes to provide an energy assessment with their planning application, showing an on site provision of 10%, where feasible, of their projected energy requirement from renewable sources;~~
~~b) expecting all major schemes to demonstrate in their energy assessment that the proposed heating and cooling systems have been selected in accordance with the following order of preference: passive solar design; solar water heating; combined heat and power, for heating and cooling, preferably fuelled by renewables; community heating for heating and cooling; heat pumps; gas condensing boilers and gas central heating;~~

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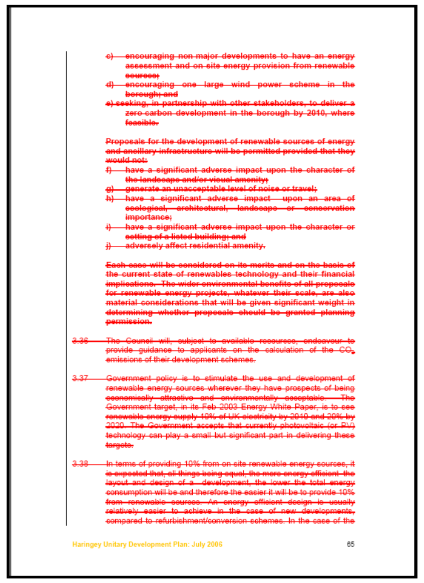

~~c) encouraging non major developments to have an energy assessment and on site energy provision from renewable sources;~~
~~d) encouraging one large wind power scheme in the borough; and~~
~~e) seeking, in partnership with other stakeholders, to deliver a zero carbon development in the borough by 2010, where feasible.~~

~~Proposals for the development of renewable sources of energy and ancillary infrastructure will be permitted provided that they would not:~~
~~f) have a significant adverse impact upon the character of the landscape and/or visual amenity;~~
~~g) generate an unacceptable level of noise or travel;~~
~~h) have a significant adverse impact upon an area of ecological, architectural, landscape or conservation importance;~~
~~i) have a significant adverse impact upon the character or setting of a listed building; and~~
~~j) adversely affect residential amenity.~~

~~Each case will be considered on its merits and on the basis of the current state of renewables technology and their financial implications. The wider environmental benefits of all proposals for renewable energy projects, whatever their scale, are also material considerations that will be given significant weight in determining whether proposals should be granted planning permission.~~

~~3.36 The Council will, subject to available resources, endeavour to provide guidance to applicants on the calculation of the CO_2 emissions of their development schemes.~~

~~3.37 Government policy is to stimulate the use and development of renewable energy sources wherever they have prospects of being economically attractive and environmentally acceptable. The Government target, in its Feb 2003 Energy White Paper, is to see renewable energy supply 10% of UK electricity by 2010 and 20% by 2020. The Government accepts that currently photovoltaic (or PV) technology can play a small but significant part in delivering these targets.~~

~~3.38 In terms of providing 10% from on site renewable energy sources, it is expected that, all things being equal, the more energy efficient the layout and design of a development, the lower the total energy consumption will be and therefore the easier it will be to provide 10% from renewable sources. An energy efficient design is usually relatively easier to achieve in the case of new developments, compared to refurbishment/conversion schemes. In the case of the~~

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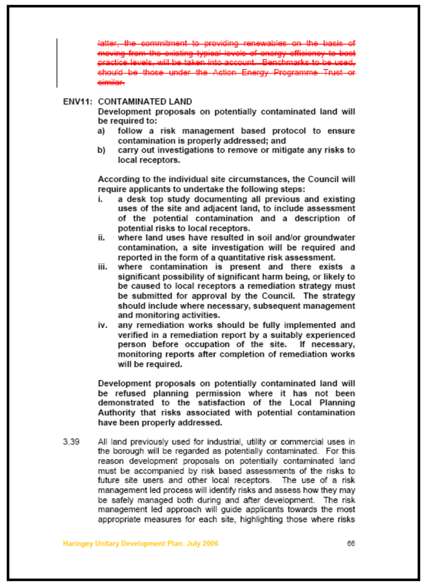

~~latter, the commitment to providing renewables on the basis of moving from the existing typical levels of energy efficiency to best practice levels, will be taken into account. Benchmarks to be used, should be those under the Action Energy Programme Trust or similar.~~

ENV11: CONTAMINATED LAND
Development proposals on potentially contaminated land will be required to:
a) follow a risk management based protocol to ensure contamination is properly addressed; and
b) carry out investigations to remove or mitigate any risks to local receptors.

According to the individual site circumstances, the Council will require applicants to undertake the following steps:
i. a desk top study documenting all previous and existing uses of the site and adjacent land, to include assessment of the potential contamination and a description of potential risks to local receptors.
ii. where land uses have resulted in soil and/or groundwater contamination, a site investigation will be required and reported in the form of a quantitative risk assessment.
iii. where contamination is present and there exists a significant possibility of significant harm being, or likely to be caused to local receptors a remediation strategy must be submitted for approval by the Council. The strategy should include where necessary, subsequent management and monitoring activities.
iv. any remediation works should be fully implemented and verified in a remediation report by a suitably experienced person before occupation of the site. If necessary, monitoring reports after completion of remediation works will be required.

Development proposals on potentially contaminated land will be refused planning permission where it has not been demonstrated to the satisfaction of the Local Planning Authority that risks associated with potential contamination have been properly addressed.

3.39 All land previously used for industrial, utility or commercial uses in the borough will be regarded as potentially contaminated. For this reason development proposals on potentially contaminated land must be accompanied by risk based assessments of the risks to future site users and other local receptors. The use of a risk management led process will identify risks and assess how they may be safely managed both during and after development. The risk management led approach will guide applicants towards the most appropriate measures for each site, highlighting those where risks

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It is interpreted that all the new developments should adopt the Major of London Hierarchy.

The London Plan (consolidated with alterations since 2004) - the Mayor's Spatial Development Strategy

Policy 4A.4 Energy Assessment

The Mayor will and boroughs should support the Mayor's Energy Strategy and its objectives of improving energy efficiency and increasing the proportion of energy used generated from renewable sources.

The Mayor will and boroughs should require an assessment of the energy demand and carbon dioxide emissions from proposed major developments, which should demonstrate the expected energy and carbon dioxide emission savings from the energy efficiency and renewable energy measures incorporated in the development, including the feasibility of CHP/CCHP and community heating systems.

Policy 4A.7 Energy Efficient and Renewable Energy

The Mayor will and boroughs should in their DPDs adopt a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from onsite renewable energy generation (which can include sources of decentralised renewable energy) unless it can be demonstrated that such provision is not feasible. This will support the Mayor's Climate Change Mitigation and Energy Strategy and its objectives of increasing the proportion of energy used generated from renewable sources by:

- *requiring the inclusion of renewable energy technology and design, including: biomass fuelled heating, cooling and electricity generating plant, biomass heating, combined heat, power and cooling, communal heating, cooling and power, renewable energy from waste (Policy 4A.21) Photovoltaics, solar water heating, wind, hydrogen fuel cells, and ground-coupled heating and cooling in new developments wherever feasible*
- *facilitating and encouraging the use of all forms of renewable energy where appropriate, and giving consideration to the impact of new development on existing renewable energy schemes.*

The Energy Hierarchy

Policy 4A.1 Tackling climate change

The Mayor will, and boroughs should, in their DPDs require developments to make the fullest contribution to the mitigation of an adaptation to climate change and to minimise emissions of carbon dioxide.

The following hierarchy will be used to assess applications:

• using less energy, in particular by adopting sustainable design and construction measures

• supplying energy efficiently, in particular by prioritising decentralised energy generation, and

• using renewable energy

Therefore the following energy hierarchy would be adopted.

(i) Use of energy efficient features to the design and construction of the development **(BE LEAN)**

(ii) Use of clean carbon efficient technologies (i.e. CHP) **(BE CLEAN)**

(iii) Use of low to zero carbon technologies (renewable technologies) **(BE GREEN)**

4.0 Energy Profile Studies

An energy profile analysis was carried out using dynamic simulation modelling. The licensed computer software program TAS N.G. 9.0.4 was used.

The climate weather file taken for this study was London TRY (CIBSE 2005).

An energy demand analysis was undertaken for the all the building components in the development.

The following graphs indicate the analyses undertaken for each building.

The energy profiles were based on the NCM database calculations and professional judgement on predicted unregulated energy consumption. Refer to Appendix B for further information on key assumptions. The buildings were modelled using the drawings schedule in Appendix A.

The building was divided into zones to reflect the different functional uses and environmental systems by which they are served. The construction and properties of the various building elements were defined and a construction type assigned to each surface. Internal gains, heating and ventilation systems were entered for each zone. Parameters defining the heating and ventilation systems were entered and the simulation was run over a year using hourly weather data.

Internal conditions from the national calculation methodology database were attributed to the zones. The model was then set up to produce the target/ building emissions rate and associated energy/ CO2 information

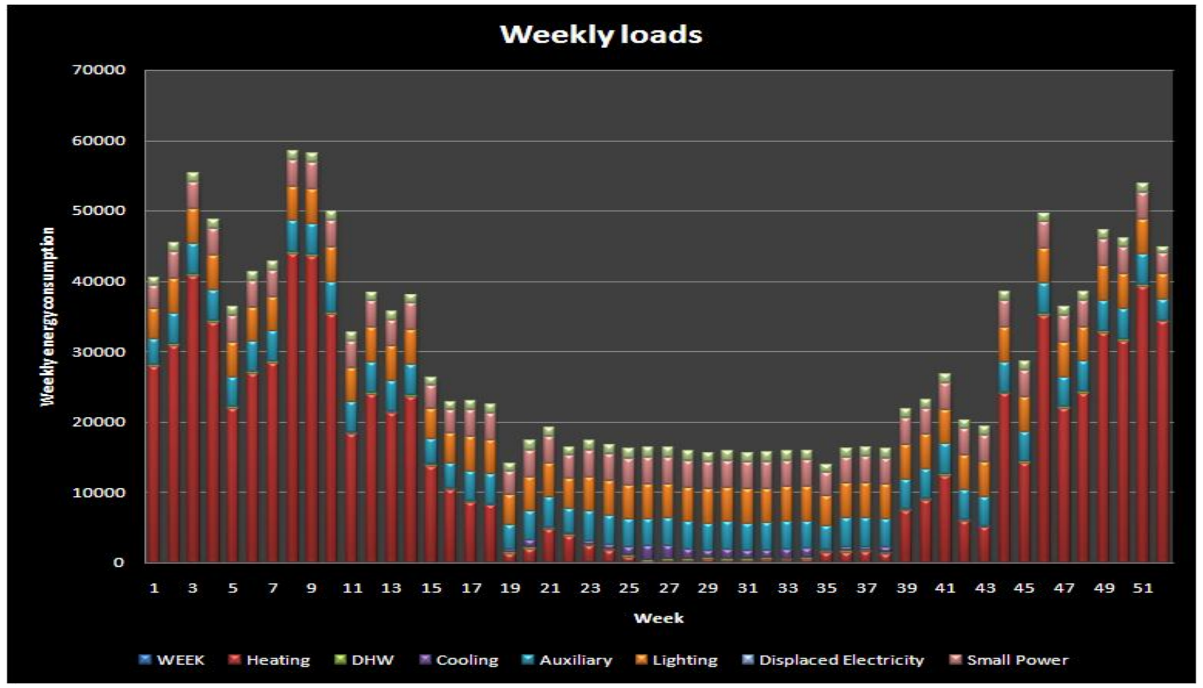
The energy profile for the development was carried out using the licensed dynamic thermal simulation package TAS NG version 9.1.e.

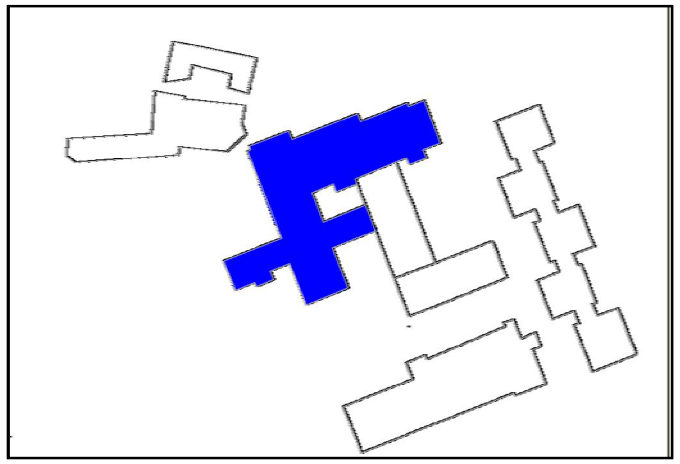
The Simulation Methodology involved the creation of 3D - geometric model of the whole development. This was subsequently zoned in accordance with the Part L2A requirement to establish target and building emission rates.

The model was then adapted to allow for both regulated energy services (regulated by Part L2A e.g. heating cooling, lighting etc) and unregulated services (e.g. small power, external lighting etc.)

This produced an energy assessment model which was adapted in order to assess provision to the site.

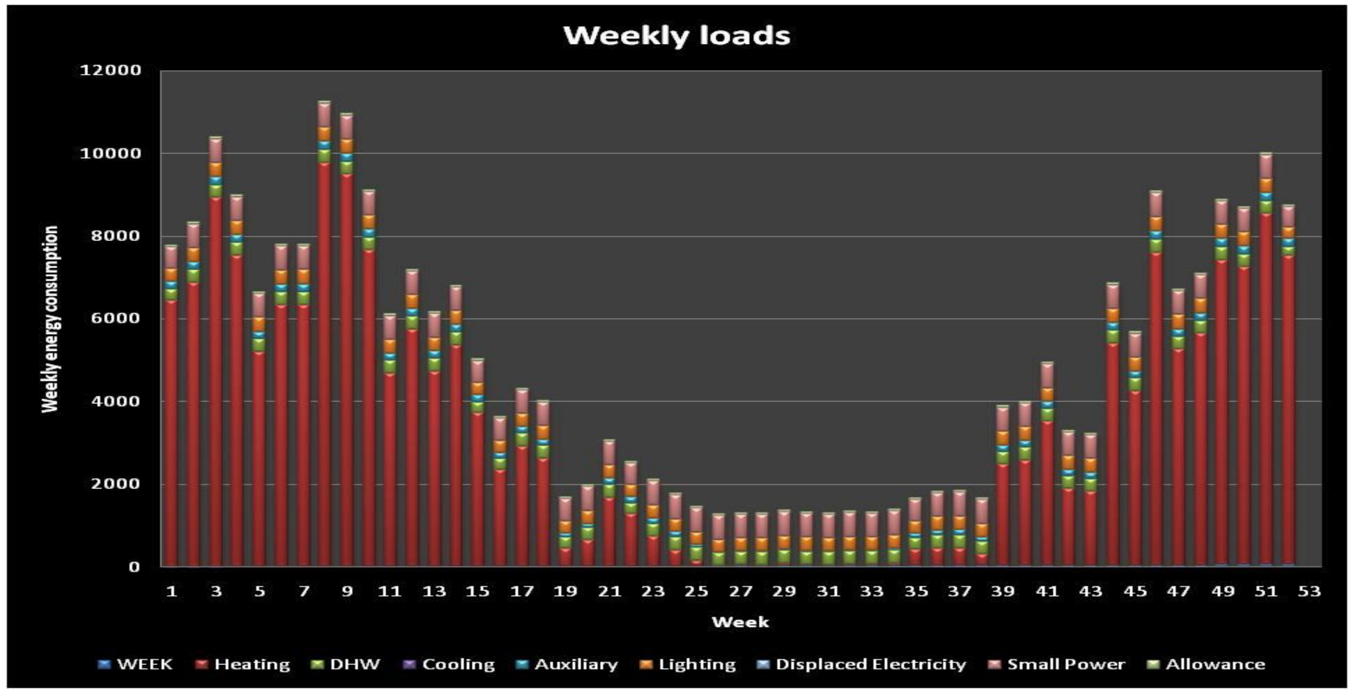
4.1 Hornsey Town Hall

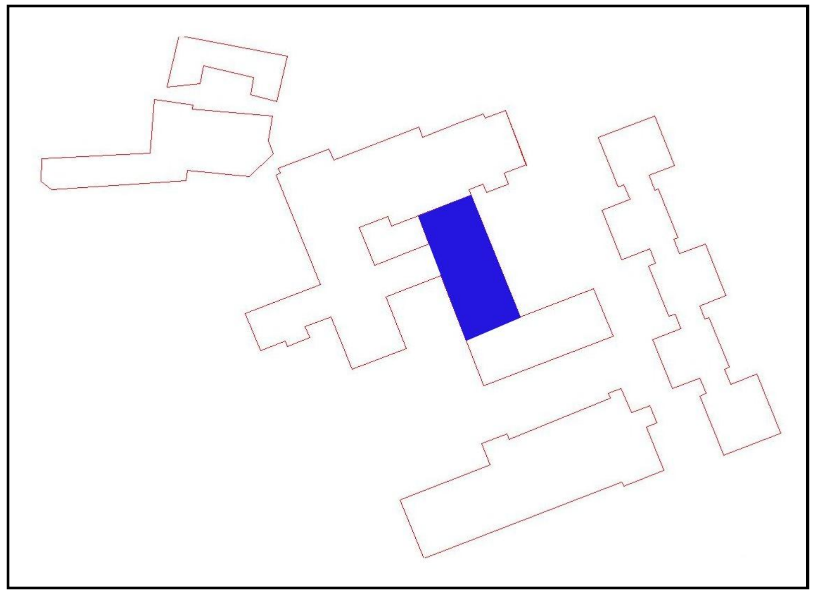




Load	kWh/year
Heat	792,844
Electricity	739,732

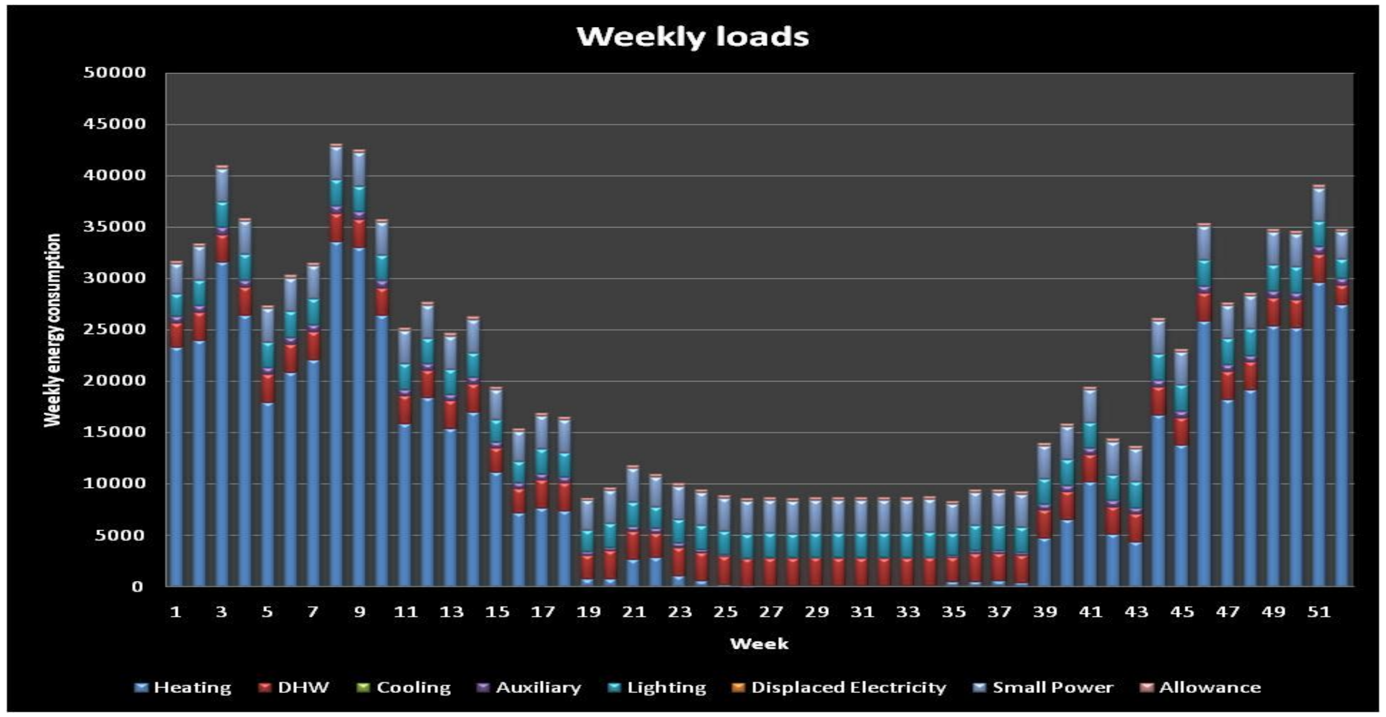
4.2 East wing

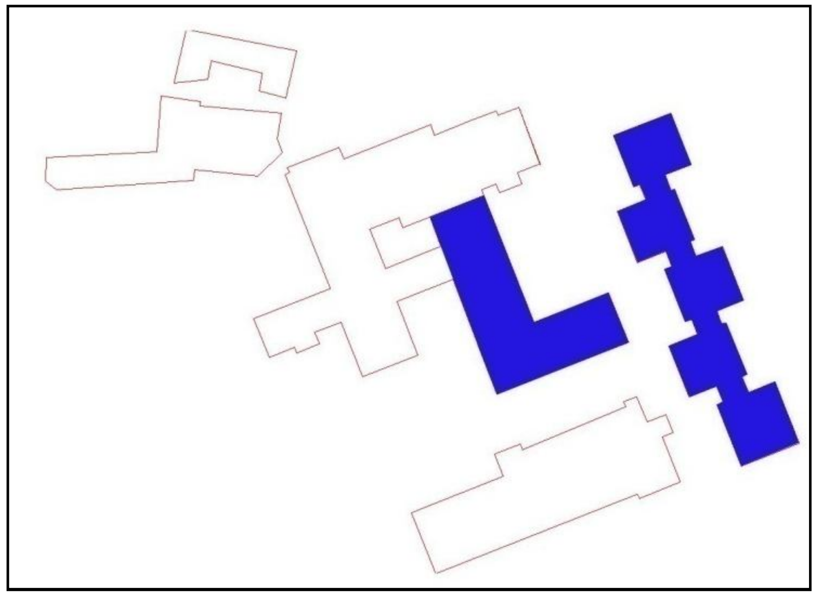




Load	kWh/year
Heat	199,563
Electricity	56,256

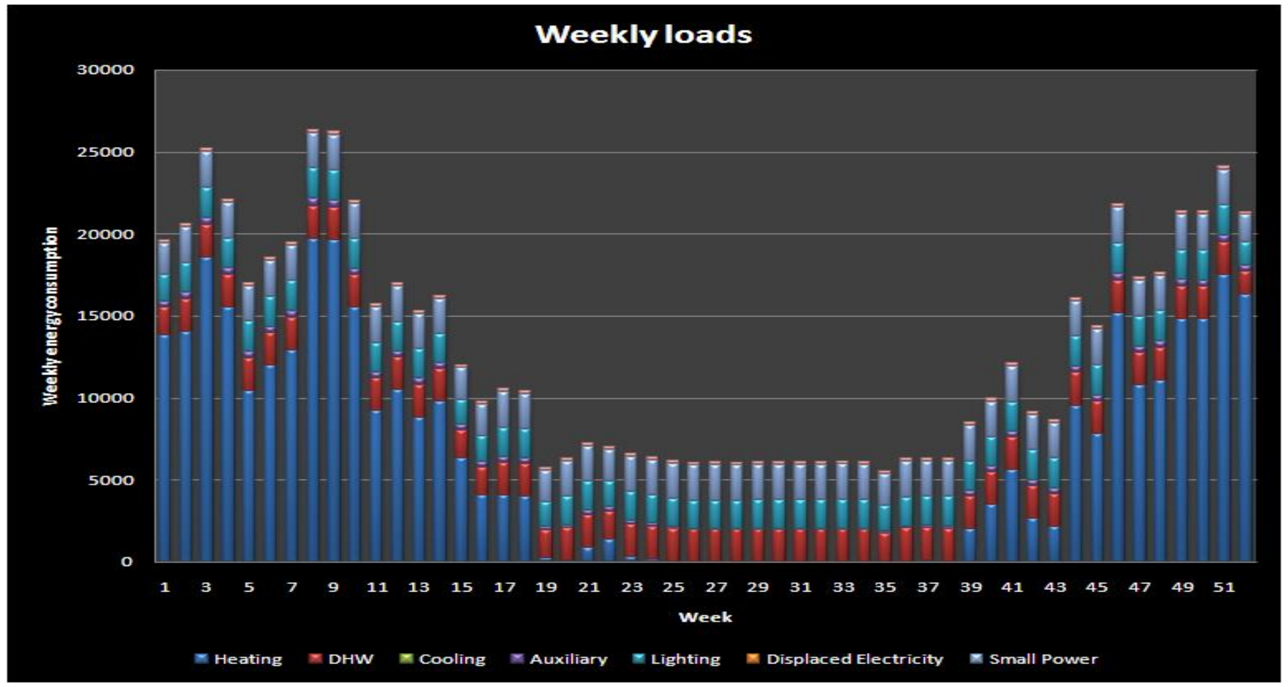
4.3 Block A + Block B (New Build) +East Wing (Refurbishment)

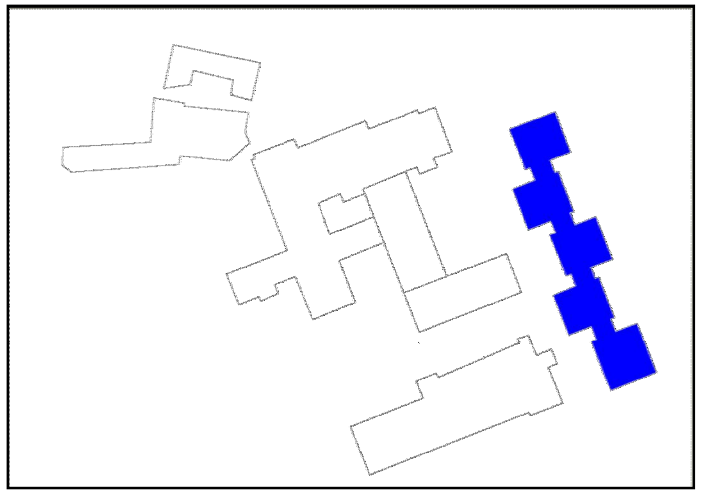




Load	kWh/year
Heat	738,225
Electricity	329,639

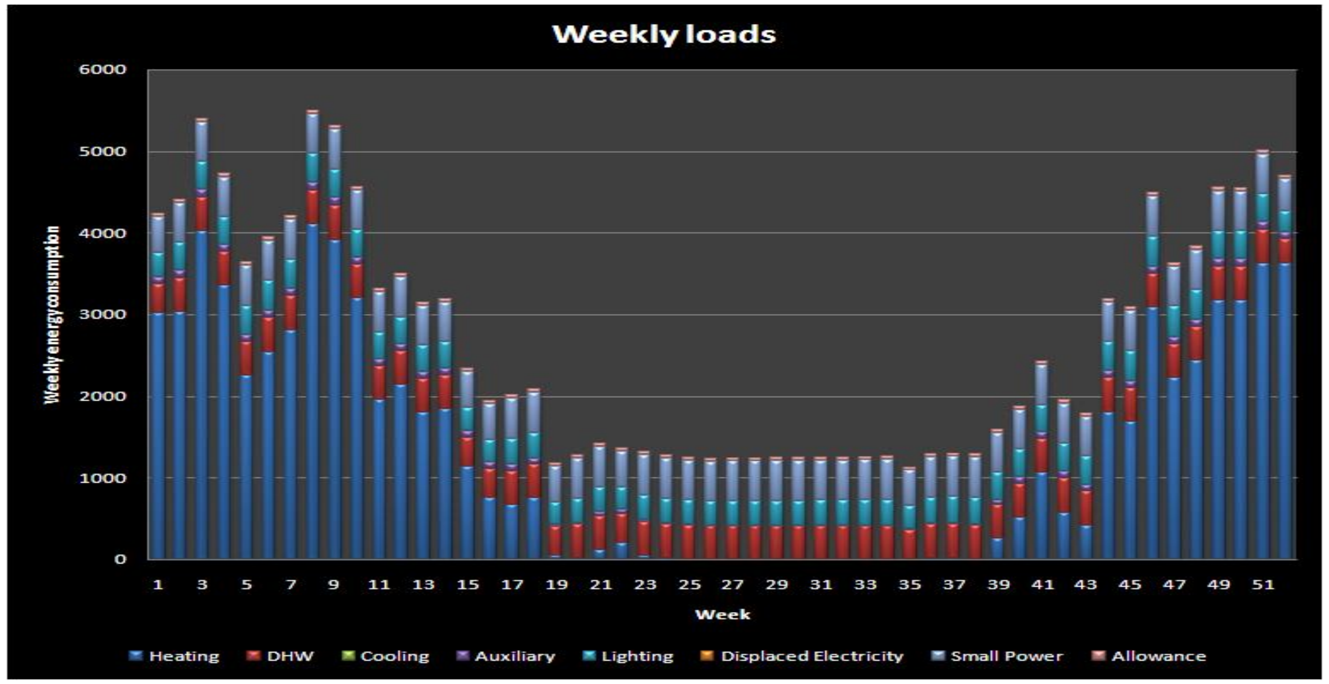
4.3 Block A (New Build)

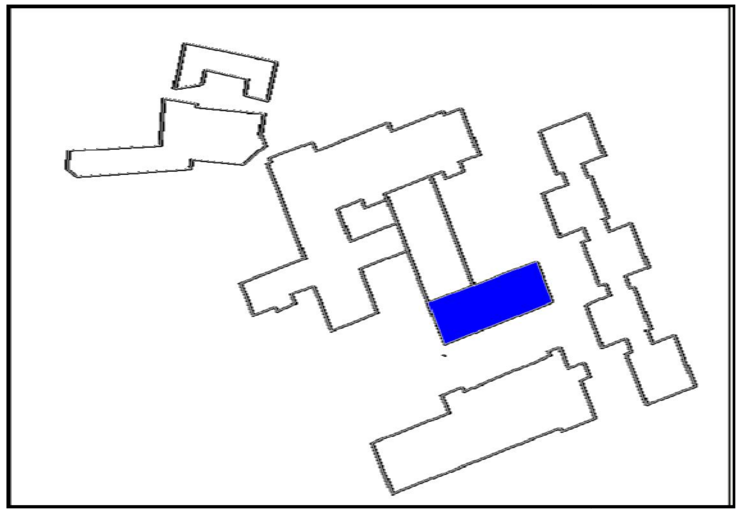




Load	kWh/year
Heat	93,077
Electricity	47,101

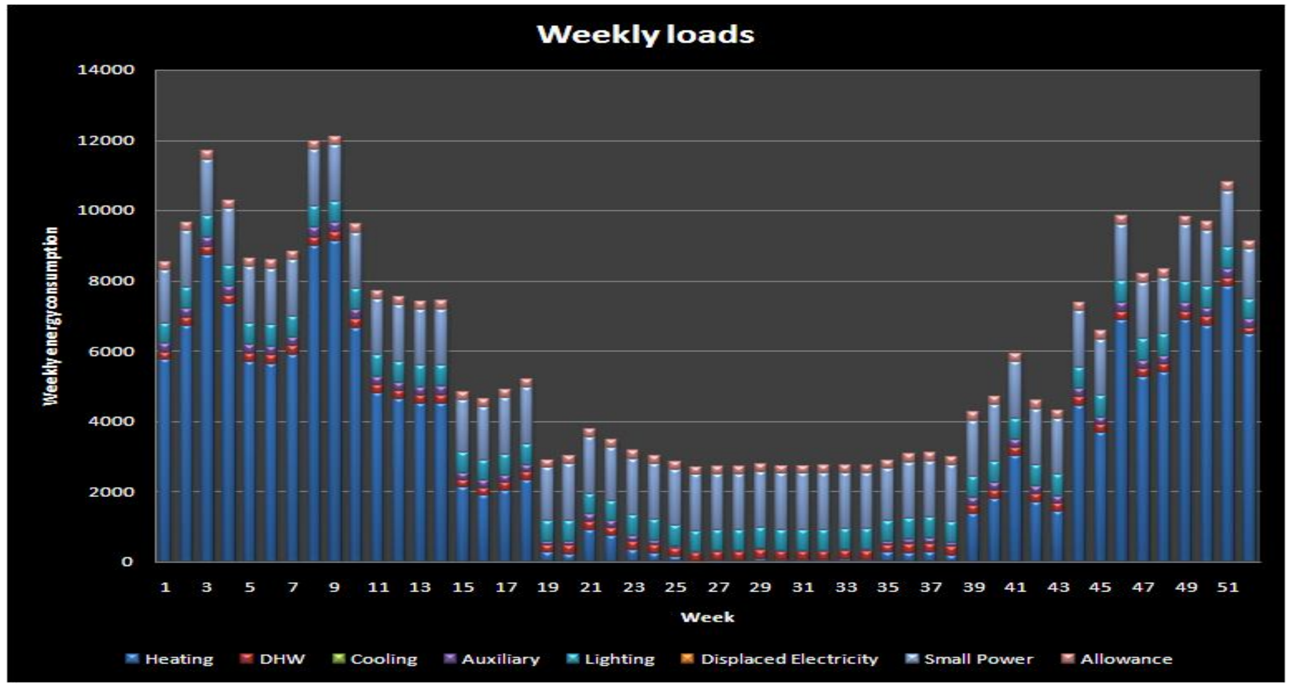
4.4 Block B (New Build)

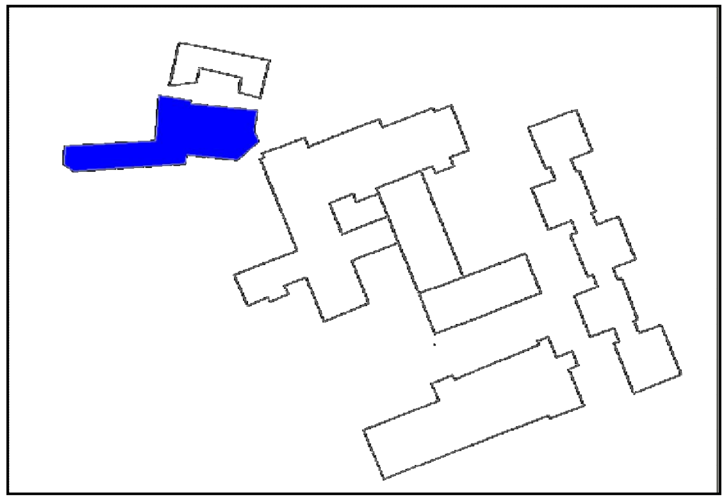




Load	kWh/year
Heat	449,166
Electricity	227,013

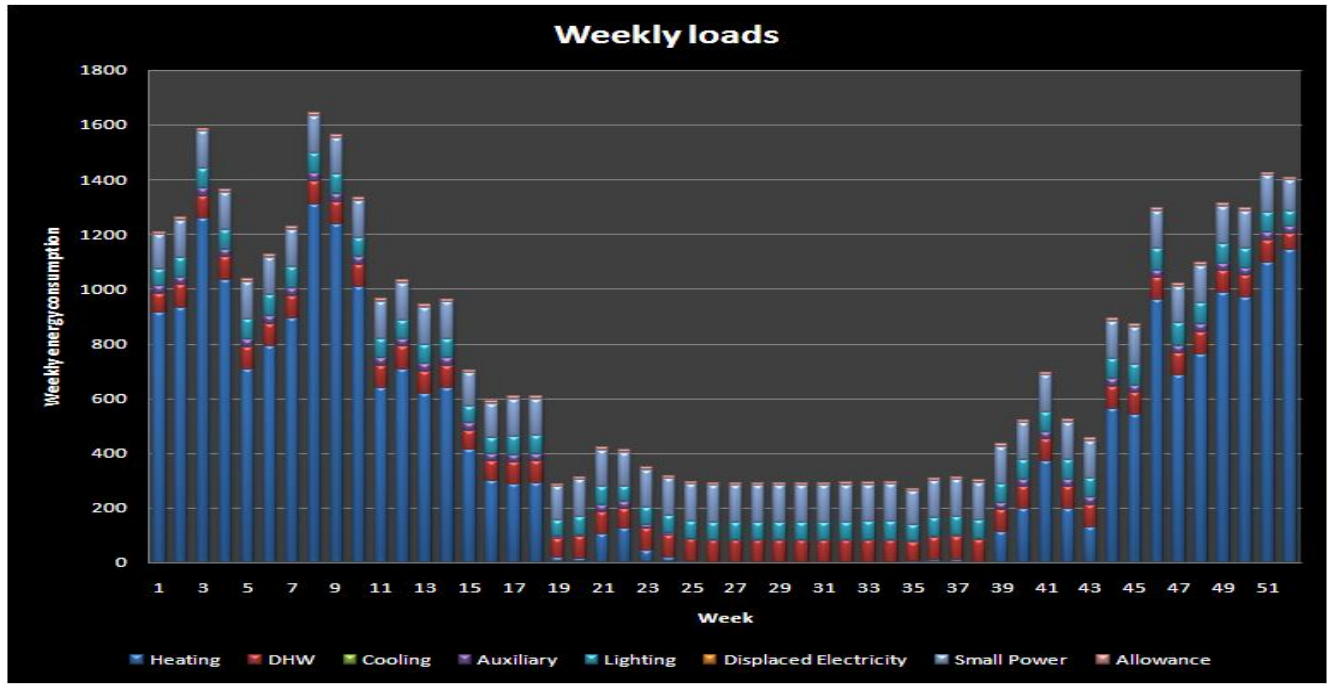
4.5 Broadway Annexe (Refurbishment)

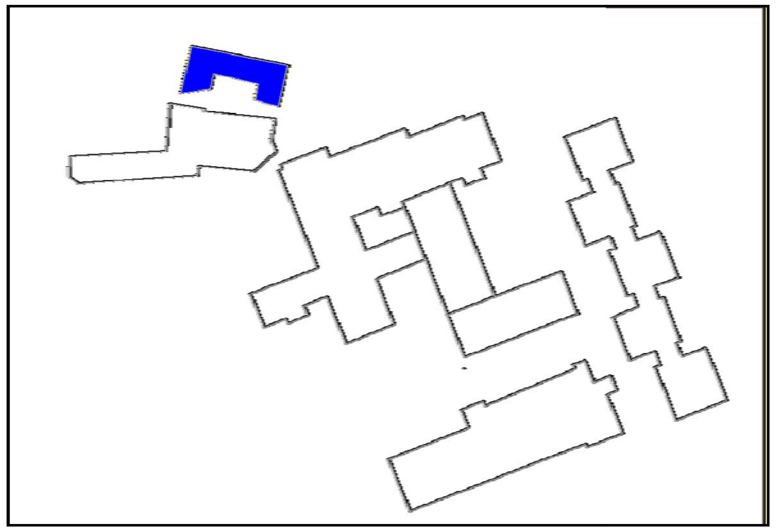




Load	kWh/year
Heat	130,494
Electricity	125,775

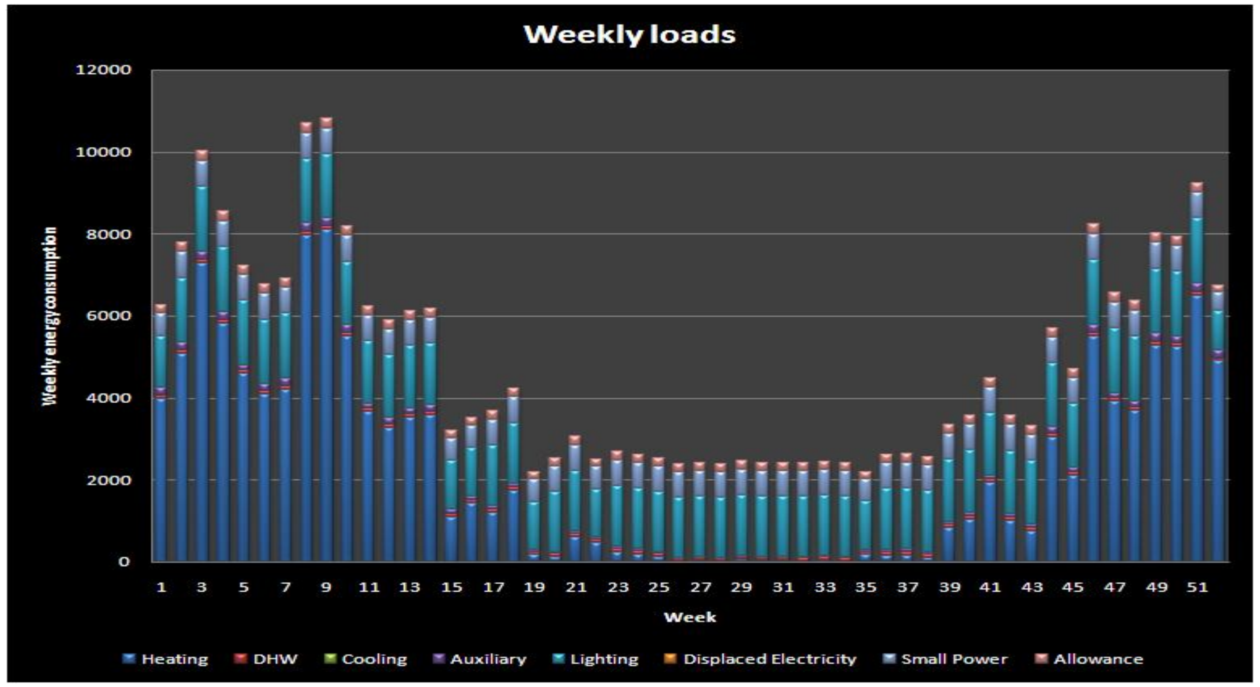
4.6 Mews

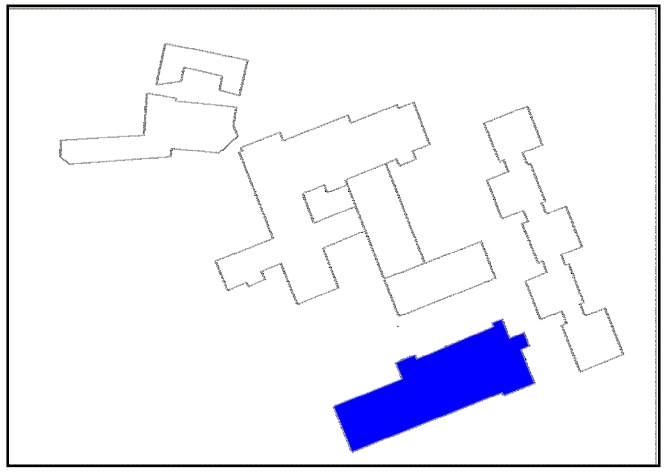




Load	kWh/year
Heat	178,577
Electricity	135,536

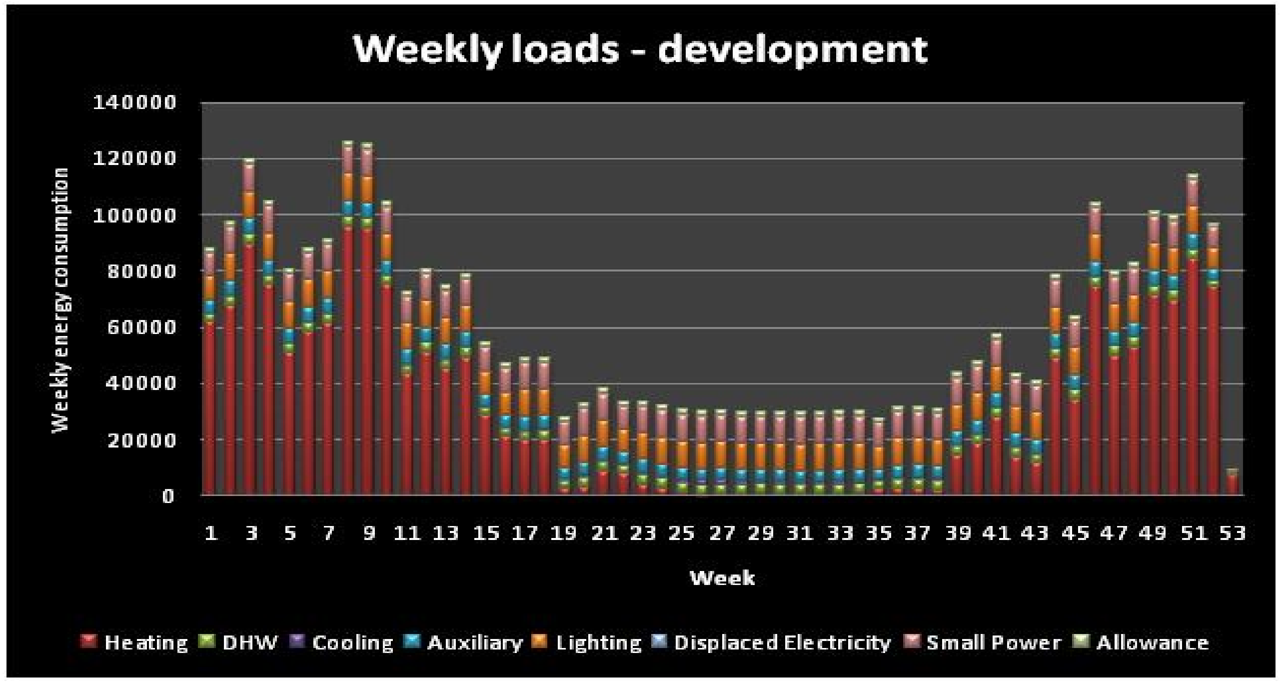
4.7 Library

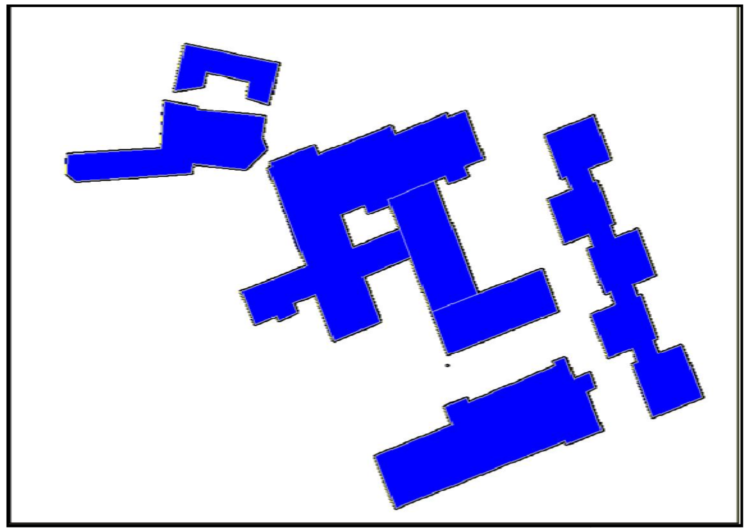




Load	kWh/year
Heat	27,343
Electricity	12,083

4.8 Total Load





Load	kWh/year
Heat	1,871,000
Electricity	1,344,000

4.9 Summary

The energy profile loads detailed in the sections above were used to assess the viability of using combined heat and power systems and use of renewable technologies where applicable.

Building	Heating	Electricity
Existing Town hall	792,844	739,732
East Wing	199,563	56,256
Residential – Block A	449,166	227,013
Residential – Block B	93,077	47,101
Broadway Annexe	178,577	135,536
Mews	27,343	12,083
Library	130,494	125,775

5.0 Combined Heat and Power analysis (new build only)

A combined heat and power analysis was carried out on the new build developments only in line with the London Major Energy hierarchy.

The new build developments comprised of:

(i) Block A

(ii) Block B

5.1 Key drivers

Two key drivers were identified for the new build residential developments:

(A) 20% carbon reduction target in accordance with the Major of London plan

(B) An aspirational target for Code for sustainable homes Level 3, this would require the dwelling emission rate to have a 25% improvements over the target emission rate.

5.2 Block A

The energy profile and study below indicates the following annual energy demand

- Energy thermal 449,166 kWh/year
- Energy electricity 227,013 kWh/year

Assuming that the following building services were applicable:

a) Heating and domestic hot water was provided by high efficient gas fired plant

b) Mechanical fans for ventilation extract were provided in the WC's and kitchens

c) Bedroom and living/common spaces were ventilated naturally.

5.3 CHP technical feasibility analysis

From the energy profile, CHP analysis was carried out. It was deduced that a CHP system would be technical feasible to serve the development.

The following CHP unit was selected for Block A

Electrical Output kW	Heat Output kW	Fuel Input (KW)	Thermal Store Size
122	200	401	65m3

The table below illustrates the carbon reduction potential of the selected CHP unit

DEVELOPMENT	$KgCO_2$	$KgCO_2/m^2$
Base Building including Unregulated Energy	197,123	23.8
Development with CHP	126,556	15.3
Reduction (%)	35.8	30.8

5.3.1 CHP financial analysis

A simple pay back study was carried out to show the financial feasibility if the CHP

CHP Parameters			
	Average Electrical Output	*122*	kWe
	Average heat Output	*200*	kWth
	Overall CHP efficiency	*80.3*	%
	Fuel Input	*401.0*	kW
	Average Electricity price	*0.1*	£/kWhr
	Gas/Oil Price	*0.044*	£/kWhr
	Conventional boiler efficiency	*90*	%
	CHP maintenance costs	*0.010*	£/kWhr
	CHP hours run	*2229*	hrs
	Capital cost (supply + installation) (£)	*99,600*	£
Conventional operating cost			
	Electricity Cost	*12.20*	£/hr
	Boiler fuel Cost	*9.78*	£/hr
	Total conventional operating costs	*21.98*	£/hr
CHP operating costs			
	Fuel	*17.64*	£/hr
	Maintenance Cost (p/kWhr)	*1.22*	£/hr
	Total CHP operating costs	*18.86*	£/hr
	CHP Benefit		
	Operating Cost Savings	3.11	£/hr
	Annual operating cost savings	7954	£/year
	Simple Payback Period	**12.5**	years

Based on the energy model developed for Block A, the following energy loads are predicted.

	Demand (kWhr)	CHP Provision (kWhr)	Grid Provision (kWhr)	Export Provision (kWhr)
Heat	449,166	445,800	3366	-
Power	227,013	271,938	-	44,925

5.4 Block B

The energy profile and study below indicates the following annual energy demand

- Energy thermal 93,077 kWh/year
- Energy electricity 47,101 kWh/year

Assuming that the following building services were applicable:

a) Heating and domestic hot water was provided by high efficient gas fired plant

b) Mechanical fans for ventilation extract were provided in the WC's and kitchens

c) Bedroom and living/common spaces were ventilated naturally.

5.4.1 CHP technical feasibility analysis

From the energy profile, CHP analysis was carried out. It was deduced that a CHP system would be technical feasible to serve the development.

The following CHP unit was selected for Block B

Electrical Output kW	Heat Output kW	Fuel Input (KW)	Thermal Store Size
25	38	83	15m3

The table below illustrates the carbon reduction potential of the selected CHP unit

DEVELOPMENT	**$KgCO_2$**	**$KgCO_2/m^2$**
Base Building including Unregulated Energy	40,874	23.7
Development with CHP	26,785	15.6
Reduction (%)	34.5	34.5

5.4.2 CHP financial analysis

A simple pay back study was carried out to show the financial feasibility if the CHP

CHP Parameters			
	Average Electrical Output	25	kWe
	Average heat Output	38	kWth
	Overall CHP efficiency	75.9	%
	Fuel Input	83.0	kW
	Average Electricity price	0.1	£/kWhr
	Gas/Oil Price	0.044	£/kWhr
	Conventional boiler efficiency	86	%
	CHP maintenance costs	0.010	£/kWhr
	CHP hours run	2345	hrs
	Capital cost (supply + installation) (£)	37,000	£
Conventional operating cost			
	Electricity Cost	2.50	£/hr
	Boiler fuel Cost	1.94	£/hr
	Total conventional operating costs	4.44	£/hr
CHP operating costs			
	Fuel	3.65	£/hr
	Maintenance Cost (p/kWhr)	0.25	£/hr
	Total CHP operating costs	3.90	£/hr
	CHP Benefit		
	Operating Cost Savings	0.54	£/hr
	Annual operating cost savings	1483.8	£/year
	Simple Payback Period	**29**	years

Based on the energy model developed for Block B, the following energy loads are predicted.

	Demand (kWhr)	CHP Provision (kWhr)	Grid Provision (kWhr)	Export Provision (kWhr)
Heat	93,077	89,452	3366	-
Power	47.101	58,625	-	11,524

5.3.3 Common CHP System to Block A and B

Another option would be to have one CHP to serve Blocks A and B. This would see the same size CHP serving block A with a thermal store of circa 70 m$^{3.}$.

- The plant size foot print for the CHP and thermal store only would be 10m x 7m (height 3m)

5.5 Summary

To summarize, the CHP analyses for build developments Block A and Block B seemed to be viable.

- For Block A 122 kWe CHP unit with 65 m3 thermal store would be viable. This would give a simple payback of around 12.5 years.
- The plant size foot print for the CHP and thermal store only would be 10m x 7m (height 3m)
- For Block B 25 kWe CHP unit with 15 m3 thermal store would be viable. This would give a simple payback of around 29 years.
- The plant size foot print for the CHP and thermal store only would be 7m x 7m (height 3m)

The capital cost allows for the supply and installation of the main CHP equipment and thermal store only. It does not include management, services, infrastructure, and commissioning or maintenance costs.

Note that due to design development, the current scheme consists of 66 units in Block A and 26 units in Block B. It is deemed that with the revision in the number of residential units, this shall not materially change the energy strategy proposed.

6.0 Renewable Technologies Target Study

From the renewable analysis in 5.3 and 5.4, this suggests that a combined heat and power system is feasible.

To increase the viability of the CHP, it would require meeting as much heating and hot water energy load as possible. Therefore all renewable technologies that provide heating would not be considered.

The technologies that would be regarded as CHP compliant renewable technologies were:

(i) Photovoltaics and

(ii) Wind

Since wind does not seem to be technically feasible, Photovoltaics have been considered further.

6.1 Renewable Technology Analyses

Further to undertaking the technical and financial analysis of a combined heat and power system, an appraisal was made to suggest suitable renewable technologies to meet the 20% carbon reduction by on-site renewables (i.e. the 3rd step of the London hierarchy).

The following technologies were considered:

6.1.1 Ground source heat pump and ground source cooling

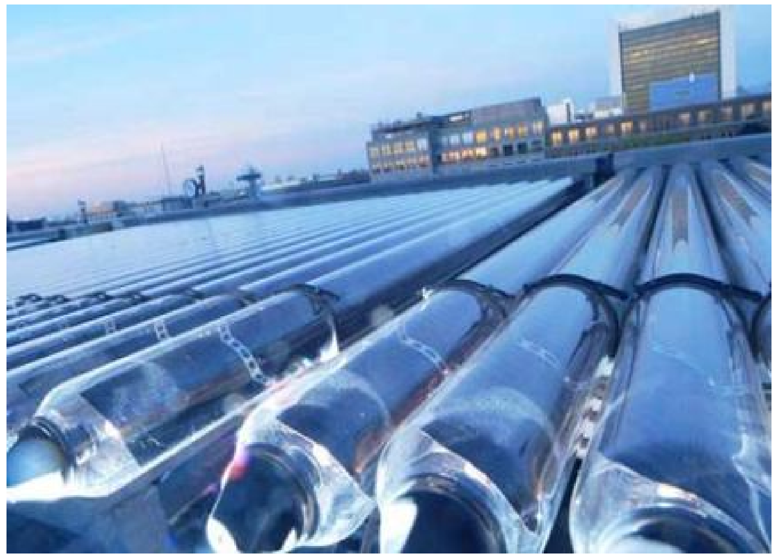
The earth strata suggest that ground source heat pumps can be used on the site. However, should a CHP be used, ground source heat pumps shall not be considered further as the CHP shall require maximum heating load to improve viability.

Is the heating system for the proposed building / development served by a low temperature heating circuit?	yes	Ground source heat pumps are ideally suited to low temperature applications such as underfloor heating.
Is there sufficient accessible ground space around the building / development to install a horizontal closed loop system?	yes	Although disruptive initially, horizontal loops tend to be cheaper overall than vertical installations.
Is the ground free from obstructions such as sewers, tunnels, etc.	yes	If detailed plans are not available then more careful investigations are required prior to commencing any drilling.
Either a vertical or a horizontal system is appropriate		

6.1.2 Solar thermal

Solar thermal panels are viable. However, should a CHP be used, solar thermal panels shall not be considered further as the CHP shall require maximum heating load to improve viability.

Will the building have either a flat roof or a roof facing within 45° of South?	yes	Solar panels which face within 45° of south are exposed to solar radiation for a high proportion of sunlight hours. Easterly facing collectors capture more energy at the start of the day, whereas westerly facing collectors capture more energy in the late afternoon/early evening. Unobstructed horizontal panels (e.g. those fitted to a flat roof) are exposed to much more solar radiation than vertical surfaces during summer months, but the reverse is true during the winter when the sun is lower in the sky.
Will the building have a year-round demand for hot water (e.g. for swimming pool heating, canteen, washroom, showers, or 'process use')?	yes	A year round demand for heat will improve the viability of a solar thermal installation. Demands other than space heating (which is not usually required during the summer summer) help to match the demand for heat to the availability of solar energy.
Is there space for hot water storage ajacent to the collectors?	yes	Hot water storage tanks can help to 'even out' the availability of daily variations in hot water demand. Ideally hot water storage should be available within the building close to the source of heat. If this is not the case then solar water heating may still be viable, but additional costs will be incurred installing distribution pipework to transfer heat from the collectors to the storage tanks/cylinders.
Solar hot water appears to be viable - check with planners and undertake a more detailed assessment of feasibility.		



6.1.3 Photovoltaics

The PV cells technology seems to be technically viable and shall be considered further under the financial analysis stage. Since they target the electrical demand of the site, they shall be considered further.

Will the building have either a flat roof or a roof facing within 45° of South?	yes	Solar panels which face within 45° of south are exposed to solar radiation for a high proportion of sunlight hours. Easterly facing collectors capture more energy at the start of the day, whereas westerly facing collectors capture more energy in the late afternoon/early evening. Unobstructed horizontal panels (e.g. those fitted to a flat roof) are exposed to much more solar radiation than vertical surfaces during summer months, but the reverse is true during the winter when the sun is lower in the sky.
Are high quality cladding materials proposed for the building, which could be replaced with photovoltaic materials?	no	Photovaltaic materials can be aesthetically pleasing, and may be an option for cladding external walls. Where pv panels can be used instead of high quality cladding materials, the technology can be highly cost-effective. In such circumstances the capital cost of cladding materials that are not used can offset some or all of the cost of the pv installation, and payback periods can be greatly reduced.
Will the building be free from overshadowing for most of the day from other buildings, structures and other objects (e.g. trees)?	yes	Shading can have a profound effect on the output of photovoltaic installations. Often the reduction in output is greater than the extent of shading (e.g. if 50% of a panel is in shade, the output of the panel can be very much less than 50% of its unshaded output).
Either roof mounted (cells or solar tiles) or stand-alone (freestanding) pv systems appear to be viable		

6.1.4 Wind power

Wind energy depends on an understanding of the frequency of different wind speeds.

A preliminary assessment has been carried out using the data from BWEA website for the post code N8 9JJ and it results that the wind speed is not suitable for using a wind energy system.

Since the average wind speed at 10 m is 4.9 m/s this suggests that wind technology would not be feasible to the site.

Wind speed	[m/s]
@ 10 m agl	4.9

Is the average wind speed on site greater than 5m/s ?	no	Wind speed data are available (free of charge) from several sources. The UK Wind Speed Database can provide this information on-line based on Ordnance Survey co-ordinates - http://www.bwea.com/noabl/ Alternatively, weather data can be accessed from the NASA database via RETScreen if longitude and latitude are known for the location - http://www.retscreen.net/ang/d_data_w.php
Is the area free from obstructions which could interfere with the wind flow cause turbulence?	no	Examples of obstructions which affect air flow include any trees, features of buildings and other structures.
Is the site in or near either of the following? - conservation area - area of historic interest - metropolitan open land - green belt	yes	Wind turbines may not be granted planning permission on sites which are adjacent to conservation areas, etc.
Wind technology does not appear to be viable for the proposed building / development. Wind speeds are insufficient to produce useful quantities of energy, local obstructions may cause turbulence (further reducing their output), and there are planning considerations to be overcome.		

6.1.5 Biomass

Biomass boilers are viable. However, should a CHP be used, they shall not be considered further as the CHP shall require maximum heating load to improve viability.

Is there potential for local supply and delivery of biomass fuel?	yes	A reliable and reasonably local supply of fuel from forestry, farming or industrial sources is required with suitable transport routes. Often it can be appropriate where users produce their own fuel or are able to obtain it at zero costs. In other areas the production and use of biomass crops can boost rural economies.
Is the proposed boiler house location such that it can be served by biomass, with adequate facilities for storage?	yes	Biomass is particularly cost-effective if the existing infrastructure removes the cost for providing new build boiler houses and fuel stores.
Biomass appears to be a viable technology, provided that it is designed in a modular fashion so that maintenance can be undertaken during partial shutdown.		

6.2 20% Renewable target

To meet the 20% renewables energy target, the following two calculations for Block A and B were carried out.

6.3 Block A

6.3.1 Carbon reduction target

	CO2 Emissions kgCO2/m2	CO2 Emissions kgCO2
BER Baseline Building Emission Rate	23.8	197,123
BER with CHP	15.3	126,556
20% Carbon target	3.0	25,312

Carbon target 25,312 KgCO2/year

Based on the PV specification in the table below; 425 m2 of PV's would meet the 20% renewable targets.

PV specification

Inverter Efficiency (%)	80%
Other Efficiency (%)	90%
PV Efficiency (hybrid type)	0.17

6.3.2 Financial analysis of PV

PVs Parameters	Average Electrical Output per annum	*60000*	kWhre
	Average Electricity price	*0.1*	£/kWhr
	CHP maintenance costs	*0.010*	£/kWhr
	Capital cost (supply + installation) (£)	*354,000*	£
Conventional operating cost	Electricity Cost P.A	*6000.00*	£/annum
	Total conventional operating costs	*6000.00*	£/annum
PV Operating costs	Maintenance Cost (p/kWhr)	*600.00*	£/annum
	Total PV operating costs	*600.00*	£/annum
	Operating Cost Savings	5400.00	£/Annum
	Simple Pay back Period	**65.6**	years

6.3.3 Considerations

Even though PV's are technically feasible, financially they do not provide viable payback period and therefore should not be considered.

6.4 Block B

6.4.1 Renewable targets

	CO2 Emissions kgCO2/m2	CO2 Emissions kgCO2
BER Baseline Building Emission Rate	23.7	40,874
BER with CHP	15.6	26,785
20% Carbon target	3.1	5,357

Carbon target 5,357 KgCO2/year

Based on the PV specification in the table below; 90 m2 of PV's would meet the 20% renewable targets.

PV specification:

Inverter Efficiency (%)	80%
Other Efficiency (%)	90%
PV Efficiency (hybrid type)	0.17

6.4.2 Financial analysis of PV

PVs Parameters	Average Electrical Output per annum	*12700*	kWhre
	Average Electricity price	*0.1*	£/kWhr
	CHP maintenance costs	*0.010*	£/kWhr
	Capital cost (supply + installation) (£)	*75,000*	£
Conventional operating cost	Electricity Cost P.A	*1270.00*	£/annum
	Total conventional operating costs	*1270.00*	£/annum
PV Operating costs	Maintenance Cost (p/kWhr)	*127.00*	£/annum
	Total PV operating costs	*127.00*	£/annum
	CHP Benefit		
	Operating Cost Savings	1143.00	£/Annum
	Simple Pay back Period	**65.6**	years

6.4.3 Considerations

Even though PV's are technically feasible, financially they do not provide viable payback period and therefore should not be considered.

6.5 Block A and Block B

6.5.1 Renewable targets

	CO2 Emissions kgCO2/m2	CO2 Emissions kgCO2
BER Baseline Building Emission Rate	23.7	237,997
BER with CHP	15.2	153,341
20% Carbon target	3.0	30,668

Carbon target 30,668 KgCO2/year

Based on the PV specification in the table below; 515 m2 of PV's would meet the 20% renewable targets.

PV specification:

Inverter Efficiency (%)	80%
Other Efficiency (%)	90%
PV Efficiency (hybrid type)	0.17

6.5.2 Financial analysis of PV

PVs Parameters	Average Electrical Output per annum	*72700*	kWhre
	Average Electricity price	*0.1*	£/kWhr
	CHP maintenance costs	*0.010*	£/kWhr
	Capital cost (supply + installation) (£)	*429,000*	£
Conventional operating cost	Electricity Cost P.A	*7270.00*	£/annum
	Total conventional operating costs	*7270.00*	£/annum
PV Operating costs	Maintenance Cost (p/kWhr)	*727.00*	£/annum
	Total PV operating costs	*727.00*	£/annum
	CHP Benefit		
	Operating Cost Savings	6543.00	£/Annum
	Simple Pay back Period	**65.6**	years

6.5.3 Considerations

Even though PV's are technically feasible, financially they do not provide viable payback period and therefore should not be considered.

6.6 Summary

For block A, a CHP was viable; from the energy profiles, it was deduced that a natural gas fired CHP, 122kWe with buffer vessel of 65 m3 could be incorporated.

The aim to meet the 20% carbon reduction target by implementing 425 m2 of PV's was found to be technically viable but not financially.

For block B, a CHP was viable; from the energy profiles, it was deduced that a natural gas fired CHP, 25 kWe with buffer vessel of 15 m3 could be incorporated.

The aim to meet the 20% carbon reduction target by 90 m2 of PV's was found to be technically viable but not financially.

Another option would be to have one CHP to serve Blocks A and B. This would see the same size CHP serving block A with a thermal store of circa 70 m^3.This option would potentially be favoured by a single developer for blocks A and B

The aim to meet the 20% carbon reduction target by 515 m2 of PV's was found to be technically viable but not financially.

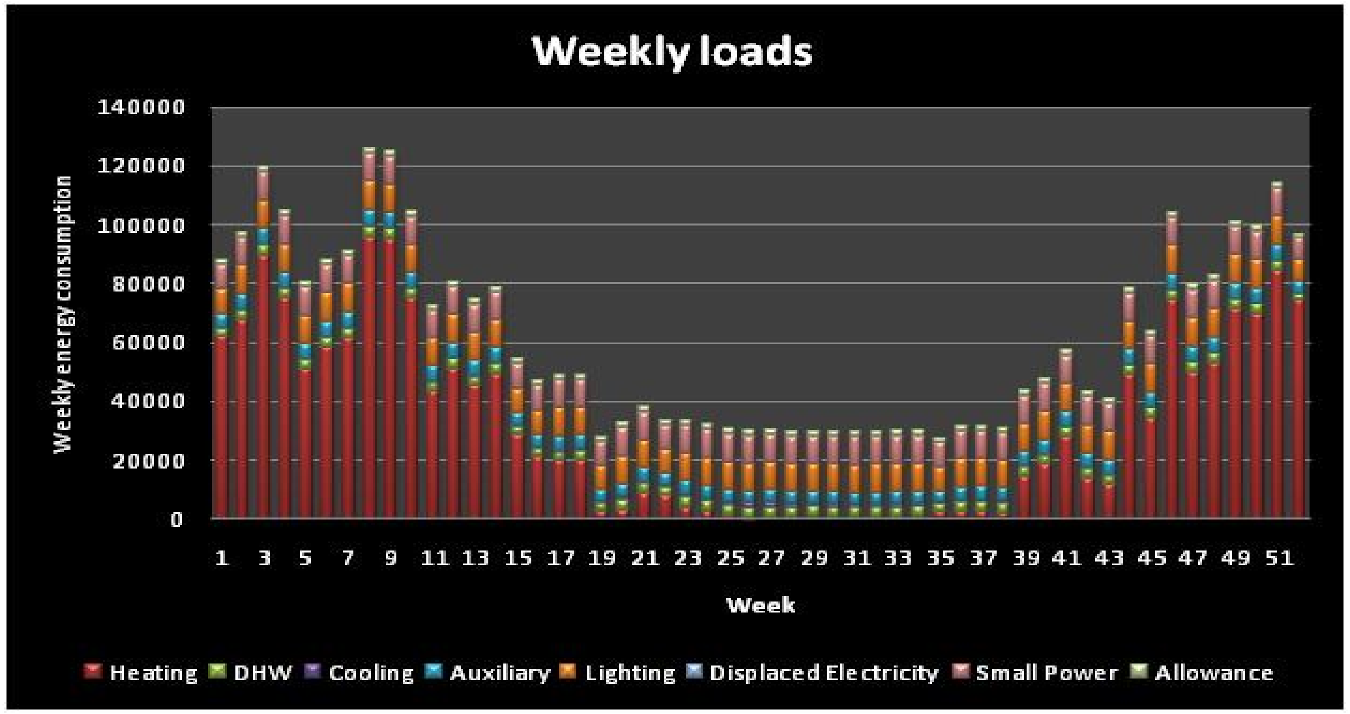
7.0 Site wide Combined Heat and Power analysis

7.1 CHP Hornsey Town Hall Site wide Loads

It was requested that a site wide CHP analysis was carried out. This would establish whether it was technically and financially suitable to provide a combined heat and power system to the whole site. This analysis included the following building components.

(i) Town Hall building
(ii) East wing residential
(iii) Block A residential
(iv) Block B residential
(v) Broadway annex
(vi) Mews
(vii) Library

First a technical analysis was carried out using the energy profile loads to assess whether the CHP was feasible.



Load	kWh/year
Heat	1,871,000
Electricity	1,344,000

7.2 Combined heat and power unit capacity

The following CHP unit was selected for the whole site

Electrical Output kW	Heat Output kW	Fuel Input (KW)	Thermal Store Size
150	236	480	75

DEVELOPMENT	$KgCO_2$	$KgCO_2/m^2$
Base Building including Unregulated Energy	992,183	48
Development with CHP	803,351	38.5
Reduction (%)	20	20

7.3 Financial Feasibility - Simple Payback Study

CHP Parameters			
	Average Electrical Output	150	kWe
	Average heat Output	236	kWth
	Overall CHP efficiency	80.4	%
	Fuel Input	480.1	kW
	Average Electricity price	0.1	£/kWhr
	Gas/Oil Price	0.044	£/kWhr
	Conventional boiler efficiency	86	%
	CHP maintenance costs	0.010	£/kWhr
	CHP hours run	2738	hrs
	Capital cost (supply + installation) (£)	114,500	£
Conventional operating cost			
	Electricity Cost	15.00	£/hr
	Boiler fuel Cost	12.07	£/hr
	Total conventional operating costs	27.07	£/hr
CHP operating costs			
	Fuel	21.12	£/hr
	Maintenance Cost (p/kWhr)	1.50	£/hr
	Total CHP operating costs	22.62	£/hr
	CHP Benefit		
	Operating Cost Savings	4.45	£/hr
	Annual operating cost savings	12182.0	£/year
	Simple Payback Period	**9.4**	years

	Demand (kWhr)	CHP Provision (kWhr)	Grid Provision (kWhr)	Export Provision (kWhr)
Heat	1,871,000	646168	1,224,832	-
Power	1,344,000	410,700	933,230	-

Note that the capital cost allows for the supply and installation of the main CHP equipment and thermal store only. It does not include management, services, infrastructure, and commissioning or maintenance costs.

Further cost exercises were carried out by Capita Symonds Cost Management team and the following information was produced.

Option	Size		Supply & install	Management	Services	Infra-structure	Commissioning	Maintenance costs/ yr	Total
	kWe	kWh	£	£	£	£	£	£	
Block A and B	**140**	**207**	117,500	25,850	25,000	337,000	2,700	28,000	**508,050**
Town hall only	**82**	**132**	91,000	20,020	25,000	319,500	3,600	28,000	**459,120**
Site wide	**150**	**236**	124,000	27,280	25,000	355,000	4,500	28,000	**535,780**
Library & town hall	**140**	**207**	117,500	25,850	25,000	337,000	2,700	28,000	**508,050**

The Infrastructure costs included pressurisation systems, insulated pipework within excavations, plate heat exchangers, control systems etc would need to be provided. The costs excluded fuel costs and the gas fired boilers and associated plant that would be required in addition to the CHP. The above costs would further depend on the manner of procurement and final detailed design sizes etc.

7.4 Absorption chillers

The cooling requirement for the whole site is minimal compared to the heating one, therefore absorption chillers has not been considered any further.

7.5 Summary

From the energy profile above a site wide CHP was found to be technically viable. However due to project constraints, the site side CHP solution is not financially viable under the present project parameters. In order to safeguard the project viability it is recommended that a site wide CHP is not proposed at this stage therefore is not included in the planning application.

It is recommended that the Council commission an Energy Service Company (ESCO) to undertake a detailed viability appraisal. This piece of work cannot be meaningfully progressed until the business plan for the Town Hall is adopted and the key stakeholders are consulted e.g. the Council, the Hornsey Town Hall Creative Trust, the Library and a potential Developer Partner.

The site wide CHP system would also require the developers to accept into utilising heat from the central energy centre in the form of low temperature hot water for the space heating and domestic hot water purposes.

This would impact onto the developers building services strategy and consequently service charge agreements to potential clients.

8.0 Conclusion

From the above studies, the following conclusion can be drawn:

8.1 Part L requirements

The following table provides the interpretation of the Building regulation Part L requirements to the various components of the building.

Building component	Status	Building regulation	Further comments
Existing Town hall	Refurbishment	Part L2B	Exempt from energy efficiency measures
East Wing – Residential	Refurbishment	Part L1A/L2B	Exempt from energy efficiency measures
Link Building - Residential	Refurbishment	Part L1A/L2B	Exempt from energy efficiency measures
Residential – Block B	New Build	Part L1A	Part L2A to common part
Residential – Block A	New Build	Part L1A	Part L2A to common part
Broadway Annex West – Retail/Residential	Refurbishment	Part L2B	Exempt from energy efficiency measures
Broadway Annex – East Retail/Residential	Refurbishment	Part L1A/L2B	Exempt from energy efficiency measures

8.2 Part L2A compliance target Emission rate calculations

To the new build common parts of residential Block A and B, the building complied with Part L2A of the building regulations. This was undertaken using TAS NG dynamic simulation modelling.

8.3 Planning policy

The planning policy for Haringey council regarding renewable energy is to follow the Major of London _ Energy hierarchy to new build developments. To this end, a combined heat and power analysis was carried out on the Blocks A and B.

8.4 CHP Analysis

The CHP analysis suggests that in both Blocks, a CHP system is viable. At this stage it is anticipated that a developer shall favour a single unit to serve both new build blocks A & B.

8.5 Renewable technologies

Renewable technologies for Block A and B were selected to be CHP compliant. Therefore ground source heat pumps, solar thermal technologies and biomass were not considered further. Wind technology was also deemed unfeasible due to insufficient average wind speeds for the location.

8.6 20% Carbon reduction targets

Photovoltaics were technically feasible but not financially and therefore not considered further.

8.7 Site wide CHP analysis

From the energy profile above a site wide CHP was found to be technically viable. However due to project constraints, the site side CHP solution is not financially viable under the present project parameters. In order to safeguard the project viability it is recommended that a site wide CHP is not proposed at this stage therefore is not included in the planning application.

It is recommended that the Council commission an Energy Service Company (ESCO) to undertake a detailed viability appraisal. This piece of work cannot be meaningfully progressed until the business plan for the Town Hall is adopted and the key stakeholders are consulted e.g. the Council, the Hornsey Town Hall Creative Trust, the Library and a potential Developer Partner.

The site wide CHP system would also require the developers to accept into utilising heat from the central energy centre in the form of low temperature hot water for the space heating and domestic hot water purposes.

This would impact onto the developers building services strategy and consequently service charge agreements to potential clients.

8.8 Residential developments

For the residential developments, a Code For Sustainable Homes Level 3 has been set for the social housing units. A CHP system shall assist in achieving the necessary energy credits to meet this requirement.

8.9 Summary of Energy Strategy

At this stage it is proposed that a gas fired CHP system is viable to serve the new building Blocks A & B.

8.10 Design Development

Design development has taken place since the energy modelling exercise has been carried out. The revision in the design is deemed not to have a material change on the energy strategy being proposed.

Appendix A – Architectural drawings

1298-BA-G200-E-S-310

1298-BA-G200-P-00-300

1298-BA-G200-P-01-301

1298-BA-G200-P-02-302

1298-BA-G200-P-03-303

1298-BA-G200-P-RF-304

1298-BA-G200-XE-S-310

1298-BA-G200-XP-00-300

1298-BA-G200-XP-01-301

1298-BA-G200-XP-02-302

1298-BA-G200-XP-02-303

1298-TH-G200-E-E1-162

1298-TH-G200-E-E-164

1298-TH-G200-E-N-161

1298-TH-G200-E-S-163

1298-TH-G200-E-W1-160

1298-TH-G200-P-00-102

1298-TH-G200-P-00-103

1298-TH-G200-P-01-104

1298-TH-G200-P-01-105

1298-TH-G200-P-02-106

1298-TH-G200-P-02-107

1298-TH-G200-P-LG-100

1298-TH-G200-P-LG-101

1298-TH-G200-XP-00-102

1298-TH-G200-XP-00-103

1298-TH-G200-XP-01-104

1298-TH-G200-XP-01-105

1298-TH-G200-XP-02-106

1298-TH-G200-XP-02-107

1298-TH-G200-XP-RF-108

1298-TH-G200-XP-RF-109

1298-TH-G200-XP-RF-110

1298-TH-G200-XS-AA-180

1298-TH-G200-XS-BB-181

1298-TH-G200-XS-CC-182

1298-TH-G200-XS-DD-183

1298-TH-G200-XS-EE-184

1298-TH-G200-XS-FF-185

1298-TH-G200-XS-GG-186

1298-FD-Op 2-P-01

1298-FD-Op 2-P-02

1298-FD-Op 2-P-03

1298-FD-Op 2-P-04

1298-FD-Op 2-P-05

Appendix B – Internal Conditions – Key assumptions and evaluations

The NCM internal conditions approved database has been used to carry out the energy calculations.

For the electricity demand, an allowance (calculated considering a percentage of the overall electrical demand) has been allocated for each building as follow:

Town Hall building	10%
East wing residential	5%
Block A	5%
Block B	5%
Broadway annex	10%
Mews	5%
Library	10%

For calculating the BER with CHP in paragraph 6.1.1 and 6.2.1 the following assumptions have been made:

- Proportion of annual heat demand supplied by CHP 60%
- Overall efficiency of the CHP plant 80%
- Heat to power ratio of the CHP plant 1.3
- Quality index 105

Note that further detailed calculations would be needed to be undertaken by the contractor to confirm final plant sizes and operating strategy of the combined heat and power systems.

Note: Boiler efficiency for energy consumption calculations at 86%

Appendix C – Material specification

i) Town Hall building – Library – East wing residential – Broadway Annexe

External wall

Layer	M-Code	Width (mm)
Inside	am1plast\1	25.0
2	am1brick\1	105.0
3	am1cav\7	100.0
4	am1brick\1	105.0

Ground floor

Layer	M-Code	Width (mm)
Inside	Flooring screed, 50 mm	50.0
2	PUR, 75 mm, 3in	5.0
3	Cast concrete, 100 mm	150.0
4	Brick slips, 25 mm	25.0
5	Clay underfloor, 750 mm	750.0

Roof

Layer	M-Code	Width (mm)
Inside	am1tile\1	25.0
2	am1cav\25	200.0
3	am1ins\1	30.0
4	am1concd\1	250.0

General glazing pane

Layer	M-Code	Width (mm)
Inside	CLEAR_3.DAT	3.05

ii) Block A / Block B - Mews

External wall

Layer	M-Code	Width (mm)
Inside	Plasterboard (wallboard)	13.0
2	Air layer, 25 mm, wall	25.0
3	Concrete, 1800 kg/m3	100.0
4	Mineral wool batt, 100mm	84.5
5	Brick, outer leaf, 105mm	102.0

Ground floor

Layer	M-Code	Width (mm)
Inside	Flooring screed, 50 mm	50.0
2	PUR, 75 mm, 3in	79.0
3	Cast concrete, 100 mm	150.0
4	Brick slips, 25 mm	25.0
5	Clay underfloor, 750 mm	750.0

Roof

Layer	M-Code	Width (mm)
Inside	Plasterboard (ceiling)	9.5
2	Min wool quilt, 150 mm	146.0
3	Cold loft space 300mm	300.0
4	Tiles Concrete, 10 mm	10.0

Double Glazing

Layer	M-Code	Width (mm)
Inside	4 mm clear glass	4.0
2	Argon, 16 mm	16.0
3	4 mm glass (low-e) N, NE, NW & S	4.0

	Existing building U value [W/m2C]	New building U value [W/m2C]
External wall	1.0	0.35
Ground floor	0.9	0.25
Roof	0.56	0.25
Window	5.8	2.19