

The Old Vinyl Factory – Material Store

Planning Energy Statement

Stage C / Planning

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1.0 EXECUTIVE SUMMARY

This report describes how the proposed Material Store development at The Old Vinyl Factory Site responds to the Outline Planning Strategy for the site, and how compliance with the planning conditions (LPA ref. 59872 / APP / 2013 / 3775) is to be achieved.

The overall energy strategy for the building is based on the Outline Energy Strategy for the site, approved under the above referenced planning consent.

This energy strategy was developed by engineers MTT and is described in MTT report 'The Old Vinyl Factory Site – Outline Sustainable Energy Assessment' (Revision 3, November 2012 - see also Appendix A):



Figure 1: MTT Report Describing a Proposed Energy Strategy for the Old Vinyl Factory Site (see also Appendix A)

1.1 MTT Energy Strategy for Outline Planning Application

Below is a summary of the principal elements described in this report:

1. The energy strategy will be developed in accordance with requirements of the London Plan and specifically the GLA Energy Team's Guidance Note 'Guidance on Preparing Energy Statements, September 2011. The London Borough of Hillingdon's planning policies relating to sustainable energy are aligned with the London Plan. After establishing the baseline energy demand and profile for the site, the strategy for the project will follow the Mayor's Energy Hierarchy in appraising appropriate measures to reduce carbon emissions and other climate impacts from the development:

Use Less Energy - 'Be Lean'

Supply Energy Efficiently - 'Be Clean'

Use Renewable Energy - 'Be Green'

The planning application is outline therefore the calculated energy consumption, carbon emissions and savings resulting from the use of low or zero carbon technologies are based on benchmark values and estimates of system efficiency and the performance of technologies

2. Buildings on the Old Vinyl Factory site, including the Material Store Building, will be connected to a site wide district heating network providing heat for space heating and hot water. The energy source within the energy centre will be comprised of energy-efficient gas-fired condensing boilers and CHP (combined heat and power) units.
3. The base line carbon emissions for dwellings in blocks of flats that are compliant with Part L1A 2010 are approx. 16 kg CO₂/m². This value is the target emission rate calculated by SAP 2009.
4. Better U-values exceeding the requirements of Part L 2010. Details of U-values described in the MTT report are given in section 4.2, with a copy of the report included in Appendix A.
5. A photovoltaic collector installation would be compatible with the CHP and communal heating system. An initial assessment based on the indicative scheme shows that a contribution from the collectors of around 6.3% of the regulated emissions of the dwellings might be achievable.
6. Compliance with Code for Sustainable Homes (Level 4) for the residential units, see section 4.0.
7. A design air permeability rate of 5m³/h/m².
8. Best practice system efficiencies for heating and ventilation systems.
9. Balanced mechanical ventilation with heat recovery.
10. Highly efficient light fittings.
11. Enhanced control of services and lighting.
12. The mechanical ventilation units, where provided, will incorporate the following design features:
 - Heat recovery of at least 92% for the residential units;
 - Specific Fan Powers of no greater than 0.49 W/l/s;
 - Summer bypass to assist with summertime cooling;
 - Variable speed controls with summertime cooling function.
13. Energy efficient measures to be employed in the design of the Material Store commercial unit include:
 - Ventilation systems will incorporate heat recovery devices with an efficiency of 75% or greater;

Cooling, where provided, will use high efficiency chillers or packaged refrigeration systems;

The very latest in lighting technology will be used with the best practice luminaires, lamps, and controls;

Daylight linked controls will be provided where appropriate.

1.2 Final Energy Strategy

The on-going design of the Material Store, its energy sources, building fabric, and building services has therefore been based on these criteria.

However during the on-going design of the Material Store, the following criteria could not be achieved, with reasons given:

1. It has not been possible to incorporate photovoltaic panels (PVs) to the development (see note 5. above). This is because there is a conflict between the amount of amenity space required in the development (as a reserved matters planning condition) and the requirement for PVs. For the PVs to effectively contribute to the building's baseline energy demand, these would have to be located on the roofs of each block. These roofs (and other amenity space) are required to meet the planning requirement for amenity space.

This issue is described in more detail in the architect's planning submission documents.

2. In the course of the ongoing design of the building, SAP calculations were produced to test the ongoing design against the fabric and energy details described in the original report and forming the basis of the Outline Planning Application.

These values for building fabric, services etc. were developed by Max Fordham LLP based on the values described by MTT. These values have been amended as part of the on-going design process, however the final values that have been developed still deliver a building that complies with planning energy targets.

The amendments made to the original fabric and service energy criteria consist of:

Improved building fabric performance;

A higher standard of air permeability;

A higher standard of building construction with regard to thermal bridging;

Therefore the final energy strategy for the Material Store is based on that developed by MTT for the Outline Planning Application and granted permission in December 2013, with the variations described above, and in further detail in sections 3.2, 3.3, 3.5 and 3.6.

2.0 INTRODUCTION

2.1 Overview

This report details the energy strategies considered and included in the on-going design of the Material Store building, which forms part of the Old Vinyl Factory site, which was granted Outline Planning consent by the London Borough of Hillingdon in April 2013, amended 19th December 2013.



Figure 2: Architect's image of the proposed Material Store development

The report describes the energy strategy proposed to meet the requirements of condition 18 of the Outline Planning Application. The strategies described in this report are based on strategies approved under this Outline Planning Consent (LPA ref. 59872 / APP / 2013 / 3775), in the energy strategy prepared for this Planning Application by MTT in report 'The Old Vinyl Factory Site – Outline Sustainable Energy Assessment' (Revision 3, November 2012).

The Outline Planning Consent assumes compliance with the Building Regulations Part L 2010, the London Plan at the time of the original Outline Planning Application and the Code for Sustainable Homes Level 4.

2.2 Description of Project - General

The Material Store is a new-build residential building (with some commercial space at ground floor) and is part of the overall masterplan for the Old Vinyl

Factory site developed by developers Cathedral and architects Studio Egret West. The site is located in Hayes in the London Borough of Hillingdon.

The 17-acre scheme, one of the largest regeneration projects in west London, will create a new community hub with more than 630 homes and 750,000 sq. ft. of commercial and leisure space - including a 7-screen multiplex cinema, museum, restaurant complex, shops and bars.



Figure 3: Architect's model of the Old Vinyl Factory Site

The Material Store building consists of 183 residential units arranged over 10 floors, including car parking facilities at ground floor and a commercial unit running along the building North elevation, facing the 'groove' – the pedestrian concourse running between the Material Store and Boiler House buildings.

The residential accommodation in the Material Store will consist of a mixture of 3 bedroom townhouse duplexes, arranged over ground and first floors, a ground floor covered car park, and a mixture of 1 bedroom, 2 bedroom and 3 bedroom apartments arranged in 4 blocks rising from 2nd to 10th floors.

Figure 4 describes the architect's accommodation schedule for the building.

	Parking spaces	Studios	1B(2P)	2B(3P)	2B(4P)	3B(5P)	UNITS
Street	20						
Level G	174					19	19
Level 1		8					8
Level 2		7	9	8			24
Level 3		7	9	8			24
Level 4		7	9	8			24
Level 5		7	9	8			24
Level 6		7	9	8			24
Level 7		7	7	6			20
Level 8		4	3	1			8
Level 9		4	3	1			8
Total		58	58	48	19		
	194	58	106	19			183

Figure 4: Architect's Accommodation Schedule

The car park provision includes car park stackers to allow 3 cars to be parked in a single space in the central car park section. This strategy requires a basement pit to accommodate cars.

The development also includes commercial space located on North elevation and arranged over ground and first floor. The space will be designed for up to 5 tenants.

This commercial space shall be provided on a shell and core basis.

This unit will not be provided with commercial scale kitchen extract ductwork, or means of exhausting kitchen extract air, and will not be suitable for occupation by a tenant requiring a commercial kitchen (Class A3 – A5 uses, e.g. a restaurant).

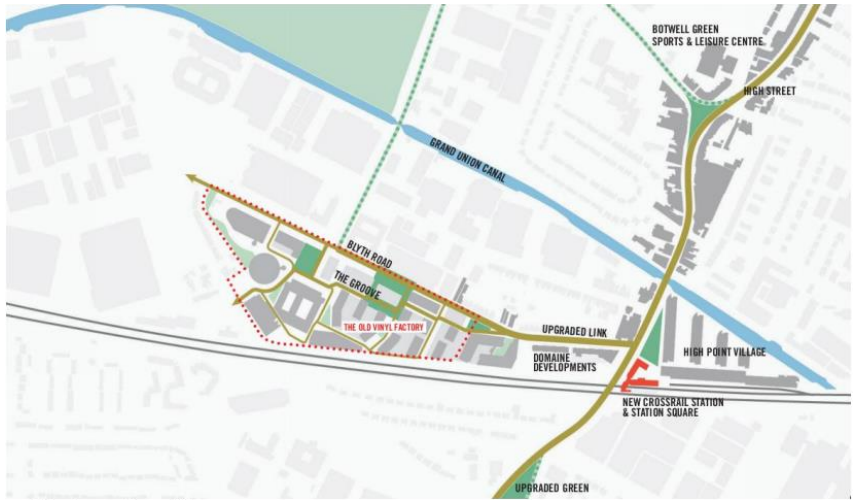
Further detail and description of the building and its context is given in the architect's planning submission material.

2.3 Site Location

The Material Store site is located within the London Borough of Hillingdon, just North of Heathrow Airport and Junction 4 of the M4. The South boundary of the site is alongside the main west-bound rail line running from London Paddington mainline station.

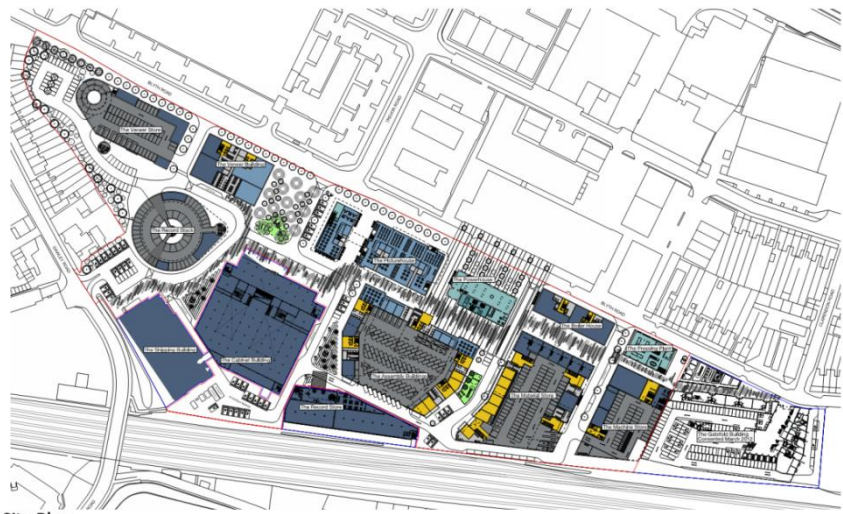
In the illustrations below, figure 5 shows the site location plan, figure 5 shows the range of buildings that are included in the site masterplan, and figure 6

shows the intended dates for phasing and delivery of the various buildings on the site.



Site Location Plan

Figure 5: Old Vinyl Factory Site Location Plan



Site Plan

Figure 6: Old Vinyl Factory Site Plan

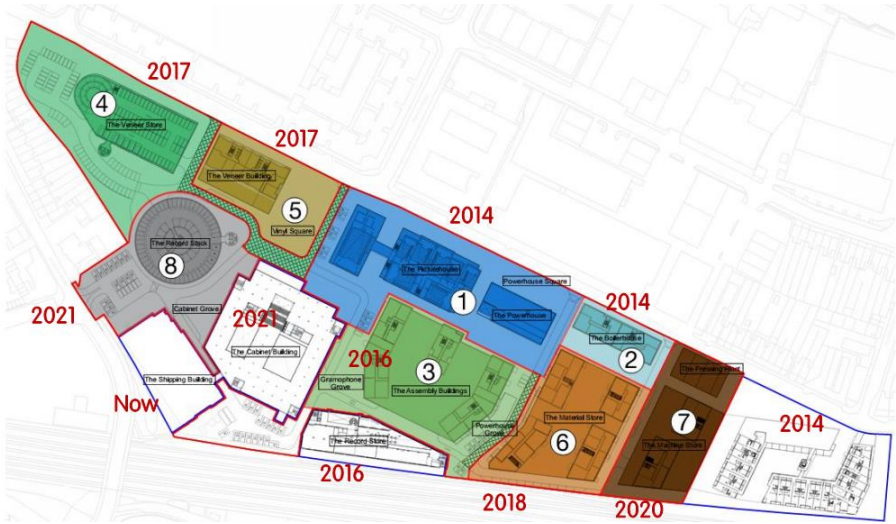


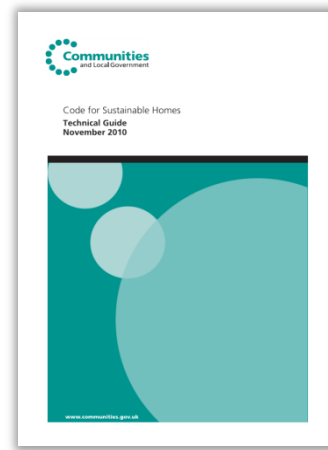
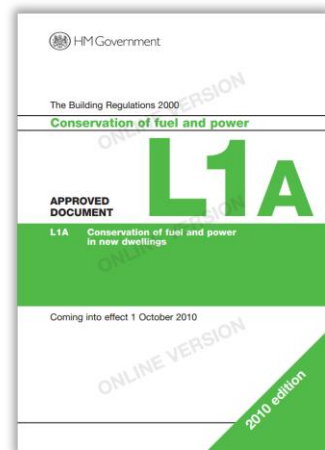
Figure 7: Old Factory Site Intended Phased Delivery

3.0 ENERGY STRATEGY

This section describes in further detail the fabric, services and energy strategy employed in the design of the Material Store building to achieve compliance with the Outline Planning Consent.

3.1 Overview of Energy Strategy

This report describes how this Outline Planning Energy strategy was tested against the current design for the project to test compliance with the Building Regulations Part L 2010, Code for Sustainable Homes Level 4.

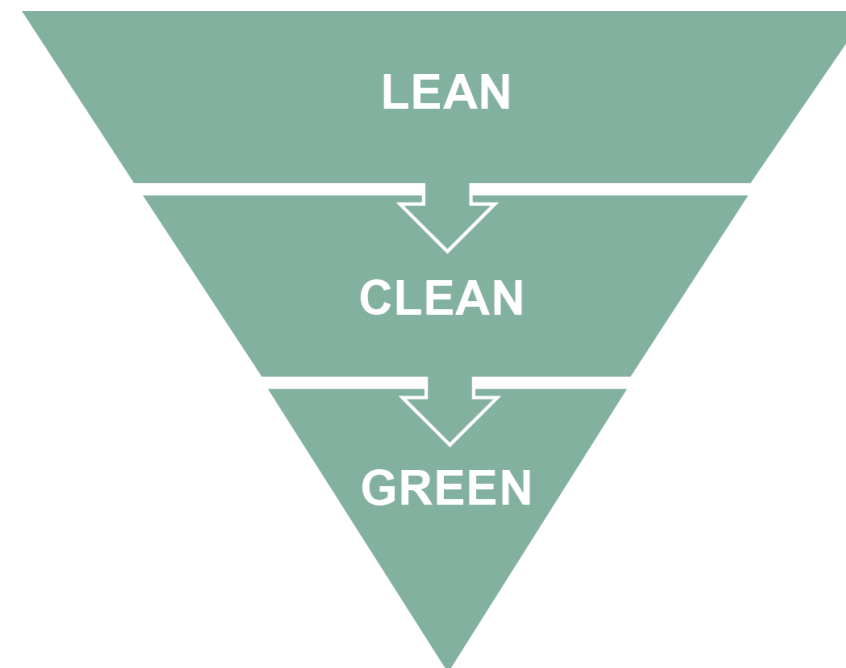


The existing energy strategy for the building was tested against the current design by modelling a range of dwelling types within the development using Stroma FSAP 2009 software (to test compliance and improvement over) Building Regulations 2010.

A range of dwelling types were modelled, including the ground floor 2-storey duplexes, each different flat type at 1st floor, and each of the flat types that make up the remaining accommodation from 2nd to 10th floors.

The existing energy strategy is therefore predominantly based on the parameters developed by MTT for the original Outline Planning Application for the site masterplan.

This existing strategy, and the final strategy developed for the building and described in this report comprises strategies as prioritised by the London Plan (2011, early minor alterations 2012 & further alterations to the London Plan 2014); i.e. Be lean, be clean, be green:



Be lean:

Use less energy; employ high levels of passive design to reduce overall heating and cooling loads by employing high insulation standards, a high level of air-tightness, overall good fabric energy efficiency; good daylight but also good shading to prevent overheating; energy efficient appliances and light fittings;

Be clean:

Use high efficiency systems to generate, distribute and control heating cooling and electrical energy. Energy efficient heating & cooling sources, service distribution systems designed to minimise energy losses, heat recovery systems where appropriate, energy efficient control systems.

Be green:

Use renewable energy systems whenever possible and / or appropriate to generate as much 'free' energy as possible from the site.

Details of how the Material Store design responds to these requirements are given below, in section 3.4 Energy Hierarchy, below.

3.2 Design Parameters – Existing Outline Planning Energy Strategy

The following parameters were used in our preliminary analysis. These are values taken from the MTT proposal for the whole site Outline Masterplan,

See also in MTT report ‘The Old Vinyl Factory Site – Outline Sustainable Energy Assessment’ (Issue 3, 12th November 2012, Appendix A).

Item	Value
U Value external walls:	0.16 W/m2.K
U Value external roofs:	0.14 W/m2K
U Value ground floor floors:	0.12 W/m2.K
U Value external windows/doors:	1.4 W/m2.K (whole unit)
U Value communal circulation walls:	0.16 W/m2.K
U Value party walls:	0.0 W/m2.K
Y-value (thermal bridging):	0.15 (SAP default)
Shading Devices:	Light coloured curtain or roller blind – fraction closed 0.8
Air permeability:	5 m3/m2h
Ventilation:	MVHR with SFP = 0.6; heat recovery 90%
Design air change rate:	3
Space Heating and DHW:	Community CHP / gas boilers
Space Heating and DHW efficiency:	89% (heat to power = 1.25)
Controls:	Programmer, room thermostat, TRVs and interlock
Emitters:	Underfloor heating
% low energy light fittings:	100%
Renewables:	None

3.3 Design Parameters – Material Store Reserved Matters Energy Strategy

The design parameters described in section 1.4 were used to carry out a preliminary analysis using FSAP 2009 software. The following adjustments to these values have been made in order to meet the required 25% improvement over SAP 2009 DER.

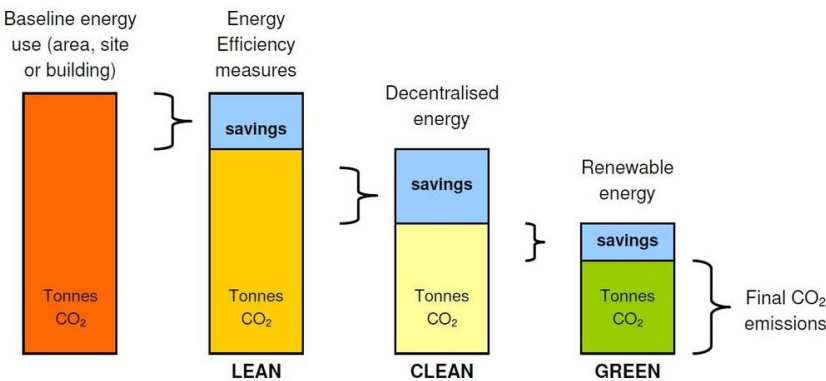
Therefore the following values were used (changes are highlighted):

Item	Value
U Value external walls:	0.14 W/m2.K
U Value external roofs:	0.10 W/m2K
U Value ground floor floors:	0.10 W/m2.K
U Value external windows/doors:	1.4 W/m2.K (whole unit)
U Value communal circulation walls:	0.14 W/m2.K
U Value party walls:	0.0 W/m2.K
Y-value (thermal bridging):	0.08 (SAP accredited construction details)
Shading Devices:	Light coloured curtain or roller blind – fraction closed 0.8
Air permeability:	3 m3/m2h
Ventilation:	MVHR with SFP = 0.6; heat recovery 90%
Design air change rate:	3
Space Heating and DHW:	Community CHP / gas boilers
Space Heating and DHW efficiency:	89% (heat to power = 1.25)
Controls:	Programmer, room thermostat, TRVs and interlock
Emitters:	Radiators
% low energy light fittings:	100%
Renewables:	None

3.4 Energy Hierarchy, Be Lean, Be Clean, Be Green

The following section describes how the Material Store energy and servicing strategy has been designed in order to achieve compliance with the Outline Planning Strategy.

The existing energy strategy for the site, described in general terms in MTT report ‘The Old Vinyl Factory Site – Outline Sustainable Energy Assessment’ (Issue 3, 12th November 2012, Appendix A), has been developed with reference to the



Be Lean, Use Less Energy
The priority in all developments is to minimise the energy consumption through passive measures. This includes designing a highly insulating fabric to the building, with minimum uncontrolled air permeability and low ‘thermal bridging’.

Be Lean: Building Fabric and Fabric Energy Efficiency
The Material Store dwellings have been designed to the following standards:

Building Element	Part L 2010 Minimum Performance Requirement	Material Store Performance
External Wall U-value (W/m ² K)	0.3	0.14
External Roof U-value (W/m ² K)	0.2	0.1
External Floor U-value (W/m ² K)	0.25	0.1
External Doors/Windows U-value (W/m ² K)	2.0	1.1
Party Walls U-value (W/m ² K)	0.2	0.0
Air Permeability (m ³ /hm ² @50Pa)	10.0	3.0
Thermal Bridging (W/mK)	Approved Construction Detail 0.08	Enhanced Construction Detail 0.05

It can be seen that the fabric elements of the Material Store are to be constructed to values exceeding those allowable by the Building Regulations 2010 by a considerable margin.

These highly insulating building fabric elements contribute to delivering a building with a very good (low) fabric energy efficiency (FEE).

An effective FEE should ensure that a good minimum standard for the building fabric (the longest-lasting part of a home) will be embedded in all new homes. It is measured in kWh/m²/yr and is therefore not affected by carbon emission factors for different fuel types.

The FFE calculated for the Material Store using the U-values listed above is approximately 39 kWh/m²/yr.

This is the value proposed by the Zero Carbon Hub as being appropriate for zero carbon apartment blocks and mid-terrace homes, and is also in line with a dwelling designed to achieve CfSH level 5 or 6. In short, this is a very high performing fabric design.

In achieving such a good quality building fabric it is anticipated the heating season of the dwellings will be hugely reduced, meaning they will require heating to be on lower and for less of the year. It is expected that dwellings should only need heating when average external temperatures drop below approximately 8.0°C, subject to occupancy and behaviour.

Be Lean: Lighting
Dwellings will also be installed with energy efficient light fittings throughout and windows will be sized and positioned to provide good, even day lighting, in order to minimise residents’ use of electrical lighting.

Communal / landlord’s areas, such as the amenity spaces and communal corridors, will also be provided with low energy light fittings throughout. In these areas, light fittings will be carefully controlled, for example using passive infra-red sensors (PIRs) to ensure lighting is only on when it is needed, not continually during the night.

Be Lean: Ventilation
The dwellings in the Material Store are insulated to a high standard, see above. This high standard of thermal fabric insulation also necessitates a low level of air infiltration / air permeability, see above.

Sealing a building means the ventilation required for occupancy has to be provided by other means – older less air-tight buildings were able to provide ventilation to occupants through natural infiltration.

The location of the Material Store in relation to the adjacent railway line also means that the building fabric and windows need to be carefully designed to provide occupants with the appropriate acoustic measures. In the case of apartments very close to the railway line this means secondary glazing, and bedroom windows that cannot be opened (without admitting too much noise).

See also the separate Max Fordham LLP noise / acoustics report.

Therefore in the Material Store background ventilation will be provided by a mechanical ventilation heat recovery (MVHR) system in each apartment, consisting of mechanical extract ventilation from wet rooms (kitchens and bathrooms) and matched supply ventilation to habitable rooms. The MVHR unit includes a heat exchanger so that waste heat extracted from wet rooms is delivered to the supply air delivered to habitable rooms, reducing space heating energy use.

The MVHR system will be designed and installed to a high standard of workmanship, (NHBC technical standards 2014) with insulated ductwork where appropriate, and MVHR units with low specific fan powers. MVHR units will be provided on a flat by flat basis and located in flat utility cupboards, with MVHR ductwork running at high level in the apartment ceiling void.

Acoustic attenuation shall be provided to MVHR fresh / air and exhaust ductwork where appropriate, to prevent noise ingress into the flats from outside.

Be Lean: User Guidance
Additionally, guidance will be produced for residents in order to inform them on how to use less energy around the house and thus hopefully reduce the unregulated energy consumption. Energy display devices and energy efficient white goods will also help residents to manage their unregulated energy use.

Be Clean, Supply Energy Efficiently

Whilst a significant impact is made to a home’s energy consumption by passively reducing the energy requirements of the properties, as detailed above, there is still a requirement for energy to be supplied to the dwellings. That energy should be produced and transported as efficiently as possible. This is done via appropriate selection of mechanical and electrical systems.

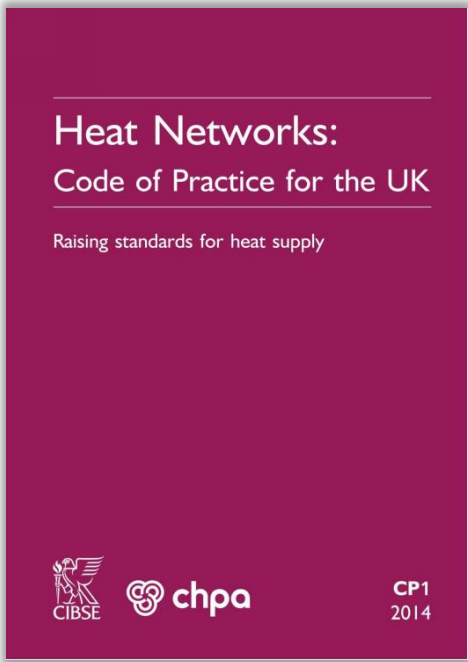
Heating of the home and hot water is a key demand on energy often accounting for upwards of 50% of a household’s carbon footprint. The government and GLA (Greater London Authority) place an emphasis on supplying this energy through district heating networks. The London Plan outlines this in policies 5.5 and 5.6 where they place the order of priority on supplying energy to the home by:

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

The original Outline Planning Consent for the was granted on the basis of an energy strategy incorporating a site-wide CHP district heating network.

This district heating network will be provided by a heating installation comprising conventional high efficiency gas-fired condensing boilers and CHP (combined heat and power) units. This plant will be located in the Power House building, adjacent to the Material Store.

The plant and systems that comprise the site energy centre (boilers, CHP units, distribution pipework, controls, heat exchangers, buffer vessels etc.) are to designed by others. However it is anticipated that these systems will be designed and installed to industry best practice guidelines, CIBSE and CHPA (combined Heat & Power Association) Code of Practice CP1 (this is still a draft / consultation document):



Good practice design elements from this guide that contribute to a reduction in losses and energy efficiency overall that will be incorporated into the design of the district heating network include:

- Low temperature heating flow and return temperatures (85°C flow temperature / 65°C return temperature for distribution pipework serving the building, and maximum 70°C flow temperature / maximum 40°C return temperature for secondary heating pipework within the building) to reduce network heat energy losses;
- Variable volume flow (variable speed circulation pumps);
- Differential pressure control;
- Enhanced district heating pipework insulation (to the same standard as chilled water pipework);
- Direct connection between district heating network and Material Store building to reduce energy losses through the plate heat exchanger, and;
- Heat losses from the network up to point of connection to the Building to be no more than 15% of the annual load.

Be Clean: Site Wide CHP

District heating networks can be run on a combination of CHP engine and boilers (typically gas) or on boilers alone.

CHP is most suited to continually running at between 50-100% of its capacity at all times. It is ineffective to size a CHP to provide for a highly variable load, such as space heating, as this varies greatly from summer to winter in the British climate. In this scenario we would size the CHP engine when running at 50% capacity to fully account for the losses resulting from the network of pipes, as this is a relatively consistent heat load throughout the year.

Be Clean: Communal Heating

Cooling is not required on the site, so only communal heating will be considered.

In order to minimise the losses of the distribution network, and in order to address policy 5.9 (overheating and cooling) we are proposing a system which

uses twin pipe distribution where ever possible below ground, and top of the range insulated products, installed to chilled water levels of insulation and workmanship, elsewhere. Running the network at low temperatures (70/40 within the building in the winter and 60/40 in the summer, compared with typical values of 80/60 year round) also reduces the losses of the network, without reducing the functionality. We also propose the use of condensing gas boilers with the communal heating network.

Since district heating pipes generally run hot all-year round (to provide heat for hot water use), where these pipes run in residential buildings, for example above ceilings in communal corridors, overheating of these areas can be a problem.

The Material Store heat distribution system has been carefully designed so that heating pipework does not run horizontally through communal areas. Instead, horizontal runs of heating pipework will be limited to the ground floor car park. Subsequently, heating pipework will run to flats only in vertical risers (with some minimal offsets required between 1st and 2nd floors). This design will ensure overheating of communal areas is not a significant issue.

Be Green, Use Renewable Energy

A standard requirement of the London Plan is to incorporate renewable energy technologies (such as solar thermal water heating, geothermal energy capture systems such as ground source cooling, wind turbines, biomass heating etc.) into a new development.

Most of these technologies are not suitable for incorporating into city centre sites generally and the Material Store building in particular.

The MTT report ‘The Old Vinyl Factory Site – Outline Sustainable Energy Assessment’ (Issue 3, 12th November 2012, see Appendix A) includes an assessment of the suitability of a number of renewable energy technologies in a site-wide context, and proposes that renewable energy be provided to residential buildings on the site by means of photovoltaic (PV) solar panels installed on roofs.

However, there is a conflict in planning requirements between the need to provide adequate amenity space and the requirement for PVs. Including PVs to the scheme would mean that the amenity space required cannot be provided, therefore PVs have not been incorporated as part of the building’s overall energy strategy.

The building itself, and its fabric and services, have been designed to meet the Outline Planning energy targets, without PVs installed.

3.5 Energy Assessment Methodology

This section describes how the development’s energy use was assessed to determine compliance with the Outline Planning energy targets. These targets are described in MTT report ‘The Old Vinyl Factory Site – Outline Sustainable Energy Assessment’ (Issue 3, 12th November 2012, see Appendix A).

The target to be achieved is a 25% improvement in TER (target emissions rate) over DER (dwelling emissions rate) for a building compliant with the 2010 edition of the Building Regulations.

To carry out the assessment, a number of main different flat types were modelled using FSAP 2009 software.



A total of 8 flat types have been modelled. Each of these flat types has also been copied into the model in the different orientations at which they occur.

The SAP results indicate, for each dwelling, the %age improvement in TER over DER (with a target improvement of 25% required).

Results for each dwelling type are given in Appendix B.

An area-weighted average for the whole development (in accordance with the methodology described in the SAP technical guidance) has been subsequently been calculated to establish the %age improvement over Building regulations 2010 DER.

The area weighted calculation is also given in Appendix B.

3.6 Energy Assessment Results

As described in sections 3.2 and 3.3, SAP calculations were first run using the SAP inputs described in the MTT report.

Following this, a new set of fabric values were developed in order to establish details for a scheme compliant with the planning energy targets, see sections 3.2 and 3.3.

The SAP inputs for each dwelling are given in section 3.3 and are copied below:

Item	Value
U Value external walls:	0.14 W/m2.K
U Value external roofs:	0.10 W/m2K
U Value ground floor floors:	0.10 W/m2.K
U Value external windows/doors:	1.4 W/m2.K (whole unit)
U Value communal circulation walls:	0.14 W/m2.K
U Value party walls:	0.0 W/m2.K
Y-value (thermal bridging):	0.08 (SAP accredited construction details)
Shading Devices:	Light coloured curtain or roller blind – fraction closed 0.8
Air permeability:	3 m3/m2h
Ventilation:	MVHR with SFP = 0.6; heat recovery 90%
Design air change rate:	3
Space Heating and DHW:	Community CHP / gas boilers
Space Heating and DHW efficiency:	89% (heat to power = 1.25)
Controls:	Programmer, room thermostat, TRVs and interlock
Emitters:	Radiators
% low energy light fittings:	100%
Renewables:	None

Therefore it is proposed that the development is delivered consisting of a design incorporating the design values given in the table above.

It can be seen that the development achieves the Planning Energy target improvement of 25% using the SAP inputs described in this table.

See also Appendix B for a record of SAP results.

4.0 SUMMERTIME OVERHEATING

A study has been carried out on the Material Store to establish if there is a risk of summertime overheating in the dwelling apartments. This study was carried out generally in accordance with the methods set out in CIBSE TM52: 2013 ‘The Limits of Thermal Comfort – Avoiding Overheating in European Buildings’.



4.1 Methodology

The methodology for this study involved modelling a single apartment in Dynamic Thermal Simulation software (IES) using the methodology described in CIBSE TM52. This apartment was then rotated to face different orientations corresponding to the orientations of apartments within the actual Material Store building.

Inputs used in the modelling were as follows:

Ventilation	Windows openable, side hung, summer bypass on MVHR
Management of Solar Gain	Living Room: Overshading from balcony above. Internal Blinds closed when rooms unoccupied. Bedroom: External shading from perforated external louvre (on one window only, assumed 50% perforated).
Orientations Tested	All Orientations

4.2 Results

Results have been tested against the new CIBSE TM52 Adaptive Thermal Comfort Criteria (Category 2 New Builds) using the London Test Reference Year as referenced in GLA guidance for managing risk of overheating.

The benefit of TM52 over the previously used Guidance in CIBSE Guide A is that it accounts for “Adaptive Thermal Comfort”, where the upper limit temperature is not an absolute number but is defined by the difference in temperature between the internal and external daily mean temperature. This accounts for a human’s ability to respond to their climate, i.e. in the height of the summer a person’s threshold upper limit before becoming “uncomfortably hot” is greater than in mid-season.

The results obtained from the dynamic thermal simulation show that the apartment modelled passed the criteria described in TM52 for the criteria given.

Further modelling will continue as the design progresses to establish compliance with TM52 for all apartments, including those with acoustic treatment described in the Max Fordham acoustic report.

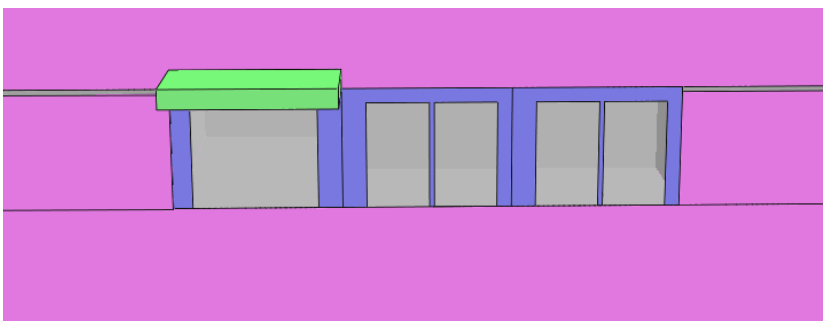


Figure 8: Image from IES Dynamic Thermal Simulation

5.0 CODE & BREEAM

5.1 Code for Sustainable Homes

The Outline Planning Permission for the buildings on the site requires that compliance with a minimum of Level 4 of the Code for Sustainable Homes for all residential developments, in line with Hillingdon's local planning policy, is achieved.



To this end, a Code for Sustainable Homes pre-assessment on the residential components of the development.

It is a mandatory requirement to achieve a 25% improvement in the Dwelling emission rate in comparison with the 2010 in order to achieve code 4.

The other sustainable features contributing to the successful achievement of Code for Sustainable Homes Level 4 can be seen in the Scotch & Partners Code for Sustainable Homes report, issued separately, however these include:

- An (mandatory) 25% improvement of TER (target emissions rate) over DER (dwelling emissions rate);
- A fabric energy efficiency (FEE) of 39 kWh/m²/yr (or better);
- Energy display devices for electricity AND heat energy use;
- Energy labelled white goods;
- Energy efficient external light fittings;
- Indoor water use < 105 litres per person per day (achieved by specifying low-water use fittings);
- Roofs, walls, floors, external walls and building services to have insulation using substances with global warming potential (GWP) <5 (manufacture and installation), and;
- Airborne and impact sound insulation values - an improvement of 5dB over Building regulations Part E.

...plus various other design and operational features, described in the separate Code for Sustainable Homes submission.

5.2 BREEAM Assessment

The Outline Planning Permission for the buildings on the site requires that compliance with BREEAM (Very Good) in line with Hillingdon's local planning policy for all non-residential developments, is achieved.

Therefore the small commercial unit, located at ground and first floors, is subject to BREEAM assessment, under BREEAM 2014 shell retail (with consideration for shell office).

Design features included in the design of the commercial unit space are described in further detail in the separate BREEAM submission report.



6.0 CONCLUSIONS

The Material Store building will be designed and built including very high standards of passive design, including very high standards of thermal insulation, a very high standard of air-tightness, and very high standards for thermal bridging.

The building and the dwellings will also be served by energy efficient plant and systems, including connection to site-wide district heating network incorporating a mixture of high efficiency gas boilers and combined heat and power (CHP) units, with the district heating system itself designed to best practice standards, with low flow and return temperatures and a high standard of heating pipework insulation. Individual apartments will feature

energy efficient MVHR ventilation systems with heat recovery, instantaneous hot water via well insulated heat interface units and efficient control systems including room thermostats with timeclock programmers and thermostatic radiator valves (TRVs) on radiators. The building has also been designed so that heating distribution pipework generally only runs vertically, avoiding the problem of heating pipework causing overheating in communal corridors.

In addition, the dwellings will be designed to achieve compliance with Level 4 of the Code for Sustainable Homes, with the commercial unit complying with BREEAM (Very Good).

Energy efficient features incorporated to meet this standard will include a very high standard of fabric energy efficiency, low energy internal and external light fittings, low water use fittings, energy efficient white goods and energy display devices.

These features all contribute to meeting the energy targets described in section 3.0.

7.0 APPENDIX A – OUTLINE PLANNING ENERGY REPORT





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SUSTAINABLE ENERGY STRATEGY

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DATE OF ISSUE	DETAILS OF CHANGE	AUTHOR	CHECKED
9 TH JULY 2012	ISSUE ONE	BR	JW
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- Background
- Baseline energy consumption and carbon emissions
- BE LEAN – reduce energy demand
- BE CLEAN – supply energy efficiently
- BE GREEN – renewable energy
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THE OLD VINYL FACTORY SUSTAINABLE ENERGY STRATEGY

SUMMARY

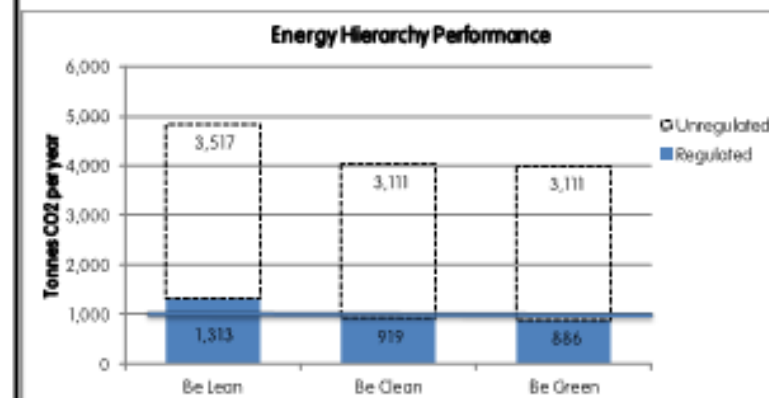
Outline planning permission is being sought for a masterplan for the re-development of The Old Vinyl Factory Site at Hayes. The redevelopment includes new build elements and the refurbishment of a number of existing buildings and is expected phased over a period of 7 years. This Outline Sustainable Energy Assessment is intended to provide an outline of the proposed development's response to planning policies relating to sustainable energy use.

Energy efficiency measures will be implemented to provide carbon savings of approximately 3-5% in comparison to the baseline building that is fully compliant with the challenging standard set by Part L 2010. The energy efficiency measures include: improved fabric insulation; improved air tightness; high efficiency fans; heat recovery on ventilation systems; etc. This will ensure the development achieves part L 2010 compliance through energy efficiency measures alone.

A site wide heating system, incorporating gas fired CHP plant, will be installed to serve the heat requirements of the entire site. The CHP will meet the domestic hot water demand and a portion of the space heating demand in the dwellings and commercial areas. The communal heating system and CHP is expected to reduce regulated CO₂ emissions by approximately 30%. The CHP unit will also meet some of the heat demand of the existing buildings and, consequently, will reduce the site's non-regulated carbon emissions. The CHP unit will be installed when sufficient energy demand exists to reflect the phasing of the buildings.

A photovoltaic collector installation would be compatible with the CHP and communal heating system. An initial assessment based on the indicative scheme shows that a contribution from the collectors of around 6.3% of the regulated emissions of the dwellings might be achievable.

The total site wide regulated carbon saving through the combination of energy efficient design, decentralised energy on-site renewable energy sources, in comparison to the baseline scheme, is expected to be approximately 35%.



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THE OLD VINYL FACTORY SUSTAINABLE ENERGY STRATEGY

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BACKGROUND

Outline planning permission is being sought for a masterplan for the re-development of The Old Vinyl Factory Site at Hayes. The redevelopment includes new build elements and the refurbishment of a number of existing buildings. The planning application is in outline so the level of detail available is not sufficient to provide a detailed energy assessment.

This Outline Sustainable Energy Assessment is intended to provide an outline of the proposed development's response to planning policies relating to sustainable energy use.

A number of pre-application meetings have been held with the London Borough of Hillingdon and the Greater London Authority, which included discussions regarding the approach to the sustainable energy strategy for the development. This Assessment responds to the feedback received at the meetings.

SITE DESCRIPTION

This outline energy strategy is based on the current masterplan, phasing and usage mix

The masterplan consists of:

- Refurbished office buildings, some locally listed
- New employment spaces at a variety of scales
- Up to 642 residential units, (132 of which have already been approved as part of the Gatefold planning permission.)
- Cafés, bars, leisure and arts spaces along the pedestrian route and Blyth Road to encourage integration with the wider Hayes community
- Re-provided car parking (from surface to predominantly multi storey and integral to new buildings)
- An active new pedestrian route (The Groove) connecting through the site and towards the town centre
- A sequence of planned landscaped spaces (squares, groves and playgrounds) linked by the new pedestrian route (The Groove)

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Site Location Plan



Site Plan

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Schedule of Buildings:				
Building Name	Building Type (predominantly)	Approx. treated floor area, m ²		Anticipated year of occupation
		Dwellings	Commercial	
Shipping Building	Existing commercial (to remain as is)		8250	Occupied
Gatefold (not part of this application)	Predominantly Dwellings	9250		2015
Pressing Plant	Existing commercial (to be refurbished)		625	2020
Material Store	Dwellings (with some commercial)	11150		2018
Machine Store	Dwellings (with some commercial)	4100	2350	2020
Boiler House	Dwellings (with some commercial)	2400		2014
Powerhouse	Existing commercial (to be refurbished)		570	2014
Picture House	New commercial		4483	2014
Veneer Building	Dwellings (with some commercial)	6200		2017
Cabinet Building	Existing commercial (to be refurbished)		20300	2021
Assembly Building	Dwellings (with some commercial)	10500		2016
The Record Store	Existing commercial (to be refurbished)		8700	2015
The Veneer Store Carpark	New commercial		295	2017
The record Stock Carpark	New commercial		230	2021

n.b. the floor area stated is the 'treated floor area', i.e. the area of the building that is provided with space heating and is subject to Part L of the Building Regulations.

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THE OLD VINYL FACTORY SUSTAINABLE ENERGY STRATEGY

POLICY BACKGROUND

The energy strategy will be developed in accordance with requirements of the London Plan and specifically the GLA Energy Team's Guidance Note 'Guidance on Preparing Energy Statements, September 2011'. The London Borough of Hillingdon's planning policies relating to sustainable energy are aligned with the London Plan.

After establishing the baseline energy demand and profile for the site, the strategy for the project will follow the Mayor's Energy Hierarchy in appraising appropriate measures to reduce carbon emissions and other climate impacts from the development:

- Use Less Energy - 'Be Lean'
- Supply Energy Efficiently - 'Be Clean'
- Use Renewable Energy - 'Be Green'

The planning application is outline therefore the calculated energy consumption, carbon emissions and savings resulting from the use of low or zero carbon technologies are based on benchmark values and estimates of system efficiency and the performance of technologies.

The GLA Guidance Note states that an energy strategy should include the following information:

- A target for regulated CO₂ reductions
- A target for regulated CO₂ emissions savings through energy demand reduction measures
- Commitment to communal heating infrastructure, if appropriate for the development, and evidence of investigation into the existence of any wider district networks that the development could be connected to
- Investigations of the feasibility and, where viable, commit to the installation of CHP in the proposed development
- Large-scale developments should provide a feasibility assessment to ensure that CHP is sized to minimise CO₂ emissions
- Identification of measures to minimise unregulated emissions
- Where appropriate an initial feasibility test for renewable energy technologies should be undertaken with a resulting commitment to further reduce CO₂ emissions through the use of onsite renewable energy generation
- Where the required improvement on a development's Target Emission Rate is not met a commitment to ensure the shortfall is met off-site using the provision established by the Borough

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PHASING

The diagram below shows the proposed phasing for the development. It is envisaged that the initial elements of the development will be completed in 2014, with the entire development completed by 2021.



The Gatefold building, Shipping Building, Cabinet Building and Record Store do not form part of this planning application. However, for the purposes of the assessment of the site wide energy scheme it is assumed that these buildings will be connected to the site wide system when feasible in the future.

The Shipping Building is currently part occupied and fully serviced by existing plant and equipment. For the purposes of the analysis of the site wide energy scheme it is assumed that it will not be connected to the system until 2017 at the earliest. The connection will be made when the existing plant has reached the end of its economic life.

Phases 3 and 6 (The Assembly Building and The Materials Store) are interchangeable in terms of their order of construction. Due their similar sizes and uses, and their close proximity to each other and the energy centre, the order in which these two buildings are constructed will make no material difference to the site's energy strategy.

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BASELINE ENERGY CONSUMPTION AND CARBON EMISSIONS

For this outline planning application the baseline energy consumption will be based on benchmarks and the results of calculations undertaken by MTT on similar projects.

The benchmarks stated in the London Renewables Toolkit are out of date, so the more up to date values stated in CIBSE Guide F, 3rd Edition, May 2012 will be used. The CIBSE benchmarks do not differentiate between regulated and non-regulated energy use.

The carbon emissions from the existing commercial buildings are not included in the calculation of the regulated emissions because the refurbishment works will be undertaken under Part L2B of the Building Regulations and, as such, there is no methodology for calculating a regulated carbon emission baseline value. However, the following table shows the baseline carbon emissions for the entire development including the non-regulated emissions of the new build elements and the existing buildings.

REGULATED EMISSIONS

From recent experience the base line carbon emissions for dwellings in blocks of flats that are compliant with Part L1A 2010 are approximately 16 kgCO₂/m². This value is the target emission rate calculated by SAP 2009.

Summary of Baseline Regulated Carbon Emissions (New build only)

Building Use	Area, m ²	Regulated Baseline Carbon Emission Rate kgCO ₂ /m ²	Baseline regulated carbon emissions, kgCO ₂
Dwellings	46,469	16	743,501
Cinema	2,690	80	215,179
Restaurants	1,793	120	215,179
New Commercial	6,454	25	161,351
Total	57,406		1,335,210

n.b. the floor area stated is the 'treated floor area', i.e. the area of the building that is provided with space heating and is subject to Part L of the Building Regulations.

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TOTAL ENERGY CONSUMPTION AND CARBON EMISSIONS

The energy consumption for the various buildings on the site are taken from Table 20.1 of CIBSE Guide F, 3rd Edition, May 2012. The values in the table below include the regulated energy consumption of the new building.

Building Use	Area, m ²	Benchmark gas consumption, kWhrs/m ² /year	Benchmark electricity consumption, kWhrs/m ² /year	Baseline total carbon emissions, kgCO ₂
Dwellings	46,469	52	30	1,189,508
Cinema	2,864	515	135	485,976
Restaurants	1,622	1100	650	891,098
Commercial	6,454	79	33	209,027
Existing Commercial	40,655	130	50	2,076,233
Total	98,063			4,851,842

SUMMARY OF CARBON EMISSIONS - BASELINE

The majority of the carbon emissions result from the non-regulated emissions associated with the new build elements and from all sources in the existing occupied and refurbished commercial buildings.

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Entire Development	Carbon dioxide emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated	Total
Building Regulations 2010 Part L compliant Development	1,335.2	3,517	4,852

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BE LEAN – reduce energy demand

The first step in pursuing an energy efficient and low-carbon design under the Energy Hierarchy is to minimise the development's energy demand. This is achieved both by passive measures and the introduction of more energy efficient plant and services. Any measures achieved at this stage will reduce the extent of measures or size of plant needed to address the subsequent 'be clean' and 'be green' stages.

The building services strategy has been developed in response to the following drivers for the project:

- maximising the potential of the building to satisfy market expectations (balancing of scope of works with value to create the optimal specification)
- achieving environmental comfort conditions and occupant wellbeing, buildability, and avoiding unnecessary costs of construction
- achieving appropriate sustainability targets

In establishing the proposed energy strategy and servicing strategy for the development, the requirement to minimise energy consumption through available building fabric and building services measures has been considered a priority.

DWELLINGS

The dwellings will be constructed to be energy efficient and achieve compliance with Part L1A 2010 (Code level 3 energy performance) without the need for low or zero carbon technologies. This performance will be achieved through the use of energy efficient design, including:

- Better U-values exceeding the requirements of Part L 2010
- Air permeability of 5m³/h/m²
- Best practice system efficiencies for heating, and ventilation system
- Balanced mechanical ventilation with heat recovery
- Highly efficient light fittings
- Enhanced control of services and lighting
- The mechanical ventilation units, where provided, will incorporate the following design features:
 - Heat recovery of at least 92% for the residential units.
 - Specific Fan Powers of no greater than 0.49 W/l/s.
 - Summer bypass to assist with summertime cooling
 - Variable speed controls with summertime cooling function

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COMMERCIAL

The new commercial buildings will be constructed to exceed the limiting requirements of the Building Regulations. Ventilation systems will incorporate heat recovery devices with an efficiency of 75% or greater. Cooling, where provided, will use high efficiency chillers or packaged refrigeration systems.

The very latest in lighting technology will be used with the best practice luminaires, lamps, and controls. Daylight linked controls will be provided where appropriate.

The existing commercial buildings will be refurbished to a standard that meets or exceeds the limiting requirements of the building regulations as and when it is commercially viable to do so. The Shipping Building is currently occupied, and has recently undergone some refurbishment, so any further work will be planned around tenancy agreements.

The two large existing office buildings, The Record Store and The Cabinet Building, will be refurbished when new tenants have been found. The nature of the businesses that will occupy the buildings is unknown, therefore, the benchmark energy consumption from CIBSE Guide F has been used for this outline energy strategy.

CARBON EMISSIONS REDUCTIONS, BE LEAN

Based on MTT's experience of similar developments the dwellings will exceed Building Regulations compliance by around 3-5% and the new Commercial Buildings will comply with Building Regulations as a base build.

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Entire Development	Carbon dioxide emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated	Total
Building Regulations 2010 Part L compliant Development	1,335.2	3,517	4,852
After energy demand reduction	1,312.9	3,517	4,830

GLA Table 2: Carbon Dioxide Emissions from each stage of the Energy Hierarchy

Entire Development	Carbon dioxide savings (Tonnes CO ₂ per annum)		Carbon dioxide savings (%)	
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	22	22	1.7%	0.5%

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BE CLEAN – SUPPLY ENERGY EFFICIENTLY

The next step in the Energy Hierarchy is the 'be clean' strategy of supplying the required energy, after all possible energy efficiency measures have been incorporated, as efficiently as possible.

Potential approaches include connecting the scheme to existing low carbon or CHP-led district energy networks, or if no existing schemes exist, investigating whether such networks are planned in the area and designing systems with the flexibility to connect to these in the future.

With or without a district energy system, the feasibility of CHP (combined heat and power), including the provision of cooling using the CHP waste heat should be reviewed. For larger developments the use of a site wide communal heating system should be provided if considered viable.

EXISTING DISTRICT ENERGY SCHEMES

A review of the London Heat Map has shown that there is a future planned district heating network adjacent to the site in Blyth Road. The Hillingdon-Hayes network is proposed to run from the junction of Blyth Road and Trevor Road to Hayes Swimming Pool at the northern end of the town via Station Road and Hayes Town centre.

The proposed route passes to the north of the Power House.

Future Connections

The Old Vinyl Factory site wide heating network will be suitable for connection in the future to the Hillingdon-Hayes network. It is proposed that a pair of pipes will be laid from the plant room in the powerhouse to the boundary of the site on Blyth Road to allow a connection into the future network. In the event of the system being connected either the Powerhouse will become a supplier (exporter) of energy to the network, or if it is importing energy, some of the existing plant will be removed to create space for the district energy system interface plant.

The pipework system will be of sufficient capacity to allow the district network to connect directly into the system if that is the preferred method at the time of connection.

COMMUNAL HEATING

ENERGY DEMAND PROFILE

The daily and monthly energy demand profile is important when considering the provision of a site wide district energy system, particularly if the primary source of heat is a combined heat and power (CHP) unit, biomass boiler, or other low carbon source of heat where the installation cost of the plant is relatively high compared to conventional boilers and its efficiency tends to suffer a reduction at part load.

The domestic hot water demand for the proposed residences will provide a year round background demand for heat. This is supplemented during the winter by the space heating demand from the

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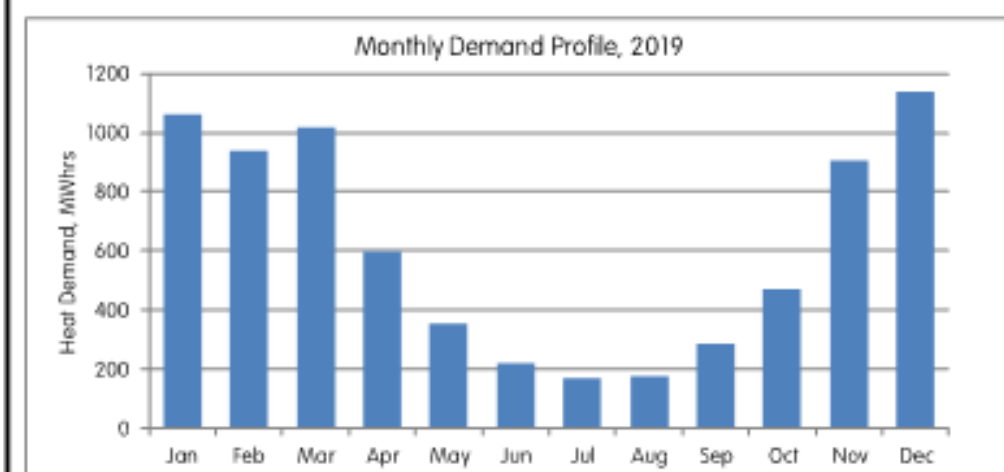
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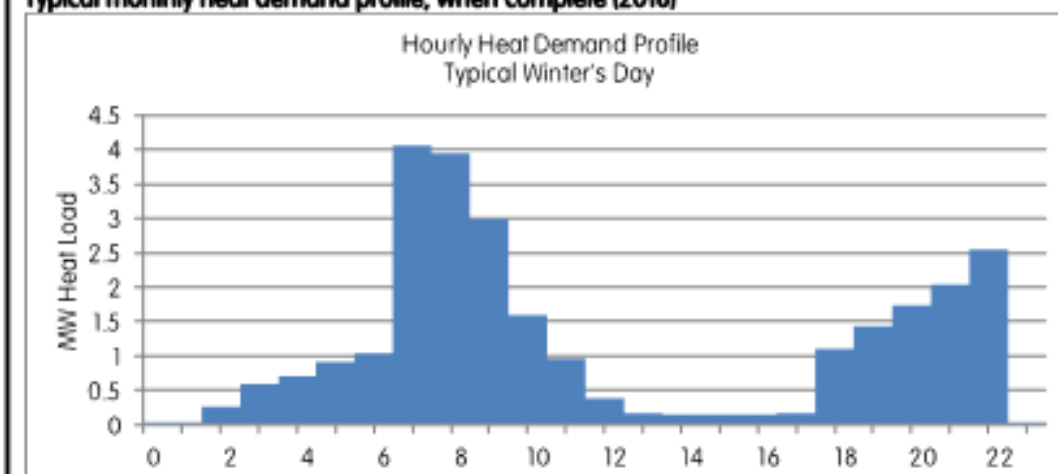
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proposed dwellings and the various new and existing commercial buildings. Due to the relative size of the commercial buildings, and the fact that existing buildings such as the Cabinet and Shipping Building, are not constructed to modern standards the space heating demand is approximately treble the domestic hot water demand. Whilst the summer to winter load variation is greater than would ideally be preferred for a communal heating system with a CHP lead the differing daily heat use profile for the dwellings and commercial areas helps to mitigate the annual imbalance.



Typical monthly heat demand profile, when complete (2018)



Typical daily heat demand profile, winter.

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The energy demand profile is satisfactory for the use of decentralised energy generation (combined heat and power) and a communal energy system.

In addition to the heat demand there are a number of large electrical demands at single points of connection, for instance the proposed Picture House and the Cabinet Building may be able to be supplied directly with the electricity generated by the CHP plant.

PROPOSED PLANT DESCRIPTION

The main heating plant will comprise a combined heat and power unit along with high efficiency gas boilers. A key feature of the central plant will be thermal stores in order to allow the CHP unit to operate for at least 4500 hours per year, whilst meeting a high proportion of the heat demand.

The energy centre in the Power House will contain all the primary heating sources for the entire development to serve all end uses. The primary plant and equipment located within the Power House will include:

- CHP unit
- Thermal storage vessels
- Gas fired boilers
- Variable speed primary and secondary distribution pumps
- Gas meters
- Controls
- The main electrical substation and landlord's switchgear for the site

SYSTEM RESILIENCE

The CHP and thermal store combination will be sized to meet the peak heat demand, however, there will be periods where the thermal store is exhausted and the CHP has insufficient capacity to meet the instantaneous heat demand. Under these circumstances the gas fired boilers will operate to meet the demand. In order to provide system resilience during planned or unplanned CHP maintenance the boilers will be sized to meet the peak demand of the development.

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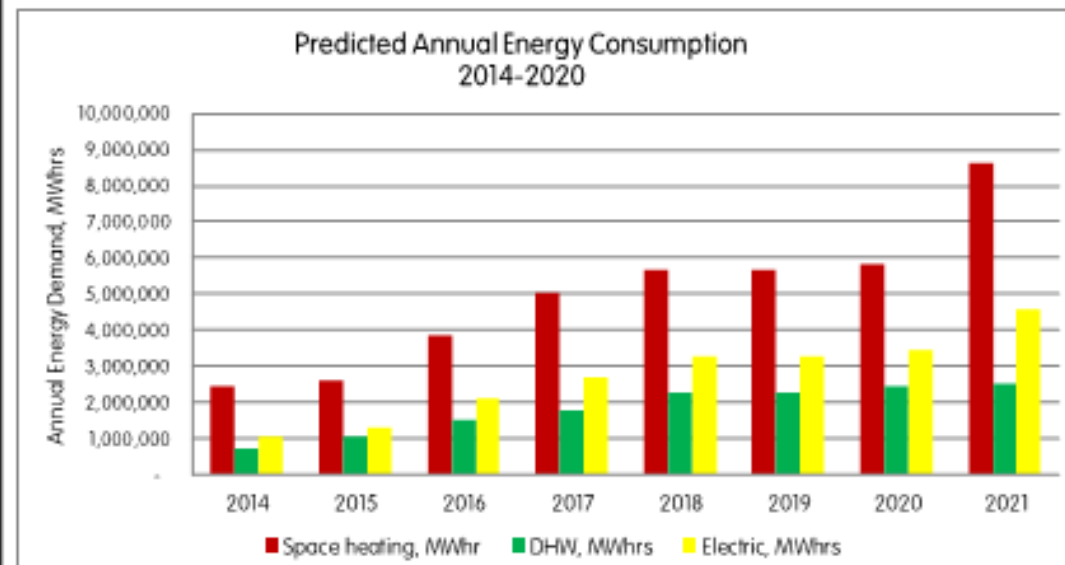
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PHASING

The phased addition of the buildings and their energy demands results in a stepped growth of energy demand during the construction period.



Predicted annual delivered energy to 2021

The phased development programme will have an influence on the configuration and timing of the plant in the energy centre. The energy centre itself, located in the power house, will be delivered as part of the first phase of the development in order to enable the development of the site wide energy system in tandem with the buildings.

The heat demand of the development is predicted to be introduced gradually over a period of 7 years; the initial demand in 2014/2015 is more than trebled by the time the cabinet building is completed in 2021. Of key importance to the viability of the CHP is the domestic hot water demand, which trebles between 2014 and 2018.

The phasing plan shows that in 2015 the connected demand could be approximately 1,054MWhrs of domestic hot water and approaching 1,300MWhrs of heat demand (assuming the Gatefold is connected into the system and the commercial buildings are well occupied). In 2018 the connected demand is predicted to be approximately 2,268MWhrs of domestic hot water and 5,625MWhrs of space heating.

The central energy centre will provide the heat from 2014 onwards, and the district heating mains will be progressively installed to allow connection to the buildings as they are completed or occupied.

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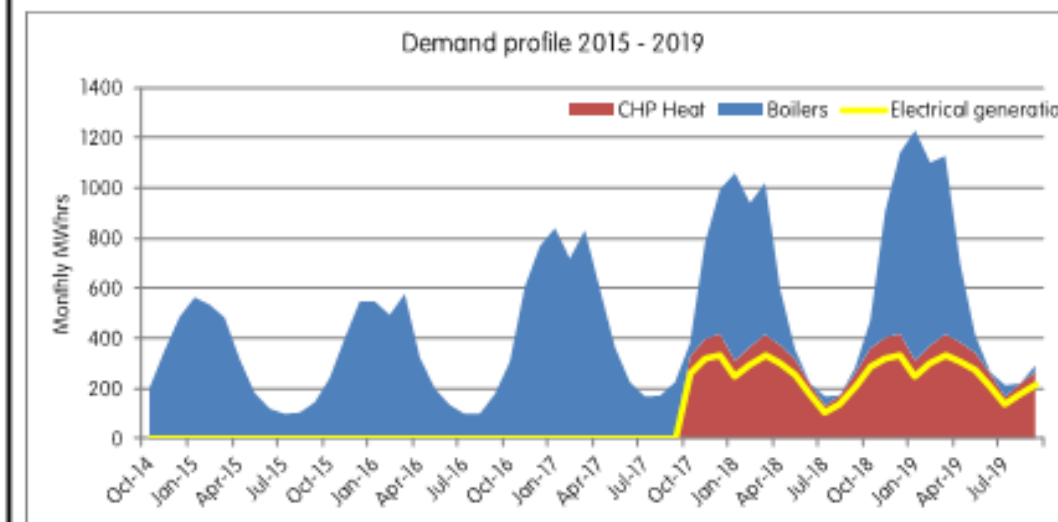
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CHP UNIT OUTLINE ANALYSIS

For a CHP sized to meet the year round domestic hot water demand the ideal size would be around 550kW thermal, 400kW electrical. However, this would allow the CHP to meet only a very small proportion of the space heating demand, and would not generate a sufficient proportion of the overall heat demand to satisfy the target planning requirements for reducing the regulated carbon emissions by 25% from Part L 2010. Experience on other projects has shown that by meeting around 45-50% of the total heat demand of a dwelling the carbon emissions can be reduced by 25% from the part L 2010 compliant rate. To meet 50% of the heat demand of the entire site the ideal capacity CHP unit would be around 600kW with a heat output of 750kW. If not all buildings are connected – for example, the Gatefold may not be connected to the communal scheme from the outset due to programme requirements, then the CHP unit could be of a lower capacity.

Due to the low heat demand in the period 2014 to 2017 it is proposed that the CHP unit will not be part of the first phase of the central plant installation as its operating hours would be less than 4000 hours for the until mid 2017. The CHP will be installed in 2018 as part of phase 6 when the heat demand is sufficiently well developed to allow the unit to operate efficiently and effectively with an more than 5000 annual full load running hours. For the period up to 2018 the development would be served by the site wide system with gas fired boilers generating the heat.

A review of currently available CHP units has shown that efficiencies of 47.8% thermal and 39.2% electrical are achievable. Based on these values EnergyPro has been used to estimate the performance of the system. The annual energy production of the CHP and boilers is shown in the following graph.



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CARBON EMISSIONS REDUCTIONS, BE CLEAN

EnergyPro has been used to provide an early indication of plant and equipment capacities and the associated carbon savings. For a site wide system serving all buildings, including the Gatefold, the CHP is predicted to provide a total carbon saving of approximately 800 tonnes CO₂ a year in comparison to a traditional gas fired boiler solution.

This carbon saving is attributable to each building in different quantities, for this assessment it has been assumed that the carbon savings are proportional to the total energy demand of each element of the development. However, a more detailed analysis of energy use and delivery would show that the proportion of heat consumed by the proposed dwellings is greater than calculated using the simplistic assessment as most of the CHP heat output during the summer is delivered to the dwellings only for the domestic hot water generation.

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Entire Development	Carbon dioxide emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated	Total
Building Regulations 2010 Part L compliant Development	1,335.2	3,517	4,852
After energy demand reduction	1,312.9	3,517	4,830
After CHP	919	3,111	4,030

GLA Table 2: Carbon Dioxide Emissions from each stage of the Energy Hierarchy

Entire Development	Carbon dioxide savings (Tonnes CO ₂ per annum)		Carbon dioxide savings (%)	
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	22	22	1.7%	0.5%
Savings from CHP	394	800	30.0%	16.6%

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THE OLD VINYL FACTORY SUSTAINABLE ENERGY STRATEGY

Proposed network and phasing



REPORT

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THE OLD VINYL FACTORY

SUSTAINABLE ENERGY STRATEGY

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BE GREEN – renewable energy

The third and final stage of the energy hierarchy - 'be green' is to review the potential of a range of renewable energy systems to serve the energy requirements of the site and thereby offset CO₂ emissions.

The following renewable energy technologies have been considered for application at the Old Vinyl Factory:

- Solar Water Heating
- Wind Power
- Biomass Heating
- Heat Pumps
- Photovoltaics

SOLAR WATER HEATING

As the proposed CHP system already provides a means to supply hot water with reduced carbon emissions, the use of solar water heating has not been considered appropriate for the development.

WIND POWER

It is recognised that wind generators are often associated with unacceptable visual and noise implications. Wind technology as a renewable energy source is not considered appropriate for this site.

BIOMASS HEATING

Due to the provision of a CHP unit to meet the majority heat energy demand biomass energy has not been considered as a technically or economically appropriate technology to meet the remaining heat energy demand of the development. In addition to this, the sourcing and delivery of biomass fuel and the impact on air quality militate against the use of biomass boilers.

HEAT PUMPS

As the proposed CHP system already provides a means to supply hot water and space heating with reduced carbon emissions heat pump technologies are not considered suitable for the project.

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THE OLD VINYL FACTORY

SUSTAINABLE ENERGY STRATEGY

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CONCLUSIONS

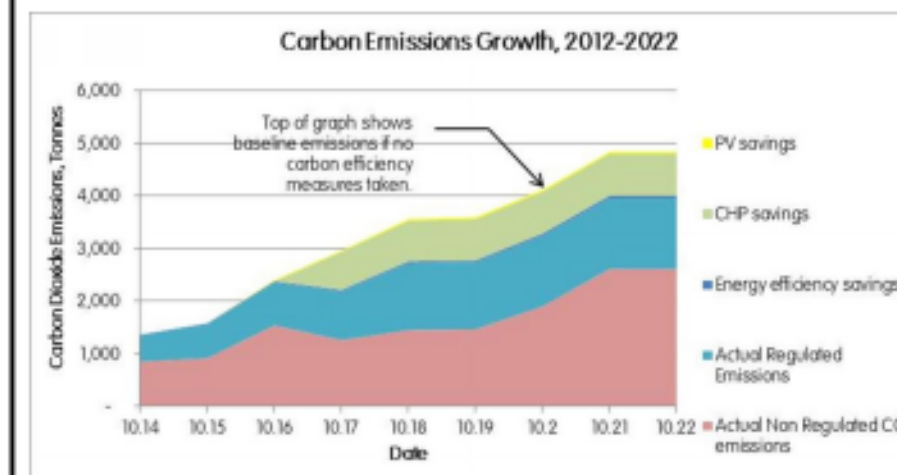
Energy efficiency measures will be implemented to provide carbon savings of approximately 3-5% in comparison to the baseline building that is fully compliant with the challenging standard set by Part L 2010. The energy efficiency measures include: improved fabric insulation; improved air tightness; high efficiency fans; heat recovery on ventilation systems; etc. This will ensure the development achieves part L 2010 compliance through energy efficiency measures alone.

A site wide heating system, incorporating gas fired CHP plant, will be installed to serve the heat requirements of the entire site. The CHP will meet the domestic hot water demand and a portion of the space heating demand in the dwellings and commercial areas. The communal heating system and CHP is expected to reduce regulated CO₂ emissions by approximately 30%. In addition to reducing the regulated carbon emissions the CHP unit will also meet some of the heat demand of the existing buildings and, consequently, will reduce the site's non-regulated carbon emissions.

A photovoltaic collector installation would be compatible with the CHP and communal heating system. At this master planning stage the final area of roof that is available for the installation of PV collectors is not known, but it is assumed that the contribution from the collectors will be around 6.3% of the regulated emissions of the dwellings.

GLA tables 1 and 2 show the savings in carbon dioxide achieved by the three steps. The total site wide regulated carbon saving through the combination of energy efficient design, decentralised energy on-site renewable energy sources, in comparison to the baseline scheme, is expected to be approximately 35%.

The following graph shows the carbon savings for the first seven years of the development as the various phases are completed.



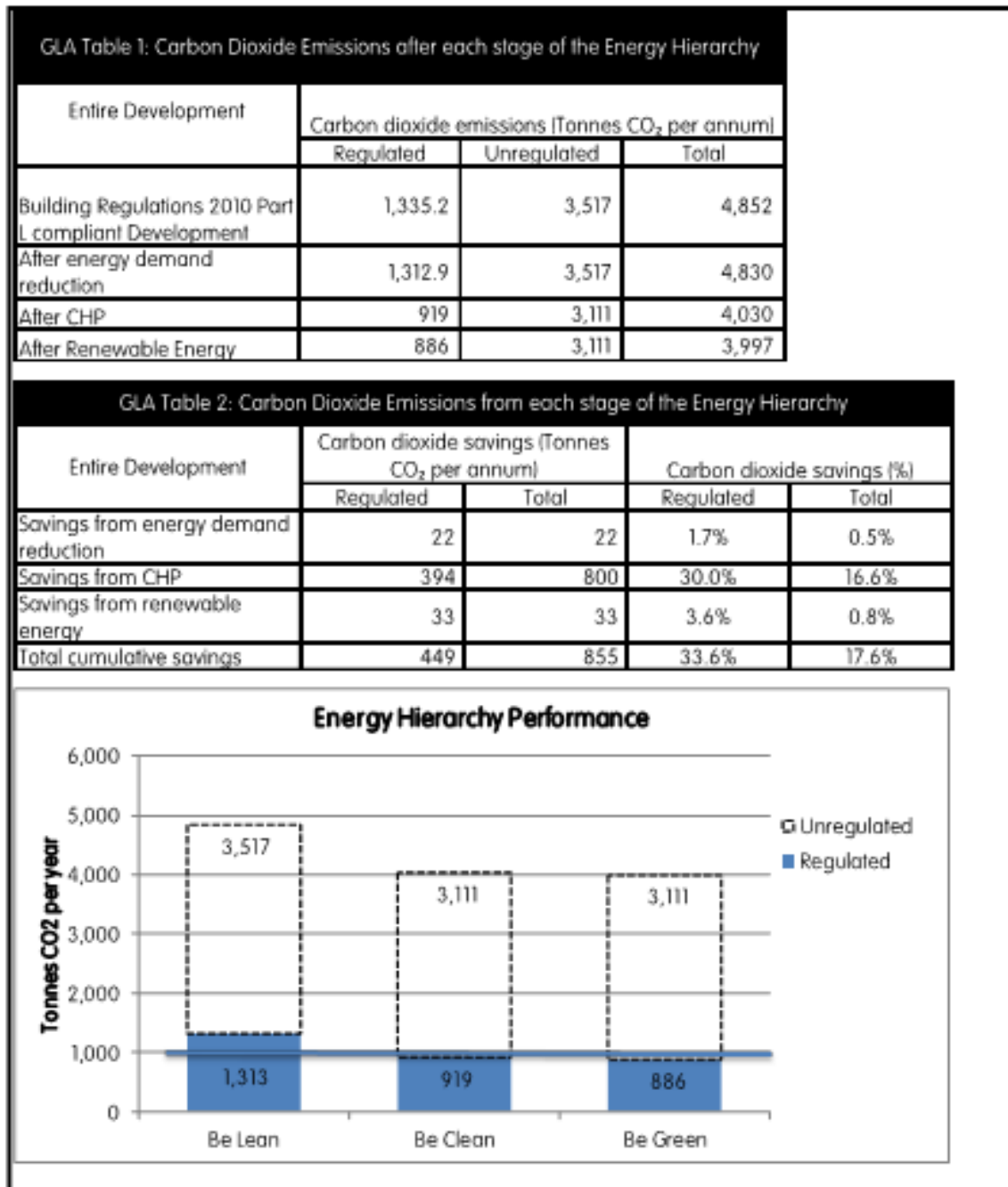
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8.0 APPENDIX B – SAP CALCULATION RESULTS

The following outputs are from three of the twelve dwellings assessed in order to analyse potential site energy strategies. This sample evidences how lean, clean and green savings are generally being made for the site.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
Property Address:
Building regulation assessment

TER 15.7 kg/m²/year
DER 9.37 kg/m²/year
The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		9.37	(ZC1)
TER		15.7	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		9.37	
% improvement DER/TER	40.3		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	9.37	(ZC1)
CO2 emissions from appliances, equation (L14)	14.64	(ZC2)
CO2 emissions from cooking, equation (L16)	1.71	(ZC3)
Net CO2 emissions	25.7	(ZC8)

Result:
Credits awarded for Ene 1 = 4.4
Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 48.81
Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		32.54	
Standard DER		16.18	
Actual Case CO2 emissions		25.73	
Actual DER		9.37	
Reduction in CO2 emissions	20.93		

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kW_e or 300kWh must be certified.
- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Stroma FSAP 2009 Version: 1.5.0.83 (SAP 9.90) - <http://www.stroma.com> Page 1 of 1

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
Property Address:
Building regulation assessment

TER 15.7 kg/m²/year
DER 9.29 kg/m²/year
The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		9.29	(ZC1)
TER		15.7	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		9.29	
% improvement DER/TER	40.8		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	9.29	(ZC1)
CO2 emissions from appliances, equation (L14)	14.64	(ZC2)
CO2 emissions from cooking, equation (L16)	1.71	(ZC3)
Net CO2 emissions	25.6	(ZC8)

Result:
Credits awarded for Ene 1 = 4.4
Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 49.3
Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		32.4	
Standard DER		16.04	
Actual Case CO2 emissions		25.65	
Actual DER		9.29	
Reduction in CO2 emissions	20.83		

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Stroma FSAP 2009 Version: 1.5.0.83 (SAP 9.90) - <http://www.stroma.com> Page 1 of 1

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
Property Address:
Building regulation assessment

TER kg/m²/year
DER 18.88
10.2
The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		10.2	(ZC1)
TER		18.88	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.2	
% improvement DER/TER	46		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	10.2	(ZC1)
CO2 emissions from appliances, equation (L14)	14.95	(ZC2)
CO2 emissions from cooking, equation (L16)	1.8	(ZC3)
Net CO2 emissions	26.9	(ZC8)

Result:

Credits awarded for Ene 1 = 4.9

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 55.43

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		34.51	
Standard DER		17.77	
Actual Case CO2 emissions		26.94	
Actual DER		10.2	
Reduction in CO2 emissions	21.94		

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA. It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
Property Address:
Building regulation assessment

TER kg/m²/year
DER 18.8
12.76
The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		12.76	(ZC1)
TER		18.8	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		12.76	
% improvement DER/TER	32.1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	12.76	(ZC1)
CO2 emissions from appliances, equation (L14)	17.45	(ZC2)
CO2 emissions from cooking, equation (L16)	3.27	(ZC3)
Net CO2 emissions	33.5	(ZC8)

Result:

Credits awarded for Ene 1 = 3.6

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 39.12

Credits awarded for Ene 2 = 6.9

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		40.19	
Standard DER		19.47	
Actual Case CO2 emissions		33.48	
Actual DER		12.76	
Reduction in CO2 emissions	16.7		

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA. It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
 Property Address:
 Building regulation assessment

TER kg/m²/year
 16.34
 DER 11.74

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		11.74	(ZC1)
TER		16.34	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		11.74	
% improvement DER/TER	28.2		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	11.74	(ZC1)
CO2 emissions from appliances, equation (L14)	17.45	(ZC2)
CO2 emissions from cooking, equation (L16)	3.27	(ZC3)
Net CO2 emissions	32.5	(ZC8)

Result:

Credits awarded for Ene 1 = 3.3

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 33.15

Credits awarded for Ene 2 = 8.6

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		38.93	
Standard DER		18.21	
Actual Case CO2 emissions		32.46	
Actual DER		11.74	

Reduction in CO2 emissions 16.62

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
 Property Address:
 Building regulation assessment

TER kg/m²/year
 16.34
 DER 11.24

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		11.24	(ZC1)
TER		16.34	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		11.24	
% improvement DER/TER	31.2		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	11.24	(ZC1)
CO2 emissions from appliances, equation (L14)	17.45	(ZC2)
CO2 emissions from cooking, equation (L16)	3.27	(ZC3)
Net CO2 emissions	32	(ZC8)

Result:

Credits awarded for Ene 1 = 3.6

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 28.14

Credits awarded for Ene 2 = 9

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		38.35	
Standard DER		17.63	
Actual Case CO2 emissions		31.96	
Actual DER		11.24	

Reduction in CO2 emissions 16.66

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
Property Address:
Building regulation assessment

	kg/m ² /year
TER	16.09
DER	10.96

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		10.96	(ZC1)
TER		16.09	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.96	
% improvement DER/TER	31.9		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	10.96	(ZC1)
CO2 emissions from appliances, equation (L14)	16.95	(ZC2)
CO2 emissions from cooking, equation (L16)	2.71	(ZC3)
Net CO2 emissions	30.6	(ZC8)

Result:

Credits awarded for Ene 1 = 3.6

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 32.67

Credits awarded for Ene 2 = 8.8

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year
Standard Case CO2 emissions		36.03
Standard DER		16.37
Actual Case CO2 emissions		30.62
Actual DER		10.96

Reduction in CO2 emissions 15.02

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
Property Address:
Building regulation assessment

	kg/m ² /year
TER	18.67
DER	13.62

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		13.62	(ZC1)
TER		18.67	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		13.62	
% improvement DER/TER	27		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	13.62	(ZC1)
CO2 emissions from appliances, equation (L14)	16.95	(ZC2)
CO2 emissions from cooking, equation (L16)	2.71	(ZC3)
Net CO2 emissions	33.3	(ZC8)

Result:

Credits awarded for Ene 1 = 3.2

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 47.36

Credits awarded for Ene 2 = 3.2

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year
Standard Case CO2 emissions		39.34
Standard DER		19.68
Actual Case CO2 emissions		33.28
Actual DER		13.62

Reduction in CO2 emissions 15.4

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
 Property Address:
 Building regulation assessment

TER kg/m²/year
 16.09
 DER 11.52

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		11.52	(ZC1)
TER		16.09	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		11.52	
% improvement DER/TER	28.4		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	11.52	(ZC1)
CO2 emissions from appliances, equation (L14)	16.95	(ZC2)
CO2 emissions from cooking, equation (L16)	2.71	(ZC3)
Net CO2 emissions	31.2	(ZC8)

Result:

Credits awarded for Ene 1 = 3.3

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 37.06

Credits awarded for Ene 2 = 7.5

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year
Standard Case CO2 emissions		36.71
Standard DER		17.05
Actual Case CO2 emissions		31.18
Actual DER		11.52
Reduction in CO2 emissions	15.06	

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited QODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
 Property Address:
 Building regulation assessment

TER kg/m²/year
 18.67
 DER 13.4

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		13.4	(ZC1)
TER		18.67	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		13.4	
% improvement DER/TER	28.2		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	13.4	(ZC1)
CO2 emissions from appliances, equation (L14)	16.95	(ZC2)
CO2 emissions from cooking, equation (L16)	2.71	(ZC3)
Net CO2 emissions	33.1	(ZC8)

Result:

Credits awarded for Ene 1 = 3.3

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 48.38

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year
Standard Case CO2 emissions		39.05
Standard DER		19.39
Actual Case CO2 emissions		33.06
Actual DER		13.4
Reduction in CO2 emissions	15.34	

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kW_e or 300kWh must be certified.
- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited QODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name:

Assessor Number:

Property Address:

Building regulation assessment

	kg/m ² /year
TER	15.22
DER	10.77

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		10.77	(ZC1)
TER		15.22	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.77	
% improvement DER/TER	29.2		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	10.77	(ZC1)
CO2 emissions from appliances, equation (L14)	16.65	(ZC2)
CO2 emissions from cooking, equation (L16)	2.48	(ZC3)
Net CO2 emissions	29.9	(ZC8)

Result:

Credits awarded for Ene 1 = 3.4

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 33.28

Credits awarded for Ene 2 = 8.6

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year
Standard Case CO2 emissions		34.94
Standard DER		15.81
Actual Case CO2 emissions		29.9
Actual DER		10.77

Reduction in CO2 emissions 14.42

Credits awarded for Ene 7 = 1

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited OGDIA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name:

Assessor Number:

Property Address:

Building regulation assessment

	kg/m ² /year
TER	17.67
DER	12.43

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		12.43	(ZC1)
TER		17.67	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		12.43	
% improvement DER/TER	29.7		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	12.43	(ZC1)
CO2 emissions from appliances, equation (L14)	16.65	(ZC2)
CO2 emissions from cooking, equation (L16)	2.48	(ZC3)
Net CO2 emissions	31.6	(ZC8)

Result:

Credits awarded for Ene 1 = 3.4

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 43.77

Credits awarded for Ene 2 = 4.6

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year
Standard Case CO2 emissions		37.05
Standard DER		17.92
Actual Case CO2 emissions		31.56
Actual DER		12.43

Reduction in CO2 emissions 14.82

Credits awarded for Ene 7 = 1

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited OGDIA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
 Property Address:
 Building regulation assessment

TER 14.26 kg/m²/year
 DER 10.05
 The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		10.05	(ZC1)
TER		14.26	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.05	
% improvement DER/TER	29.5		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	10.05	(ZC1)
CO2 emissions from appliances, equation (L14)	16.65	(ZC2)
CO2 emissions from cooking, equation (L16)	2.48	(ZC3)
Net CO2 emissions	29.2	(ZC8)

Result:

Credits awarded for Ene 1 = 3.4
 Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 28.43
 Credits awarded for Ene 2 = 9

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		34.04	
Standard DER		14.91	
Actual Case CO2 emissions		29.18	
Actual DER		10.05	
Reduction in CO2 emissions	14.28		

Credits awarded for Ene 7 = 1

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA. It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Assessor Number:
 Property Address:
 Building regulation assessment

TER 16.7 kg/m²/year
 DER 11.68
 The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2009 DER Worksheet		11.68	(ZC1)
TER		16.7	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		11.68	
% improvement DER/TER	30.1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	11.68	(ZC1)
CO2 emissions from appliances, equation (L14)	16.65	(ZC2)
CO2 emissions from cooking, equation (L16)	2.48	(ZC3)
Net CO2 emissions	30.8	(ZC8)

Result:

Credits awarded for Ene 1 = 3.5
 Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 39.18
 Credits awarded for Ene 2 = 6.9

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		36.08	
Standard DER		16.95	
Actual Case CO2 emissions		30.81	
Actual DER		11.68	
Reduction in CO2 emissions	14.61		

Credits awarded for Ene 7 = 1

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

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- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA. It is the responsibility of the Accredited ODEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

ENHANCED FABRIC

SAP Inputs

Thermal Mass

Floor U-Value

Roof U-Value

External Wall U-Value

Windows U-Value

Air Permeability

Ventilation

Y - Value

Medium MF

0.1 MF

0.1 MF

0.14 MF

1.2 MF

3 MF

sfp = 0.6, heat MTT

0.08

SAP ACCREDITED DETAILS

Nomenclature

Type

Orientation

1 NW

2

SE,

e.g.

[3,

							IF NO	Ene02 Calc. Needs attention to account for decimals!											
BLOCK	FLOOR LEVEL	TYPE	ORIENTATION	ASPECT	HEIGHT	SAP REF.	DEFINE EQUIVALENT	DFEE kWhr/(m2.yr)	Ene02 DFEE CISH Score	Area m2	TOTAL AREA M2	Proportion of Total FL Area	Average Weighting	Weighting Factor	Ene01 Weighted % Improvement	Ene02 Weighted DFEE kWhr/(m2.yr)	Ene02 Weighted DFEE kWhr/(m2.yr)	ARCHITECT REF	
	0	1	SE	D	G	Type 1SEDG		49.3	0.0	108.7	760.9	7%	3%	221%	89%	108.8	0.0	Duplex	
	0	1	NW	D	G	Type 1NWDG		48.8	0.0	108.7	978.3	9%	3%	284%	113%	138.4	0.0	Duplex	
	0	2	NW	D	G	Type 2NWDG		55.4	0.0	103.3	103.3	1%	3%	30%	12%	16.6	0.0		
	0	1.1	NW	D	G	Type 1.1NWDG			0.0	127.0	0.0	0%	0%	0%	0%	0.0	0.0	Duplex	
	0	1.2	NW	D	G	Type 1.2NWDG			0.0	120.3	0.0	0%	0%	0%	0%	0.0	0.0	Duplex	
	0	1.3	NW	D	G	Type 1.3NWDG			0.0	103.3	0.0	0%	0%	0%	0%	0.0	0.0		
	1	3.1	SE	D	M	Type 3.1SEDM			0.0	61.5	0.0	0%	0%	0%	0%	0.0	0.0		
	1	3.1	S	S	M	Type 3.1SSM	Type 3SESM	33.2	8.0	61.5	61.5	1%	3%	18%	5%	5.9	1.4		
	1	3.1	NW	S	M	Type 3.1NWSM	Type 3NWSM	28.1	9.0	61.5	123.0	1%	3%	36%	11%	10.0	3.2		
	1	3.1	NW	D	M	Type 3.1NWDM			0.0	61.5	0.0	0%	0%	0%	0%	0.0	0.0	1B 2P	
	1	3.2	NE	D	R	Type 3.2NEDR			0.0	0.0	0.0	0%	0%	0%	0%	0.0	0.0	1B 2P	
	1	3.3	NE	D	R	Type 3.3NEDR			0.0	0.0	0.0	0%	0%	0%	0%	0.0	0.0	1B 2P	
	1	3.4	NE	D	M	Type 3.4NEDM			0.0	51.0	0.0	0%	0%	0%	0%	0.0	0.0		
	2 - 9	3	SE	S	M	Type 3SESM		33.2	8.0	48.4	823.1	7%	3%	239%	67%	79.1	19.1	1B 2P	
	2 - 9	3	SE	S	R	Type 3SESR		28.1	9.0	48.4	193.7	2%	3%	56%	16%	15.8	5.1	1B 2P	
	2 - 9	3	NW	S	M	Type 3NWSM		28.1	9.0	48.4	0.0	0%	0%	0%	0%	0.0	0.0	1B 2P	
	2 - 9	3	NW	S	R	Type 3NWSR		39.1	6.0	48.4	0.0	0%	0%	0%	0%	0.0	0.0	1B 2P	
	2 - 9	3.5	NW	S	M	Type 3.5NWSM	Type 3NWSM	28.1	9.0	53.0	265.0	2%	3%	77%	24%	21.6	6.9		
	2 - 9	3.5	SE	S	M	Type 3.5SESM	Type 3SESM	33.2	8.0	53.0	424.0	4%	3%	123%	35%	40.7	9.8		
	2 - 9	3.5	NW	S	R	Type 3.5NWSR	Type 3NWSR	39.1	6.0	53.0	53.0	0%	3%	15%	5%	6.0	0.9	1B 2P	
	2 - 9	3.5	SE	S	R	Type 3.5SESR	Type 3SESR	28.1	9.0	53.0	106.0	1%	3%	31%	9%	8.6	2.8	1B 2P	
	2 - 9	4	NE	D	M	Type 4NEDM		32.4	8.0	61.9	556.7	5%	3%	161%	37%	52.2	12.9	1B 2P	
	2 - 9	4	NE	D	R	Type 4NEDR		47.4	3.0	61.9	123.7	1%	3%	36%	8%	17.0	1.1	1B 2P	
	2 - 9	4	S	D	M	Type 4SDM		37.1	7.0	61.9	989.8	9%	3%	287%	81%	106.3	20.1	1B 2P	
	2 - 9	4	S	D	R	Type 4SDR		48.4	0.0	61.9	185.6	2%	3%	54%	15%	26.0	0.0	1B 2P	
A	2 - 9	6	NW	D	M	Type 6NWDM		33.3	8.0	73.4	880.8	8%	3%	255%	90%	85.0	20.4	1B 2P	
A	2 - 9	6	NW	D	R	Type 6NWDR		43.8	4.0	73.4	146.8	1%	3%	43%	13%	18.6	1.7	1B 2P	
A	2 - 9	6	NW-2	D	M	Type 6NW-2DM		38.9	7.0	73.4	807.4	7%	3%	234%	57%	91.0	16.4	1B 2P	
A	2 - 9	6	NW-2	D	R	Type 6NW-2DR		49.6	0.0	73.4	146.8	1%	3%	43%	10%	21.1	0.0	1B 2P	
B	2 - 9	6	SE	D	M	Type 6SEDM		38.4	7.0	73.4	880.8	8%	3%	255%	63%	97.9	17.9	1B 2P	
B	2 - 9	6	SE	D	R	Type 6SEDR		49.1	0.0	73.4	146.8	1%	3%	43%	11%	20.9	0.0	1B 2P	
B	2 - 9	6	SE-2	D	M	Type 6SE-2DM		40.6	6.0	73.4	367.0	3%	3%	106%	24%	43.2	6.4	1B 2P	
B	2 - 9	6	SE-2	D	R	Type 6SE-2DR		51.3	0.0	73.4	73.4	1%	3%	21%	5%	10.9	0.0	1B 2P	
	2 - 9	6	NW	S	M	Type 6NWSM		28.4	9.0	73.4	513.8	5%	3%	149%	44%	42.3	13.4		
	2 - 9	6	NW	S	R	Type 6NWSR		39.2	6.0	73.4	73.4	1%	3%	21%	6%	8.3	1.3		
	2 - 9	7	NE	D	M	Type 7NEDM		40.1	6.0	73.2	366.0	3%	3%	106%	26%	42.5	6.4		
	2 - 9	7	NE	D	R	Type 7NEDR		50.1	0.0	73.2	73.2	1%	3%	21%	5%	10.6	0.0		
	2 - 9	8	NW	D	M	Type 8NWDM		36.8	7.0	70.7	353.5	3%	3%	102%	25%	37.7	7.2		
	2 - 9	8	NW	D	R	Type 8NWDR		47.6	3.0	70.7	70.7	1%	3%	20%	5%	9.8	0.6		
	2 - 9	9	SW	D	M	Type 9SWDM	Type 6SE-2DM	40.6	6.0	60.4	302.0	3%	3%	88%	20%	35.5	5.3		
	2 - 9	9	SW	D	R	Type 9SWDR	Type 6SE-2DR	51.3	0.0	60.4	60.4	1%	3%	18%	4%	9.0	0.0		
	2 - 9	9	NW	D	M	Type 9NWDM	Type 6NW-2DM	38.9	7.0	62.1	310.5	3%	3%	90%	22%	35.0	6.3		
	2 - 9	9	NW	D	R	Type 9NWDR	Type 6NW-2DR	49.6	0.0	62.1	62.1	1%	3%	18%	4%	8.9	0.0		

11383.02

1.00

1.00

29%

38.8

7.0

