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ENERGY STATEMENT (SAP COMPLIANCE)

TEMPLE DINSLEY

PRESTON, HITCHIN, HERTFORDSHIRE, SG4 7RT

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All information provided here is based on plans and information available at the time of writing. Prior to implementation of the options discussed, further detailed study, design, and costing, based on ground surveys, structural analysis, over shading studies, etc., as relevant to each renewable/low carbon source, is necessary.

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1. EXECUTIVE SUMMARY

This report describes the development of the climate change and energy strategy for the proposed development 'Temple Dinsley, Preston, Hitchin, Hertfordshire, SG4 7RT.

The scope of this project encompasses the retrofitting the Teaching and Main Blocks into 43 new flats, the construction of 24 new dwelling houses, and the conversion of the existing pump and tank houses into residential dwellings. This energy statement focuses on the 24 no. new dwelling houses which were investigated to test compliance with Part L Volume 1 (2021) of the Building Regulations. The SAP calculations have demonstrated the proposed construction is an efficient building that fully complies with the regulations.

Additionally, the statement has been prepared to satisfy the planning requirements to grant a permission for the development.

The following three-step energy hierarchy has been adopted:

- **Be Lean:** High specification of building fabric and energy efficient services to minimise energy demand, including natural ventilation through openable windows.
- **Be Clean:** The site is not currently suitable for a local CHP system or connection to a district network. Therefore, no carbon savings are possible using this measure.
- **Be Green:** The heating and hot water for all houses will be provided by Air Source Heat Pumps (ASHPs) with additional carbon offset from photovoltaics (PV Panels).

Local Plan Policies of the North Herts Council require sustainable practices to be applied to all new buildings and there is an aspiration to achieve NHDC Gold Standard. For these developments the target is to achieve 50% renewable energy on site and a Passivhaus or LETI build standard. NB: The LETI Gold requirement is 100% renewable energy on site.

In summary, the strategy detailed in this statement demonstrates a carbon emission reduction of 111% against SAP 10 baseline for the new residential dwellings.

Through a combination of these measures the design aims to meet the planning requirements.

- North Herts Council requirement:

The pre-app sets out the minimum targets for the new and existing buildings. The following target has been proposed for the development.

New buildings – Energy Efficiency	NHC Gold Level, LETI Target
New buildings – Renewable Energy	NHC Gold Level, LETI 100% renewable generation on-site
Existing buildings – Energy Efficiency	NHC Silver Level, Meet STBA WHLP

Existing buildings – Renewable Energy	NHC Silver Level, 25% renewable generation on-site
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- Part L 2021 Building Regulations: The proposed design for the new dwelling houses is intended to minimise carbon emissions; thus, with the incorporation of efficient systems and on-site renewables in the form of PV and Heat Pump, we achieve an improvement of **111.0%** in carbon emissions over the 2021 Building Regulations.

Carbon Emission Reduction – New build

Residential Emissions	Regulated Emissions (tonnes CO ₂ /annum)	Regulated tonnes CO ₂ /annum savings per stage	Regulated (%) CO ₂ emission saving per stage
Baseline	31.3	-	
Be Lean	16.8	14.5	46.0%
Be Clean	16.8	0.0	0.0%
Be Green	-3.60	20.3	65.0%
Cumulative on-site savings		34.8	111.0%

Table 1: Carbon Reduction

Building Regulations Requirements

For the proposed design, the Dwelling Emission Rate, Fabric Energy Efficiency and Primary Energy Rate compliance with the domestic Part L1 Volume 1 2021 targets for each dwelling has been demonstrated as compliant.

The calculated carbon emission rate for the proposed development is lower than the Part L Volume 1 (2021) target.

The full results from the SAP calculations showing compliance against TER (Target Emission Rate), TFEE (Target Fabric Energy Efficiency) and TPER (Target Primary Energy Rate) has been shown in Section 4.3

2. INTRODUCTION

This energy statement has been prepared by CBG Consultants on behalf of Studio Cullinan and Buck Architects Ltd. ("Applicant") in support of its planning application for the proposed development.

Description of the project

The proposed development comprises the conversion of the existing Grade II* listed building from educational use to residential, demolition of various buildings and the erection of new dwellings, creation of car parking, restoration of gardens. A total of 69 dwellings are proposed as part of this inquiry with 43 units within existing buildings, 2 conversions, and 24 new dwelling houses. The proposed development is a mix of existing and new buildings.

The site is located within the Preston Conservation Area and within the Green Belt.



Figure 1: Proposed site plan.



The accommodation types for development are listed below:

- The existing Old House, East Wing, West Wing, West Spur, and East Annexe will now be renamed to Main Building and will house 35No. flats.
- The existing Teaching Block will be converted to 8No. flats.
- The existing Sports Hall will be demolished, and Sadleir House built in its place (6No. dwellings).
- The existing Science Block will be demolished and Edwin House (4No. dwellings) will be built.
- Barn 1 will be demolished and Summer House (1No. dwelling) created in its place.
- Templars House (2No. dwellings), Harwood House (1No. dwelling) & Violet House (4No. dwellings) will all be newly built dwellings onsite.
- The existing Stables will be demolished, and Ithel House (6No. dwellings) will be built in the same location.
- The existing Pump House (1No. dwelling) and Tank House (1No. dwelling) will be converted to new residences.



3. PLANNING POLICIES

This Climate change and energy statement addresses local and National planning policies which relate to sustainable design and construction mainly contained within the North Hertfordshire Local plan.

national planning policy framework (nppf) 2023

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Chapter 14 Meeting the challenges of climate change, flooding and coastal change

The following paragraphs set out the Government's position in response to reducing carbon emissions:

Paragraph 159. New development should be planned for in ways that:

a. avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b. can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

Paragraph 160. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a. provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b. consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c. identify opportunities for development to draw its energy supply from decentralised, renewable, or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

Paragraph 161. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

Paragraph 162. In determining planning applications, local planning authorities should expect new development to:



a. comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b. take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

Paragraph 163. When determining planning applications for renewable and low carbon development, local planning authorities should:

a. not require applicants to demonstrate the overall need for renewable or low carbon energy and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions.

b. approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas, and

c. in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable.

Paragraph 164. In determining planning applications, local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.

Local policy

North Hertfordshire District Local Plan 2011 - 2031

Preston Neighbourhood Plan

Supplementary Planning Guidance

Below are the main policies deemed relevant to climate change and energy/CO₂ reduction the proposed development needs to adhere to:

Policy D1 - Sustainable Design

Planning permission will be granted provided that development proposals:



- a) Respond positively to the site's local context.*
- b) Take all reasonable opportunities, consistent with the nature and scale of the scheme, to:
 - i. create or enhance public realm.*
 - ii. optimise the potential of the site by incorporating Sustainable Drainage Systems (SuDS);*
 - iii. reduce energy consumption and waste;*
 - iv. retain existing vegetation and propose appropriate new planting;*
 - v. maximise accessibility, legibility and physical and social connectivity both internally and with neighbouring areas;*
 - vi. future proof for changes in technology and lifestyle;*
 - vii. design-out opportunities for crime and anti-social behaviour; and*
 - viii. minimise the visual impact of street furniture and parking provision;**
- c) Have regard to the Design SPD, and any other relevant guidance;*
- d) Within Letchworth Garden City have regard to the Letchworth Garden City Design Principles contained in Appendix 5; and*
- e) For residential schemes, meet or exceed the nationally described space standards and optional water efficiency standards.*

Policy SP9 – Design and Sustainability

The Council considers good design to be a key aspect of sustainable development. We will:

- a) Support new development where it is well designed and located and responds positively to its local context.*
- b) Require Strategic Masterplans to be produced for Strategic Housing Sites and other significant development. Significant development generally comprises residential development of 100 dwellings or more. Exceptionally, developments under 100 dwellings will be considered significant if there are site specific complexities and sensitivities that require a masterplan-led approach. In some circumstances a Strategic Masterplan may also be required to consider the cumulative impact of more than one site to support a co-ordinated and integrated approach to place-making and design.*
- c) Require Strategic Masterplans and planning applications for Strategic Housing Sites and significant development to (as applicable):*



i. create buildings, spaces and streets which positively reflect and respond to the local landscape, townscape and historic character

ii. create integrated, accessible and sustainable transport systems with walking, cycling and public transport designed to be the most attractive forms of transport and effectively linking into the surrounding areas;

iii. provide a clear structure and hierarchy of pedestrian friendly streets and wellconnected footpaths and cycleways integrate with the wider built and natural environment and communities.

iv. plan for integrated and mixed-use communities with walkable locally accessible community, employment and retail facilities;

v. positively integrate with adjacent rural and urban communities and positively contribute to their character and the way the area functions, including addressing cumulative, cross boundary planning and infrastructure matters;

vi. create and accessible multi-functional green infrastructure network that provides:

- key structuring and functional place-making feature supporting healthy lifestyles, sport, play and recreation linking into the wider Green Infrastructure Network; and*
- a high-quality integrated network to support ecological connectivity, biodiversity net gain, climate adaptation and mitigation linking into the wider Ecological Network*

vii. ensure the effective use of sustainable urban drainage and sustainable water management;

viii. ensure a hierarchy of linked, high quality and attractive public spaces and public realm that is safe, attractive and supports social interaction for all age groups; and

ix. design to last with a clear stewardship, management and maintenance strategy

d) Ensure Strategic Masterplans are informed by a technical and design evidence base and include the following for Strategic Housing Sites and where applicable for other significant development:

i. site specific vision and place-making principles

ii. Masterplan setting out the quantum, scale, type, mix and distribution of land uses, housing and community facilities;

iii. Green Infrastructure Framework identifying the scale, distribution, type and design of green spaces, biodiversity net gain, strategic drainage and on and off-site linkages:

iv. Movement Framework setting out the key access points, strategic highways, street hierarchy and footways and cycleways (on and off site) Urban Design Framework and design principles identifying how



the site responds to local character and context and key structuring elements and layout principles (including heights and densities)

v. Sustainability & Energy Framework identifying site-wide and building scale opportunities for low and zero carbon.

vi. Illustrative Masterplan Layout

vii. Infrastructure Delivery, Phasing & Management Strategy

e) Encourage the submission of Strategic Masterplans for the Council's consideration and agreement before the submission of a planning application. We will also confirm the scope and contents of individual Strategic Masterplans with applicants in pre-application discussions. Planning applications must be accompanied by a Strategic Masterplan. Where applications have already been submitted to the Council a Strategic Masterplan should be agreed with the Council prior to or as part of the grant of planning permission. Adherence to the Strategic Masterplan will be secured through planning conditions and/or legal agreement.

f) Assess proposals against detailed policy requirements set out in this Plan and have regard to the Design SPD; and

g) Adopt the Government's additional technical standards for the size of new homes, water efficiency and, in specified circumstances, accessibility.

Policy NE12 – Renewable and low carbon energy development

Proposals for other renewable and low carbon energy development which would contribute towards reducing greenhouse gas emissions will be permitted subject to an assessment of the impacts upon:

- I. Landscape quality, landscape character and visual amenity, including consideration of cumulative impacts of development.*
- II. Environmental assets.*
- III. The historic environment, including the impact on the setting of historic assets.*
- IV. The transport network.*
- V. Air quality.*
- VI. Aviation interests.*
- VII. The amenity of residents.*



Pre-application Advice Dated 21st December 2023

Energy, Sustainable Design and Climate Change Mitigation

The Council passed a Climate Emergency motion in 2019 which pledged to do everything within the Council's power to achieve zero carbon emissions in North Hertfordshire by 2030. The Council has adopted a Climate Change Strategy to promote carbon neutral policies. Adopted Policy DE1 – Sustainable Design – requires developments to consider a number of criteria including the need to reduce energy consumption and waste. The Council are also in the early stages of drafting a Supplementary Planning Document on Energy and Sustainability. This is unlikely to be published until later in 2024. In all probability this SPD will set out a three tiered approach to energy and sustainability – Bronze would mean meeting the current minimum standards, Silver would be an improvement on current standards and Gold would be exemplary standards considerably in excess of minimum standards. Anything in excess of minimum standards would count as a benefit which could be presented as part of a number of cumulative benefits which constitute VSC in relation to Green Belt. This is discussed in more detail in a separate part to this response below.

Any formal planning application should include a detailed Energy and Sustainability Statement. This should be set out in two parts – energy and general sustainability issues. The sustainability issues would generally be site wide cover issues such as biodiversity net gain, sustainable water management, sustainable and active travel measures (including new and improved permissive footpaths), open space provision, waste management and construction methods management and materials. The energy element should be informed by an energy hierarchy which should consider passive design, energy efficiency in construction and the use of low carbon and renewable technologies. As the proposal has two distinct elements to it – the refurbishment and conversion of existing buildings and replacement buildings - there are likely to be different approaches needed to energy. Therefore, the energy element of any supporting statement should set these out separately for clarity.

- **Refurbished buildings – energy efficiency**
The energy efficiency element of the statement should be as a minimum Building Regulations compliant – this would be NHC Bronze Level. In excess of Building Regulations to comprise of Sustainable Traditional Buildings Alliance (STBA) Whole House Plus Level (WHPL) – this would be NHC Silver Level or STBA Whole House Advanced Level – this would be NHC Gold Level.
- **Refurbished buildings – renewable energy**
The energy generation element of the statement should be as a minimum Building Regulations compliant – this would be NHC Bronze Level. In excess of Building Regulations to include at least 25% of needed energy on site from renewables – this would be NHC Silver Level or at least 50% of needed energy on site from renewables – this would be NHC Gold Level.
- **New buildings – energy efficiency**
The energy efficiency element of the statement should be as a minimum demonstrate compliance with national and local policies and the Building Regulations. Meeting the Future

Homes Standard (or equivalent) would be NHC Silver Level. Meeting either Passivhaus or London Energy Transformation Initiative (LETI) standard would be NHC Gold Level.

- New buildings – renewable energy

The energy generation element of the statement should be Building Regulations compliant which would be the equivalent of NHC Bronze Level. Providing at least 20% renewable energy on site would be NHC Silver Level. Providing at least 50% renewable energy on site would be NHC Gold Level. The conservation officer has indicated in principle support for the integration of solar panels on new buildings if viable.

Supplementary Planning Document November 2023

The minimum target requirements are in line with those stated by North Hertfordshire District Council (NHDC). Within this, the client would like to aim for Silver for the existing (refurbished) buildings, which entails the following:

- Energy Efficiency – Equivalent to Sustainable Traditional Building Alliance (STBA) Whole House Advanced which includes the deployment of a district scheme for renewable energy.
- Energy Generation – A minimum of 25% renewable generation onsite.

For the new dwellings, the NHDC Gold standard is the aspiration, specifically the London Energy Transformation Initiative (LETI) for small scale housing, as below:

Small scale housing

Operational energy

Implement the following indicative design measures:

Fabric U-values (W/m².K)

Walls	0.13 - 0.15
Floor	0.08 - 0.10
Roof	0.10 - 0.12
Exposed ceilings/floors	0.13 - 0.18
Windows	0.80 (triple glazing)
Doors	1.00

Efficiency measures

Air tightness	<1 (m ³ /h. m ² @50Pa)
Thermal bridging	0.04 (γ-value)
G-value of glass	0.6 - 0.5
MVHR	90% (efficiency) ≤2m (duct length from unit to external wall)

Window areas guide (% of wall area)

North	10-15%
East	10-15%
South	20-25%
West	10-15%



Balance daylight and overheating



Include external shading



Include openable windows and cross ventilation

Reduce energy consumption to:



Reduce space heating demand to:



Figure 2: LETI Small Scale Housing Requirements and Criteria

- Energy Efficiency – Equivalent to LETI Small Scale Housing with the following targets:



- Energy Use Intensity (EUI) less than **35 kWh/m².annum**
- Space Heating Demand less than **15 kWh/m².annum**

- Energy Generation – NHDC Gold requires a minimum of 50% renewable generation onsite, whilst LETI requires 100% renewable generation onsite. The aspiration is to meet the LETI target in full (100%), with NHDC Gold (50%) being the secondary target.



4. PART L COMPLIANCE

Part L Volume 1 2021 Criteria

As a new build dwelling, the project will need to comply with Part L Volume 1 of the Building Regulations. This document highlights the minimum energy performance requirements for new buildings:

Criterion 1:

“Where a building is erected, it shall not exceed the target CO₂ emission rate for the building that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.”

Criterion 2:

“Where a dwelling is erected, it shall not exceed the target fabric energy efficiency rate for the dwelling that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24”

Criterion 3:

“Where a building is erected, it must not exceed the target primary energy rate for the building which has been approved pursuant to regulation 25(c), applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.”

Part L Compliance Results

The full results summary can be found as below in:

- SAP Input (**Appendix A**)
- Regulation Compliance Report (**Appendix B**)

Part L 2021 Compliance Conclusion

Results show that the percentage improvement in carbon emissions achieved through the proposed passive and active measures and introduction of renewables in the form of PV panels. The below results are taken from the Block Compliance for each building.

Building 3 – Edwin (4 houses)

Fabric Energy Efficiency (kWh/m ² .annum)			Carbon emissions (kgCO ₂ /m ² .annum)			Primary Energy (kWh _{PE} /m ² .annum)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
37.94	29.98	20.96%	10.15	-0.18	102%	52.97	11.24	78.79%

Table 2: Building 3 Edwin SAP Results

Building 4 – Violet (4 houses)

Fabric Energy Efficiency (kWh/m ² .annum)			Carbon emissions (kgCO ₂ /m ² .annum)			Primary Energy (kWh _{PE} /m ² .annum)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
34.43	27.81	19.22%	9.24	0.24	97.46%	48.23	11.94	75.24%

Table 3: Building 4 Violet SAP Results

Building 5 – Sadleir (6 houses)

Fabric Energy Efficiency (kWh/m ² .annum)			Carbon emissions (kgCO ₂ /m ² .annum)			Primary Energy (kWh _{PE} /m ² .annum)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
32.00	26.43	17.39%	8.47	-0.45	105%	44.19	7.41	83.24%

Table 4: Building 5 Sadleir SAP Results

Building 6 – Ithel (6 houses)

Fabric Energy Efficiency (kWh/m ² .annum)			Carbon emissions (kgCO ₂ /m ² .annum)			Primary Energy (kWh _{PE} /m ² .annum)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
31.06	23.65	23.85%	8.51	-0.81	109%	44.21	4.82	89.10%

Table 5: Building 6 Ithel SAP Results

Building 7 – Templar (2 houses)

Fabric Energy Efficiency (kWh/m ² .annum)			Carbon emissions (kgCO ₂ /m ² .annum)			Primary Energy (kWh _{PE} /m ² .annum)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
41.05	33.52	18.35%	9.89	-7.29	173%	51.63	-22.98	144%

Table 6: Building 7 Templar SAP Results

Building 8 – Summer House (1 house)

Fabric Energy Efficiency (kWh/m ² .annum)			Carbon emissions (kgCO ₂ /m ² .annum)			Primary Energy (kWh _{PE} /m ² .annum)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
49.00	36.54	25.43%	8.37	-0.98	111%	44.86	3.96	91.17%

Table 7: Building 8 Summer House SAP Results

Building 9 – Harwood House (1 house)

Fabric Energy Efficiency (kWh/m ² .annum)			Carbon emissions (kgCO ₂ /m ² .annum)			Primary Energy (kWh _{PE} /m ² .annum)		
TFEE	DFEE	Improvement	TER	DER	Improvement	TPER	DPER	Improvement
49.08	36.72	25.18%	8.38	-0.98	111%	44.91	3.98	91.14%

Table 8: Building 9 Hardwood House SAP Results



5. ENERGY STRATEGY

The following hierarchy has been followed with regards to optimising energy use:

- Be Lean – Use Less Energy
- Be Clean – Efficient Energy Supply
- Be Green – Renewable Energy

Following the energy hierarchy, the approach focuses on managing the energy demand of the development through a 'fabric first' method. This is the most effective way to reduce energy consumption and CO₂ emissions. Additional energy reductions will be achieved by specifying high efficiency building services to minimise energy losses in supply, storage, and distribution.

After reducing demand, further CO₂ emission reductions will be attained by utilising clean energy sources where possible and integrating appropriate renewable and low-carbon technologies. The feasibility of these renewable and low-carbon technologies is discussed in the following section.

Baseline

The baseline CO₂ emissions are calculated from the 'notional' building using the Part L software tools. The 'notional' building consists of standard set of fabric and services parameters which deliver the Target Emissions Rate. This is then used as the Baseline emissions from which savings from 'Be Lean, Be Clean, Be Green' measures are calculated.

Table 9 below shows the regulated and unregulated baseline figures.

	Carbon Dioxide Emissions (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline	31.3	-

Table 9: Baseline Carbon Emissions for the new build dwellings

6. DEMAND REDUCTION (BE LEAN)

Passive Measures

In this section, a number of passive measures are proposed prior to the implementation of LZC technologies. In general, the “fabric first” approach is being followed so as to lower the energy demand as much as possible, followed the proposal of efficient systems and finally the application of low-carbon and renewable energy systems.

New Build Fabric

A key component for Part L Volume 1 2021 is the Fabric Energy Efficiency Standard (FEES), which sets a target figure in kWh/m² for energy demand in new dwellings. FEES is assessed using Dwelling Fabric Energy Efficiency (DFEE) and Target Fabric Energy Efficiency (TFEE) values and can only be improved through the building fabric.

Table 10 shows how the U-values and airtightness of the development has been improved from the notional standards set out in Part L. The proposal also meets the LETI standards for Small scale housing.

Element	Targeted value	Part L Notional value	Improvement over Notional value	LETI Target	LETI Fabric Compliance
Exposed Wall U-value (W/m ² .K)	0.15	0.18	16.66%	0.13-0.15	LETI Compliant
Dormer Wall U-value (W/m ² .K)	0.15	0.18	16.66%	0.13-0.15	LETI Compliant
Ground Floor/ Exposed Floor U-value (W/m ² .K)	0.10	0.13	23.07%	0.08-0.10	LETI Compliant
Flat Roof U-value (W/m ² .K)	0.11	0.11	0%	0.10-0.12	LETI Compliant
Pitched Roof/ Dormer Roof U-value (W/m ² .K)	0.11	0.11	0%	0.10-0.12	LETI Compliant
Glazing U-value (W/m ² .K)	1.0 (Triple) 0.5 (Quadruple)	1.2	16.66%/ 58.33%	0.8 (triple)	LETI Compliant
Rooflight U-value (W/m ² .K)	1.0	1.2	16.66%/ 58.33%	0.8 (triple)	LETI Compliant
Airtightness (m ³ /m ² .h)	1	5	80%	<1	LETI Compliant

Table 10: Targeted values compared with Part L Notional and LETI values



Existing Build Fabric

The site consists of Grade II listed buildings. Care would be taken to improve the fabric were practically possible. For the Main Building and Teaching Block, the fabric upgraded will be carried out based on discussion with the conservative/ building control officer.

The table below shows the targeted U values for improved thermal elements.

Element	Targeted U value (W/m ² .K)	Part L Volume 1 Benchmark U value (W/m ² .K)
Exposed Wall U-value	0.30	0.30
Ground Floor/ Exposed Floor U-value	0.25	0.25
Roof U-value	0.16	0.16

Table 10: Targeted values compared with Part L minimum for existing buildings*

*Subject to discussions with conservative/ building control officer as Grade II listed buildings.

Thermal bridging

Part L1 2021 places an increased importance on addressing thermal bridging. Thermal bridging can be minimised through careful detailing or the use of Recognised Construction Details (RCDs). For this assessment, RCDs details have been employed for all junction types. However, if RCDs are used, the ψ value has to reach 0.04 W/mK as per the calculations.

Natural Ventilation

Although natural ventilation will not be the sole method of ventilating the development, it has been taken into account so as to minimise the use of the mechanical ventilation and therefore reduce the energy usage.

Summary of passive measures

- High levels of insulation- keep heat in
- Low energy glazing- keep heat in
- Airtight construction- keep warm air inside
- Good daylight- reduce artificial lighting
- Low flow taps- reduce hot water use



Active measures

There is now a clear movement away from fossil fuels across many different industries including construction. Electricity has emerged as the obvious replacement; however, the relatively high fuel cost means that heat pump technology is favoured to manage the running costs. Another key advantage of using electricity is that there are various means for it to be generated with next to no impact on climate change.

The following active measures have been used:

Space heating

Heating for the new dwelling houses will be provided by high efficiency air source heat pump. Time and temperature zone control by suitable arrangement of plumbing and electrical services.

Heating for Main Building and Teaching Block will be provided via community ASHP.

Heating for Tank House and Pump House will be provided via individual ASHP.

Domestic Hot Water

Domestic hot water for new dwelling houses will be provided via Air Source Heat Pump. All primary pipework will be insulated.

Domestic hot water for Main Building and Teaching Block will be provided via community heating system providing instantaneous hot water via Heat Interface Unit (HIU).

Ventilation

The MVHR units are proposed for all the new dwellings for better indoor air quality.

The ventilation for the Main Building and Teaching Block will be predominantly via natural ventilation through openable windows and extract fans to wet areas.

Lighting

The following measures will be considered in the detailed lighting design:

- Use of energy efficient light fittings to achieve improved lumens per circuit watt beyond the minimum requirements of the Building Regulations Part L 2021.
- PIR lighting sensors for selected areas to minimise energy use in unoccupied areas where appropriate; and
- Photocells to automatically turn off lighting in appropriate areas, such as external lighting, where daylight levels are sufficient.



Summary of active measures

- Natural ventilation through openable windows to reduce energy use
- Mechanical Ventilation with Heat Recovery (MVHR)
- LED lighting and controls
- High efficiency air source heat pump system
- Time and temperature zone control

Carbon Emissions Reduction

Table 11 shows the resulting carbon emissions of the development before and after applying the “Be Lean” measures outlined above.

As shown, the carbon emissions are predicted to be lower than the base case. This is due to the high performance of building fabric and services. Through the “Be Lean” measures, an improvement of **46.0%** can be achieved.

	Regulated Carbon Dioxide Emissions	
	Tonnes CO ₂ per annum	Savings (%)
Baseline	31.3	-
Be Lean	16.8	46.0%

Table 11: Be Lean Reduction in Carbon Emissions for New Built Dwellings

7. SYSTEM EFFICIENCY (BE CLEAN)

Local Site CHP

Residential sites typically provide only small electrical baseloads making this technology unsuitable and economically unfeasible to operate. In order for the use of CHP to be viable it is essential that the demand for heat and electricity are simultaneous. This is often a problem in the summer months as the need for heating is reduced, whilst the electricity demand remains fairly constant. Additionally, the installation of a CHP requires large up-front capital investment.

Connection to District Heating Network

The map below shows the opportunity for district heat networks in Hertfordshire. The site is not in proximity to any potential heat network. However, by using a communal heating system in the development, a future connection would not be compromised.

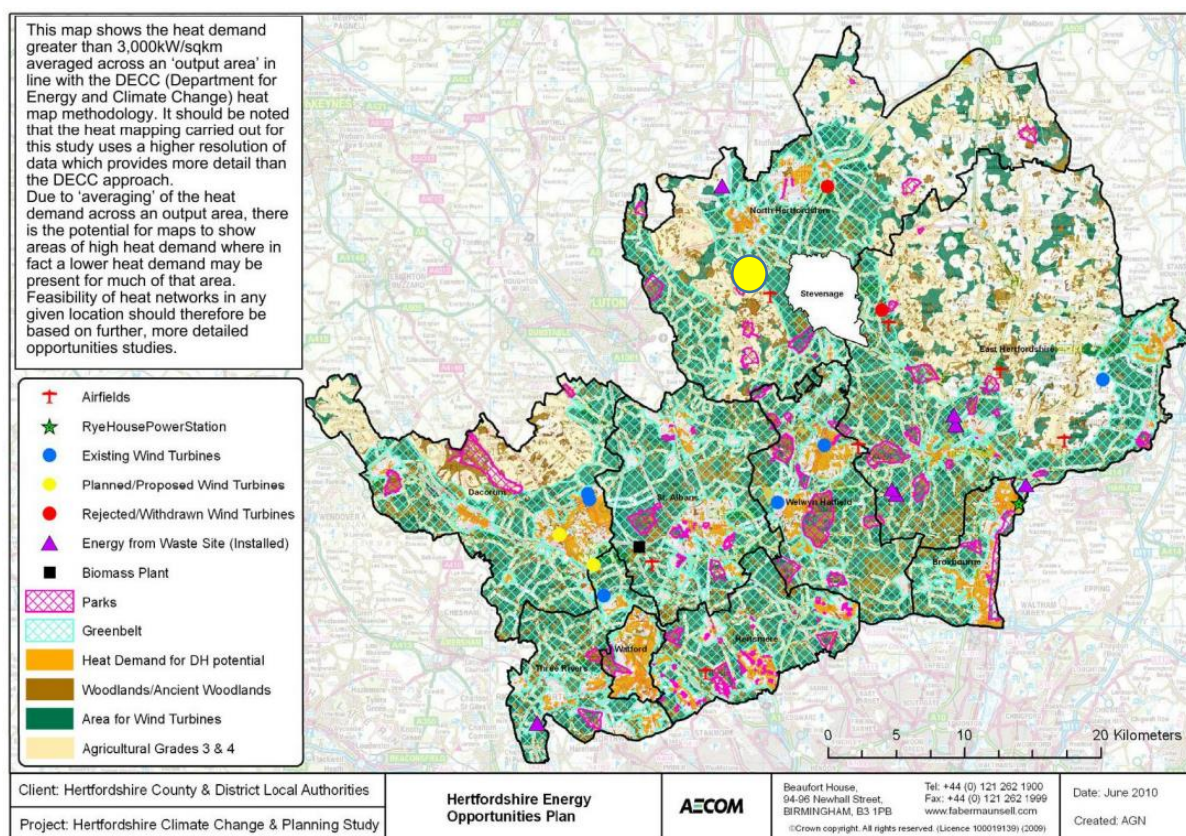


Figure 3: Heat Map Hertfordshire

For the above reason connection to a district heating network has been ruled out as an option.

Carbon Emissions Reduction

Since a district heating connection, or on-site CHP is unviable, no carbon emissions reductions are available using these measures.

8. RENEWABLE ENERGY (BE GREEN)

An initial review was conducted to eliminate any technologies which from the outset have been identified as unviable. This can be found in Appendix 3: Preliminary Appraisal of Renewable Energy Options.

From this study, Solar PV has been identified as the most effective technology for the development.

8.1 Solar Photovoltaic

Solar photovoltaic panels provide renewable electricity to a building. To maximise efficiency, panels should be South oriented with an elevation of 10-45°. There must be minimal shading of the panels as shading will reduce performance.

The panels require little maintenance although the inverters (which convert the generated DC power to AC for use in the building) are likely to require replacement every 10-15 years.

For new build dwelling houses, PV panels can be placed on the pitched roof without any significant overshadowing problems (Figure 3). Therefore, we have assumed some minor level of shading from the surrounding trees and buildings ("None or very little").

PV Type and Location

Car Park

The client has identified the roof of the proposed car park for a slightly inclined (4°) roof mounted array. In total, the available area on the roof totals to 1255m² of which 29% will be shaded by neighbouring trees.

Based on the area provided and type of installation, the roof of the car park may have solar PV panels as per below.



Figure 4: Example Car Park Solar PV Array

Dwelling Roof

To meet the above targets, additional PV may be required on the dwelling roofs. However, as aesthetics is a priority, PV slates are suggested as preferable compared to a traditional PV panel. These panels are designed and sized to look like traditional slate roofs and require no additional planning permission beyond re-slating a roof (see image below). The drawback with this technology is PV Slates are typically more expensive and provide approximately 70% of the yield per unit area when compared to 'traditional' PV panels on buildings so paybacks are generally longer. As PV is being deployed on new buildings only, finally implications will not be a limiting factor.



Figure 5: PV Slate System

The following roofs have been provisionally selected for further analysis to meet energy offsetting targets which are listed below:

- South facing Roof on Ithel – 187m² on a 50° pitch
- West facing roof on Violet– 128m² on a 50° pitch
- South-east and South-west facing roof on Templar– 180m² on a 50° pitch

Electricity Consumption

Given the desire from the Client to achieve NHDC Silver and Gold Standards, 25% of the Main Building and Teaching Block & 50% of the new dwelling's consumption will have to be offset via renewable generation. However, if LETI is being targeted for the new build dwelling, 100% of the new-build dwellings' consumption will have to be offset.

Using the Microgeneration Certification Scheme (MCS) calculation, the outputs of Scenarios 1-4 are tabularised below.

Calculation Parameters & Outputs	Scenario 1 – ASHP, NHDC Requirement	Scenario 2 – ASHP, LETI Target	Scenario 3 – GSHP, NHDC Requirement	Scenario 4 – GSHP, LETI Target
Total Consumption of Main Building & Teaching Block (kWh/annum) ¹	436,542	436,542	369,828	369,828
Total Consumption of New Dwellings (kWh/annum)	135,415	135,415	135,415	135,415
No. of PV Panels ²	540			
No. PV Slates ³	2,736			
Solar kWp Output	301			
Total Annual Yield (kWh/annum)	244,450			
Minimum Consumption Offset (kWh/annum)	176,843	244,550	160,164	227,872
PV Yield vs Consumption (kWh/annum)	+67,607 (+38%)	0 (+0%)	+84,285 (+53%)	+16,578 (+7%)

Table 12: Site Wide PV calculations

¹ Only accounts for internal consumption and not distribution losses within the heat network.

² Based on Sunpower Maxeon 3 430W

³ Based on GB Sol PV Slate – 500x300mm

From the table above, regardless of which LZC heat pump deployed and the consumption offset target, an excess yield will be seen.

For a full assessment of renewable feasibility including PV and ASHP, please refer to ‘11951-CBG-XX-XX-RP-ME-90003_P02 – Feasibility Report’.



8.2 Carbon Emissions Reduction

Following the energy hierarchy, reductions in regulated energy requirements and associated CO₂ emissions have been made at each stage as demonstrated in Table 13. The strategy detailed in Be Green stage demonstrates a further carbon emission reduction of **65%** against SAP 10 baseline for the new built dwellings. In total, the new built dwelling houses achieves **111%** CO₂ emission reduction against SAP 10 baseline which is zero carbon emissions on the regulated energy use.

	Regulated Carbon Dioxide Emissions	
	Tonnes CO ₂ per annum	Savings (%)
Baseline	31.3	-
Be Lean	16.8	46%
Be Clean	16.8	0
Be Green	-3.60	65%
Total Savings	34.8	111%

Table 13: Be Lean, Be Clean, Be Green Reductions in Carbon Emissions for New Built Dwellings

9. LETI TARGET - SMALL SCALE HOUSING SPACE HEATING DEMAND

The results below show the space heating demand derived from the SAP calculations.

The overall space heating demand for new built dwelling is less than the LETI target of 15 kWh/m².yr and therefore compliant.

	Space Heating Demand (kWh/m ² .yr)	LETI Compliant
Edwin House 1	10.87	Compliant
Edwin House 2	9.7	Compliant
Edwin House 3	13.14	Compliant
Edwin House 4	10.58	Compliant
Sadleir House 1	10	Compliant
Sadleir House 2	7.85	Compliant
Sadleir House 3	4.99	Compliant
Sadleir House 4	4.9	Compliant
Sadleir House 5	7.81	Compliant
Sadleir House 6	10.56	Compliant
Ithel House 1	8.27	Compliant
Ithel House 2	4.33	Compliant
Ithel House 3	4.33	Compliant
Ithel House 4	4.7	Compliant
Ithel House 5	5.21	Compliant
Ithel House 6	9.65	Compliant
Violet House 1	11.26	Compliant
Violet House 2	8.04	Compliant
Violet House 3	7.39	Compliant
Violet House 4	11.12	Compliant
Templar House 1	12.24	Compliant
Templar House 2	14.4	Compliant
Area Weighted Average	9.718	Compliant

Table 14: Space heating Demand – SAP calculations

10. APPENDIX 1: KEY MODELLING INPUTS – NEW BUILD DWELLINGS

SAP Specification for new build dwellings

The following input were used in creating the FSAP 10.2 model:

Construction details		
Floor	Ground floor U-value (W/m ² .k)	0.10
	Exposed floor U-value (W/m ² .k)	0.10
Wall	Exposed wall U-value (W/m ² .k)	0.15
	Dormer Wall U-value (W/m ² .k)	0.15
Roof	Pitched roof U-value (W/m ² .k)	0.11
	Flat roof U-value (W/m ² .k)	0.11
Doors & Glazing	Door U-value (W/m ² .k)	1.0
	Window U-value (W/m ² .k)	1.0 (triple)/0.5 (Quadruple)
	Glazing g-value	0.50/ 0.47
	Glazing frame factor	0.8
	Rooflight U-value (W/m ² .k)	1.0
	Rooflight g-value	0.5
	Rooflight frame factor	0.8
Thermal Mass Capacity		Light
Thermal Bridging		Y value 0.04 as per LETI target
Ventilation		
Ventilation type		Mechanical Ventilation Heat Recovery
Air permeability (m ³ /h.m ²)		1
Number of chimneys (secondary heating)		None
Primary heating details		
Heating system		Air Source Heat Pump
Heating emitter		Underfloor Heating
Heating fuel		Electricity
Heat Pump model		Eg. Mitsubishi Ecodan 8.5 kW or similar
Heat Pump annual seasonal efficiency		300-400%
Weather/load compensator		Yes
Heating controls		Time and temperature zone control by suitable arrangement of plumbing and electrical services
Water Heating		
Hot water system		ASHP From main heating system with indirect cylinder
Cylinder volume (litre)		150-300 assumed
Cylinder heat loss factor (kWh/day)		1.5-2.09 assumed
Cylinder in heated space		Yes
Cylinder stat		Yes
Primary pipework insulated		Yes

Water heating timed separately	Yes
Lighting	
Percentage of low energy lights	100%
PV Panel Parameters	
Collector Power (kWp)	301 kWp (Whole Site)*
Tilt of Panel (°)	4 deg -50 deg varies
Panel Orientation (°)	South, South-East, South-West and West varies

Table 14: SAP Specification

*Area weighted allocation. Buildings with dedicated PV are allocated from that array only. Buildings without dedicated array assumed to take a share of the car-park array.



11. APPENDIX 2: SAP REPORTS

Block Compliance

Block Reference	Temple Dinsley	Issued on Date	19/07/2024
Block Name	Temple Dinsley		
Calculation Type	New Build (As Designed)		
Assessor Details	Mr. Zahid Ashraf	Assessor ID	Q076-0001
Client			

Block Compliance Report - DER

Block Reference: Temple Dinsley	Block Name: Temple Dinsley			
Property-Assessment Reference	Floor area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
Plot 1 - Plot 1- Edwin	81.27	-1.39	12.61	111.02 %
Plot 2 - Plot 2- Edwin	134.07	-0.29	9.69	102.99 %
Plot 3 - Plot 3- Edwin	134.07	0.95	10.46	90.92 %
Plot 4 - Plot 4- Edwin	125.72	0.03	8.72	99.66 %
Plot 1 - Plot 1-Violet	143.16	0.34	9.60	96.46 %
Plot 2 - Plot 2-Violet	143.16	0.15	8.96	98.33 %
Plot 3 - Plot 3-Violet	143.16	0.12	8.82	98.64 %
Plot 4 - Plot 4-Violet	143.16	0.33	9.56	96.55 %
Plot 1 - Plot 1-Sadlier	144.00	-0.25	9.32	102.68 %
Plot 2 - Plot 2-Sadlier	177.81	-0.66	8.02	108.23 %
Plot 3 - Plot 3-Sadlier	144.00	-0.52	8.14	106.39 %
Plot 4 - Plot 4-Sadlier	144.00	-0.46	8.12	105.67 %
Plot 5 - Plot 2-Sadlier	177.81	-0.66	8.02	108.23 %
Plot 6 - Plot 6-Sadlier	144.00	-0.16	9.47	101.69 %
SUMMER HOUSE - SUMMER HOUSE	463.36	-0.98	8.37	111.71 %
Harwood House - Harwood House	463.36	-0.98	8.38	111.69 %
Plot 1 - Plot 1-lthel	136.12	-0.67	8.88	107.55 %
Plot 2 - Plot 2-lthel	136.12	-0.90	8.16	111.03 %
Plot 3 - Plot 3-lthel	136.12	-0.90	8.16	111.03 %
Plot 4 - Plot 4-lthel	136.12	-0.88	8.25	110.67 %
Plot 5 - Plot 5-lthel	136.12	-0.85	8.39	110.13 %
Plot 6 - Plot 6-lthel	136.12	-0.60	9.22	106.51 %

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Block Compliance



Ground Floor Flat - Ground Floor Flat	101.93	-8.63	11.81	173.07 %
Top Floor Flat Templar - Top Floor Flat Templar	148.31	-5.95	8.57	169.43 %
Totals:	3973.07		217.70	
Average DER = N/A	% DER/TER	N/A		
Average TER = N/A	N/A			

Block Compliance Report - DFEE				
Block Reference: Temple Dinsley		Block Name: Temple Dinsley		
Property-Assessment Reference	Floor area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
Plot 1 - Plot 1- Edwin	81.27	31.63	42.74	25.99 %
Plot 2 - Plot 2- Edwin	134.07	28.58	35.69	19.92 %
Plot 3 - Plot 3- Edwin	134.07	31.84	39.54	19.50 %
Plot 4 - Plot 4- Edwin	125.72	28.44	35.51	19.91 %
Plot 1 - Plot 1-Violet	143.16	29.56	36.00	17.90 %
Plot 2 - Plot 2-Violet	143.16	26.43	33.21	20.42 %
Plot 3 - Plot 3-Violet	143.16	25.84	32.52	20.54 %
Plot 4 - Plot 4-Violet	143.16	29.42	35.99	18.24 %
Plot 1 - Plot 1-Sadlier	144.00	28.67	34.79	17.59 %
Plot 2 - Plot 2-Sadlier	177.81	26.76	32.04	16.49 %
Plot 3 - Plot 3-Sadlier	144.00	23.54	28.87	18.45 %
Plot 4 - Plot 4-Sadlier	144.00	23.43	28.73	18.45 %
Plot 5 - Plot 2-Sadlier	177.81	26.72	32.00	16.53 %
Plot 6 - Plot 6-Sadlier	144.00	29.33	35.53	17.45 %
SUMMER HOUSE - SUMMER HOUSE	463.36	36.54	49.00	25.43 %
Harwood House - Harwood House	463.36	36.72	49.08	25.18 %

Block Compliance



Plot 1 - Plot 1-lthel	136.12	25.98	32.53	20.15 %
Plot 2 - Plot 2-lthel	136.12	21.73	29.52	26.37 %
Plot 3 - Plot 3-lthel	136.12	21.73	29.52	26.38 %
Plot 4 - Plot 4-lthel	136.12	22.20	29.96	25.89 %
Plot 5 - Plot 5-lthel	136.12	22.81	30.60	25.47 %
Plot 6 - Plot 6-lthel	136.12	27.47	34.24	19.76 %
Ground Floor Flat - Ground Floor Flat	101.93	34.46	44.56	22.67 %
Top Floor Flat Templar - Top Floor Flat Templar	148.31	32.87	38.64	14.92 %
Totals:	3973.07	672.70	850.82	
Average DFEE = 29.31 kgCO ₂ /m ²	% DFEE/TFEE		PASS	
Average TFEE = 37.41 kgCO ₂ /m ²	21.66 %			

Block Compliance Report - DPER				
Block Reference: Temple Dinsley		Block Name: Temple Dinsley		
Property-Assessment Reference	Floor area (m ²)	DPER (kWh/m ² /yr)	TPER (kWh/m ² /yr)	% DPER/TPER
Plot 1 - Plot 1- Edwin	81.27	6.62	65.96	89.96 %
Plot 2 - Plot 2- Edwin	134.07	8.73	50.55	82.73 %
Plot 3 - Plot 3- Edwin	134.07	16.73	54.72	69.43 %
Plot 4 - Plot 4- Edwin	125.72	11.04	45.29	75.62 %
Plot 1 - Plot 1-Violet	143.16	13.00	50.23	74.12 %
Plot 2 - Plot 2-Violet	143.16	11.14	46.73	76.16 %
Plot 3 - Plot 3-Violet	143.16	10.77	45.98	76.58 %
Plot 4 - Plot 4-Violet	143.16	12.86	49.99	74.27 %
Plot 1 - Plot 1-Sadlier	144.00	9.03	48.64	81.44 %
Plot 2 - Plot 2-Sadlier	177.81	6.24	41.80	85.07 %
Plot 3 - Plot 3-Sadlier	144.00	6.38	42.34	84.93 %
Plot 4 - Plot 4-Sadlier	144.00	7.06	42.24	83.29 %

Block Compliance

Plot 5 - Plot 2-Sadlier	177.81	6.23	41.78	85.09 %
Plot 6 - Plot 6-Sadlier	144.00	10.04	49.47	79.70 %
SUMMER HOUSE - SUMMER HOUSE	463.36	3.96	44.86	91.17 %
Harwood House - Harwood House	463.36	3.98	44.91	91.14 %
Plot 1 - Plot 1-lthel	136.12	6.06	46.23	86.89 %
Plot 2 - Plot 2-lthel	136.12	3.84	42.31	90.92 %
Plot 3 - Plot 3-lthel	136.12	3.84	42.31	90.92 %
Plot 4 - Plot 4-lthel	136.12	4.05	42.82	90.54 %
Plot 5 - Plot 5-lthel	136.12	4.32	43.56	90.08 %
Plot 6 - Plot 6-lthel	136.12	6.80	48.04	85.85 %
Ground Floor Flat - Ground Floor Flat	101.93	-28.35	61.77	145.90 %
Top Floor Flat Templar - Top Floor Flat Templar	148.31	-17.62	44.67	139.44 %
Totals:	3973.07	126.75	1137.20	
Average DPER = 5.33 kgCO ₂ /m ²	% DPER/TPER	PASS		
Average TPER = 46.46 kgCO ₂ /m ²	88.52 %			

12. APPENDIX 3: PRELIMINARY APPRAISAL OF RENEWABLE ENERGY OPTIONS

This appendix summarises the preliminary analysis of renewable energy options, and identifies which should be assessed in further detail, and which should be discounted because of clear technical reasons or other obstacles.

LZC Technology	Basic Technical Information	Technical, Environmental & Economic implications / Considerations	Suited Application	Site Specific Comment	Detailed Analysis?
Solar thermal	Solar collectors (flat plate or tube) transfer energy into transfer liquid to a closed loop twin coil hot water cylinder	+ Government grants available (RHIs) +/- Can meet a significant proportion of the DHW demand - Efficiency effected by site factors – shading, orientation and roof/ground space - Requires considerable hot water demand all year round to be finically beneficial	Domestic and commercial applications with high annual hot water load; leisure centres, canteens, washrooms	Due to the individual heating system and low hot water demand for each dwelling it is not considered feasible.	No
Wind turbine	Turbine/generator converts wind energy to electrical power.	+ Government grants available (FITs) + Allows on site generation of renewable electricity - Can create structural, vibrations and noise implications - Not suited for urban environments - Costs can be high in relation to the actual amount of electricity generated - Potential for additional planning issues	Large sized turbines in non-urban or offshore locations will be more effective	Significant planning uses for free standing turbine. Roof mounted turbines generally ineffective. Detailed study of site wind conditions would be required.	No
Solar Photo-voltaic	Converts sunlight to DC electrical power which then using an inverter to convert to DC.	+ Government grants available (FITs) + Allows on site generation of renewable electricity + Generally payback between 7-12 years + Low maintenance requirements - Efficiency effected by site factors – shading, orientation and roof/ground space	Wide range of building types particularly buildings with limited solar shading and south facing roof	This technology is appropriate for the dwelling on the basis that: There is a demand for electricity. Maintenance requirements are very low. No complex plant to accommodate.	Yes
Air source heat pump	Air Source Heat Pumps (ASHP) capture heat from the outside air and transfer the heat directly to the air inside the building or transferring the heat to a liquid medium that can be pumped around the building	+ Lower installation cost that ground source heat pump + Can provide heating and cooling + Government grants available (RHIs) - COP is not as good during the heating season when the outside air temperature is often less than the ground temperature - Can restrict distribution strategies - Carbon saving are less clear cut	Wide range of building types particularly building designed to have low temperature heat emitters.	The new dwelling houses have enough space for the outdoor unit, where acoustics and aesthetics are unlikely to be an issue.	Yes
Ground Source Heat Pump	Ground Source Heat Pumps (GSHP) capture heat from the ground and transfer the heat to a liquid medium that can be pumped around the building	+ COP is much better than air source heat pumps + Government grants available (RHIs) - Requires area for ground collector or borehole - High initial capital cost - Can restrict distribution strategies - Carbon saving are less clear cut	Suits building designed to have low temperature heat emitters with sufficient space for necessary ground works	High capital cost.	Yes
Biomass	Uses biomass as a fuel source for space heating and hot water	+ Government grants available (RHIs) + Renewable source of heating - Requires large fuel storage capacity - Generally a large capital cost	Building/site with sufficient access and storage facilities and a capable maintenance team	There is insufficient storage space and very limited access for regular deliveries to warrant further investigation.	No



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