Energy Strategy

Queensmere House, East Grinstead RH19 1BG

For RH19 Estates Ltd

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1. Executive Summary

This report outlines how the proposed development at Queensmere House will meet Building Regulations 2021 Part L and comply with Mid Sussex Council Development Plan policy 39 (March 2018). It is proposed that the development will target at least a 10% reduction in energy demand and to include renewables.

The applicant is seeking to demonstrate policy compliance of DP39 and DP42 of its application with Mid Sussex Borough Council.

The energy strategy will detail the method used in order to target the goal of reducing site wide energy use.

2. Planning policy

2.1 National Policy

The Department for Communities and Local Government (DCLG) released the revised National Planning Policy Framework (NPPF) in July 2018. In revising this framework, the Government's objective is to streamline the process encouraging sustainable development and promoting the needs and priorities of local communities.

This framework is to be used as the base by councils to develop their own local policy. Section 14 of the framework addresses climate change, flooding and costal change. Considerations include;

- Minimising CO_2 emissions
- Reducing greenhouse gas emissions using landform, layout, building orientation, massing and landscaping
- Vulnerability of fuel supply
- A promotion of decentralised, low carbon and renewable energy sources wherever viable
- Green infrastructure

2.2 Local policy 39 – Sustainable Design and Constructiuon

Mid Sussex Council Development Plan (March 2018) details its strategic objective for Sustainable Design and Construction within DP39: '*To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change'.*

All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures:

- **Minimise energy use through the design and layout of the scheme including through the use of natural lighting and ventilation;**
- **Explore opportunities for efficient energy supply through the use of communal heating networks where viable and feasible;**
- **Use renewable sources of energy;**
- **Maximise efficient use of resources, including minimising waste and maximising recycling/ re-use of materials through both construction and occupation;**
- **Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment;**
- **Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer term resilience**

Figure 1: Local Policy DP39 'Sustainable Design and Construction' Excerpt.

2.3 Policy 42 – Water Infrastructure and the Water Environment

The South East is classified as 'seriously' water stressed, meaning that more water is taken from the environment than the environment can sustain in the long term.

Mid Sussex Council Development Plan (March 2018) details its strategic objective for Sustainable Design and Construction within DP39: '*To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change'*

DP42 requires all developments to adhere to the optional requirement outlined within Part G of the Building Regulations:

Residential units should meet a water consumption standard of 110 litres per person per day (including external water use);

Figure 2: Local Policy DP42 Water Infrastructure and the Water Environment' excerpt.

3. Proposed development

The proposed development is for the internal conversion of an existing building to C3 residential use. The proposed scheme will comprise of 24 individual units. Table 1 outlines the proposed mix. A complete set of planning drawings will be submitted in the application.

	1B1P	1b2p	2B3P	2B4P	3B5P	Total
L Ground	-	2	-	2	1	5
Ground	2	4	1	-	-	7
First	1	4	1	1	-	7
Second	-	4	1	-	-	5
TOTAL	3	14	3	3	1	24
	71%		25%		4%	

Table 1: Accommodation Schedule.

Figure 3: Ground floor plan of the proposed development

4. Energy strategy

4.1 Calculation methodology

The dwellings have been designed and have a set of performance targets to meet; this document details a performance intended to be met. Such is the nature of construction and the evolution of design that during the process of development it is likely that some elements of the build may alter slightly e.g. availability of materials. As a result of this change the final figures will still demonstrate a compliance with the 10% energy reduction target, but it is likely to be 10% of a different set of figures.

This Energy Strategy will be produced using results based on the 2021 Part L SAP 10 methodologies. It will use these calculations to calculate the regulated residential energy demand for each dwelling type that are fully representative of all the dwellings within the proposed development.

A 5-step guide will be used to demonstrate the method of calculating the energy reduction this is:

1. Make the building as efficient as possible
2. Calculate the sites predicted energy usage
3. Assess the feasibility of communal heating networks and renewables
4. Calculate the sites predicted energy usage after improvements
5. Calculate the predicted energy usage savings as a percentage

As this scheme is classed as a change of use, the baseline “compliant” case for the energy usage will be determined by using the predicted the energy figures from the notional SAP calculations completed in accordance with Part L SAP 10. The energy saving from efficiency measures will be determined by comparing the total energy based on the notional SAP calculations with the predicted energy based on the actual proposed specification. The energy saving from the low and zero carbon technologies will be calculated separately and incorporated into the final residential results using the SAP methodology.

4.2 Key Energy Efficient Design Measures

Step 1 – Make the Building as Energy Efficient as Possible

During the design process the Design Team has explored a range of energy efficiency measures including enhanced U-values and specific construction details to reduce the effect of non-repeating thermal bridges. The specific target for the dwellings is to exceed the minimum requirements of Part L: 2021 using these measures alone.

A range of options will be evaluated, and those presented below represent one way of delivering the required result: they are not finalised, but there is a commitment to achieve the resulting level of emissions, by this or another combination of specifications. The proposed specifications (indicative) for the building fabric are as follows:

Heat Loss Element		U-values (W/m^2K) Target	Minimum Building Regulation U-values	% Improvement
Floors	Existing Ground Floors	0.17	0.25	32.00%
Walls	Existing Cavity External Walls	0.21	0.30	30.00%
	Existing Solid Top Floor Walls	0.20	0.30	33.33%
	New External Cavity Walls	0.12	0.18	33.33%
Roofs	Pitched Roof, Insulated Ceilings	0.11	0.16	31.25%
Openings	Windows	1.40	1.40	0.00%
	External Doors	1.40	1.40	0.00%

Table 2: Fabric Efficiency Improvements.

Indictive Construction Details from the Design Team:

Ground Floor: Existing ground bearing concrete slab, 75mm Celotex PIR insulation (λ0.022W/mK), 65mm screed.

Existing External Walls: 105mm existing outer leaf brickwork, 65mm cavity partially filled with 25mm Insulation (assumed EPS board, λ0.038W/mK), assumed medium dense blockwork (λ0.57W/mK), 80mm BG Thermaline Super Board (R3.56), skim finish.

Existing Solid Top Floor Walls: Existing cladding on battens, 50mm existing insulation between battens (assumed λ0.040W/mK), 150mm medium dense blockwork (assumed λ0.57W/mK), 80mm BG Thermaline Super Board (R3.56), skim finish.

New Cavity Walls: 105mm outer leaf brickwork, 150mm cavity fully filled with Isover CWS 32 Batt Insulation (λ0.032W/mK), 100mm medium dense blockwork (assumed λ0.57W/mK), 80mm BG Thermaline Super Board (R3.56), skim finish.

Pitched Roofs Insulated Ceilings: 200mm Rockwool type insulation (λ0.044W/mK) cross laid over existing joists, 200mm Rockwool type insulation (λ0.044W/mK) between existing joists, 12.5mm plasterboard, skim finish.

In addition to the above, a variety of improvements are to be explored to the building services and fit-out specifications; these include:

- Residential lighting: Low wattage fixings and design efficacy (lm/W).
- Highly efficient mains gas combi boilers.
- Ventilation: System 1 ventilation – DMEV.

Care will also be taken to reduce where possible the unregulated energy demand by providing “best in class” (“A” rated or equivalent) white goods and energy display devices that show electricity use to encourage resident to save energy. The benefits are not included in the results for *unregulated energy use* as there is no established method for calculating the savings that might result.

Step 2 – Calculate the Predicted Site Energy Use Per Annum (kWh/Year)

The regulated energy use of a dwelling is expressed as kWh per annum. Regulated energy demand has been calculated from the outputs of the SAP 10 Assessment undertaken on the proposed 24 conversion dwellings. This includes the main heating and water fuel requirement and electricity for pumps, fans and lighting.

Scenario	Energy (kWh/Year)	Energy Saved (kWh/Year)	% Saving
Baseline Energy	170587.4	-	-
Steps 1&2 – Maximise Efficiency	164902.5	5684.9	3.33%

Table 3: Baseline and Efficiency energy savings.

Step 3 – Assess Technical Feasibility of Renewable Energy Technologies for the Site

Renewable energy is defined as energy derived from energy flows that occur naturally and repeatedly in the environment. It may be contrasted with energy sources that can be depleted such as fossil fuels or uranium-238-based nuclear power.

Renewable energy technologies, with a couple of exceptions, all utilise energy from the sun – either directly or indirectly, the exceptions being true geothermal, which uses heat from the earth's mantle, and tidal / marine current electricity generation which uses the gravitational forces between the earth and the moon, (although some marine currents are also greatly affected by solar energy). Insofar as this study is only concerned with practical options for *on-site* renewable energy, these options are not considered further. The remaining range of "solar" technologies are however vast, and some would not even appear to be solar on superficial inspection. They can be summarised as follows:

- Solar thermal – direct heating of water for space heating or domestic hot water;
- Photovoltaic – direct generation of electricity from sunlight;
- Hydroelectricity – electricity generation by solar (water cycle) driven water flows;
- Wind turbines – use of solar driven air movement to generate electricity;
- Heat pumps – extraction of solar heat from the earth, atmosphere or water bodies;
- Biofuels – combustion of solid or liquid biofuels to produce heat or electricity.

The technologies, and their potential application to this site are discussed in more detail below;

Solar thermal – Solar thermal technology uses energy from the sun to heat water Systems typically comprise of solar collectors (glazed flat plate or evacuated tubes) a circulated glycol fluid and a thermal store. A typical solar thermal (hot water) panel can provide 400 kWh of *useable* hot water per year for every square metre of panel. Under normal circumstances in this proposed development this energy will replace some the electricity used for the domestic hot water demand.

Photovoltaic – Roof amounted photovoltaic arrays offer an efficient way of reducing a developments energy demand and therefore can be considered an appropriate technology to deliver on energy savings through renewables.

Wind turbines – Micro wind turbines produce electricity and can be grid-connected in the same way as photovoltaic panels. There are two main concerns with wind turbines – aesthetic considerations, and the limited output in an urban environment. It was considered that in this location the visual impact of even a modest-sized unit would be unacceptable.

Bio-fuels – In the UK at present the commercial biofuels that can be used in the context of emissions reduction in the built environment are confined to either wood pellets or wood chips (biomass) or in special cases glycerine for CHP. Such a heating system needs to be incorporated into a communal heat network. Such a network has been discounted and therefore makes this renewable unsuitable.

Heat Pumps – Heat pumps collect low temperature heat from renewable sources and "concentrate" it to a usable temperature. Fossil fuel based (grid) electricity is generally required to operate the pumps and the renewable component of the output is therefore by convention taken as the difference between the output energy and the input energy. A typical heat pump will deliver 3 kWh of useful energy for every 1 kWh of input energy. A heat pump operating in this way would therefore be deemed to have delivered 2 kWh of renewable energy.

The use of photovoltaic panels has been chosen to be incorporated into the proposed development scheme.

It is proposed that 17.5 kWp of PV will be installed on the building contributing to site wide energy reduction.

Step 4 – Calculate Energy Saving Potential Per Annum of Feasible Renewable Energy Solutions

Scenario	Energy (kWh/year)	Energy Saved (kWh/Year)	% Saving at each stage
Baseline Energy	170587.4	-	-
Steps 1&2 – Maximise efficiency	164902.5	5684.9	3.33%
Steps 3&4 – Include renewables	153375.6	11526.9	6.76%

Table 4: Energy Efficiency Savings including renewable energy contribution.

Step 5 – Calculate Energy Saving as Percentage of Site Predicted Annual Energy Use

Scenario	Energy (kWh/Year)	Energy Saved (kWh/Year)	% Saving at each stage
Baseline Energy	170587.4	-	-
Steps 1&2 – Maximise efficiency	164902.5	5684.9	3.33%
Steps 3&4 – Include renewables	153375.6	11526.9	6.76%
Step 5 – Total Savings	-	17211.8	10.09%

Table 5: Energy Efficiency Savings Summary.

5. Water Efficiency

Policy 42 of the boroughs Development Plan outlines the desire for developments to make efficient use of water: *To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change.*

In 2014 South East water published its Water Resources Management Plan to try and combat the threat of water scarcity in the event of an ever-increasing population within the South East. Average water consumption for a customer of South East water is 165 litres per person per day, the management plan aims to reduce this to 148.3 litres per person per day by 2040.

In order to assist with desire to make efficient use of water resources, the primary recommendation outlined within DP42 is that developments shall designed in accordance with the Optional Requirement of part G of the building regulations. The requirement' of 110 litres per person per day described by regulation 36 paragraph 2(a) of the Building Regulations 2010 (as amended) is below both the national and regional water consumption levels and will therefore help promote efficient use of water resources. Guidance of consumption levels is outlined within table 2.2.

Table 2.2 **Maximum fittings consumption optional requirement level**

Water fitting	Maximum consumption
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	170 litres
Basin taps	5 l/min
Sink taps	6 l/min
Dishwasher	1.25 l/place setting
Washing machine	8.17 l/kilogram

The developer will aim to meet or better the requirements outlined within the table above. Each item in the list above is not an individual target, more guidance, for example: if a higher specification of washing machine and dishwasher are specified this may free up capacity for

a bigger bath to be installed. The result of this is that the calculation shall demonstrate that the dwelling has been designed to achieved 110 litres of water per person per day.

A final and formal calculation shall be issued once all the fixtures and fittings are known; this shall demonstrate compliance.

6. Conclusion

The core strategy will be fabric first, in order to minimise the dwellings energy consumption for the life of the construction. Space and water heating will be provided via clean mains gas combi boilers.

From this low energy consumption base, renewables, in the form of photovoltaic panels will be installed across the site to deliver at least a total 10% energy saving site wide. At least 17.5 kWp will be installed on site, array size and locations across the scheme will be defined once the scheme design advances.

There is no technical reason for the proposed development not to meet an overall energy saving of at least 10%, thereby satisfying part of Planning Policy DP39 of the Mid Sussex Council Development Plan (March 2018) for including renewable energy generation.

The dwelling will be designed to target a consumption of 110 litres of water per person per day or better in line with regulation 36 paragraph 2(a) of the Building Regulations 2010 (as amended) in order to satisfy the water efficiency requirement within Planning Policy 42 of the Mid Sussex Council Development Plan (March 2018).

Appendix 1 – SAP Worksheets