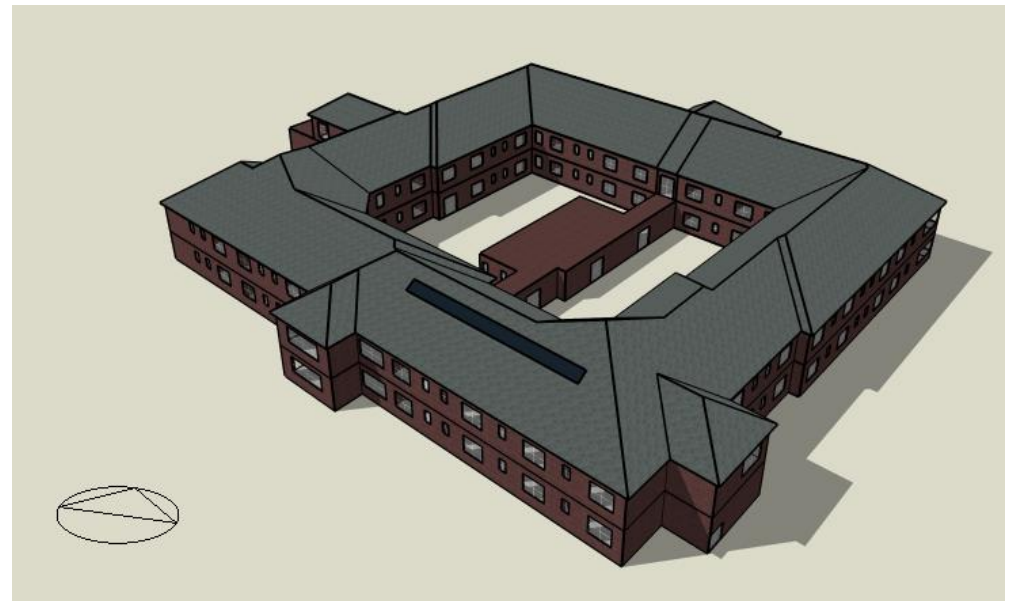


Energy Statement

Pen Y Don, Pendine Park, Summerhill,
Wrexham, LL11 4YE

Job number: 11034

Date: 18th July 2023



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Revision	Issue Date	Author	Checked	Description
0	13-07-2023	JR	PK	First Issue
1	18-07-2023	JR	PK	Minor amendment

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This document and any calculations herein have been produced based on information supplied by the client and their agents and design team. Any amendments to the technical specification on which this report is based may invalidate the results.

Contents

1	Executive Summary.....	3
2	Existing and Proposed Development	4
3	Planning Policy	6
4	Methodology	7
5	Baseline Energy & CO2.....	8
6	Low Carbon Design – Fabric First – Be Lean.....	9
7	Low Carbon Technology Review & Recommendations	10
8	Low Carbon Technology – Renewable Energy Generation - Be Green	14
9	Conclusion	15
10	Appendix 1 – BRUKL Outputs	16

1 Executive Summary

This report has been produced by Base Energy on behalf of Pendine Park Care Organisation (Summerhill) Ltd and in support of the planning application for the development named as Pen Y Don, Pendine Park, Summerville, Wrexham, LL11 4YE comprising of a new build specialist & extra care Facility falling under the requirements of Wrexham County Borough Council.

It sets out the design approach with regards to energy, carbon dioxide emissions, and sustainability in order to ensure the development complies with:

- National Planning Policy
- The Wrexham Unitary Development Plan

The above policies require:

- Meeting or exceed the CO2 Targets set by Part L of the 2021 Building Regulation

The design of the development will incorporate energy efficient building fabric and services in addition to low carbon technology:

- Thermal specification meeting or exceeding Part L 2021 notional U-values
- A design which limits air permeability, targeting 5 m³/h/m²
- A design which limits thermal bridging by incorporating Accredited psi values
- Energy saving building services including low energy lighting with occupancy and Photoelectric controls
- Low carbon Air Source Heat Pumps and Solar PV Panels

This results in a 12.3% reduction in CO2 over Part L 2021 & 39.3% reduction over Part L 2013

2 Existing and Proposed Development

The development site is located on land at Pendine Park Care Home, Summerhill, Wrexham.

The site currently has a number of private buildings dedicated to elderly care (Use Class C2).

The development proposals are for a new building on the existing care home site that will offer specialist dementia care facilities with 75 bed spaces over 2 storeys as a complimentary accommodation service and centre of excellence.

The development proposals constitute a major development.

Aspects of the site location, shape, and surroundings (in particular the adjacent buildings), along with any other requirements of planning, use type, and scale will naturally constrain the development proposals in terms of the layout, positioning, and orientation of the proposed development. Subsequently, these constraints will impact on the feasibility of certain renewable technologies (as discussed in Section 7 of this report).

Figure 2.1: Site Location and proposals

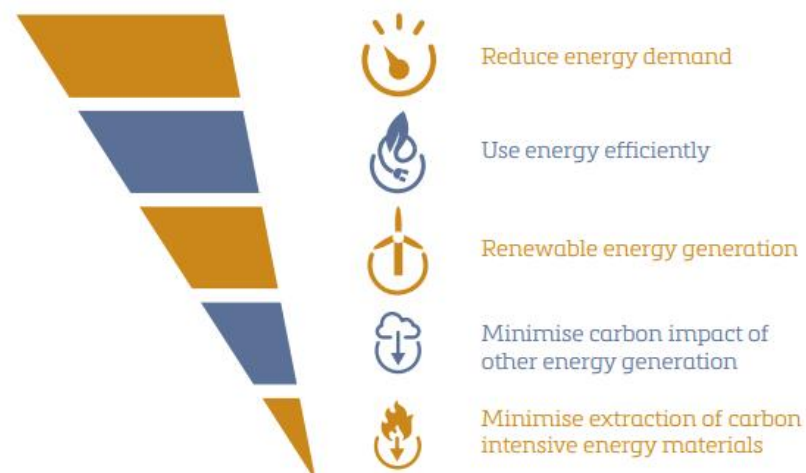




3 Planning Policy

Planning Policy Wales 11th Edition

Welsh Government planning policy recognises an energy hierarchy. The Welsh Government expects all new development to mitigate the causes of climate change in accordance with the energy hierarchy for planning, as set out in the following energy policies. Reducing energy demand and energy efficiency, through the location and design of new development, will assist in meeting energy demand with renewable and low carbon sources. This is particularly important in supporting the electrification of energy use, such as the growing use of electric vehicles and heat pumps. All aspects of the energy hierarchy have their part to play, simultaneously, in helping meet decarbonisation and renewable energy targets.



Local Planning Policy

The relevant Wrexham County Borough Council Local Planning Policy requirements are as follows.

The development should target:

- Meeting or exceeding the CO2 Targets set by Part L of the 2021 Building Regulations

Based on the above the building will aim to meet Part L 2021 regulations for CO2 emissions and Primary Energy use.

4 Methodology

The Standard Assessment Procedure (SAP) is the UK Government methodology for assessing and calculating the energy performance of dwellings.

The Simplified Building Energy Model (SBEM) is the UK Government methodology for assessing and calculating the energy performance of non-domestic buildings.

SAP and SBEM calculations take into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of the building fabric (u-values¹ and thermal mass)
- Air permeability
- Efficiency, fuel source, and control of heating and cooling systems
- Ventilation system energy use and heat recovery
- Lighting energy
- Low carbon and energy saving or generating technologies

Approved Document Part L of current Building Regulations addresses the conservation of fuel and power. Part L is divided into two separate documents:

- Part L1 Newly constructed and extended or renovated existing dwellings
- Part L2 Newly constructed and extended or renovated existing non-domestic buildings

To comply with Part L, the calculations should demonstrate how the building will either meet or achieve a percentage reduction in the Building Emission Rate (BER) under the required Target Emission Rate (TER).

The calculation software has been used to calculate a baseline of energy demand and carbon dioxide emissions as appropriate from which any reductions or contributions have been measured.

¹ U-values (Thermal Transmittance) - the measure of the overall rate of heat transfer by all mechanisms under standard conditions, through a particular section of a construction. Lower u-values mean better thermal insulation

5 Baseline Energy & CO2

Energy modelling software has been used to calculate a baseline for the development. This forms the basis from which compliance with planning policy has been measured.

Table 5.1: Baseline CO2

	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)
Baseline	17.98	3,757	67,550.86

The **Total Baseline CO2 Emissions** for the development are shown to be **67,550.86 kg/year**.

Table 5.2: Baseline Energy Demand

	Energy Demand (kWh/m2/year)	Floor Area (m2)	Total Baseline Energy Demand (kWh/year)
Baseline	194.79	3,757	731,826.03

The **Baseline Energy Demand** for the development is shown to be **731,826.03 kWh per year**.

6 Low Carbon Design – Fabric First – Be Lean

Before considering low carbon energy generating technology the development has been designed to reduce energy demand through the first step of the energy hierarchy by considering 'fabric first'. A thermally efficient building envelope will follow the design standards as set out below.

Table 6.0: Building Fabric Standards (including u-values W/m²K)

	Part L 2013 Limiting Parameters	Part L 2021 Limiting Parameters	Proposed Development
Walls	0.30	0.26	0.26
Ground Floor	0.25	0.18	0.18
Roof	0.20	0.16	0.13
Windows	2.00	1.6	1.4
Doors	2.00	1.6	1.6
Air permeability	10.00	8.00	5

- Insulation: The specified building envelope is designed to meet or exceed the notional Part L targets and will help to limit the energy demand of the building for space heating

Once heat retention has been addressed the next step is to ensure energy consuming building services are efficient.

- Lighting: Low energy LED lighting throughout with a minimum efficacy of 110 lumens per watt
- Space & Water Heating: Air Source Heat Pump (SCOP targeting 3.5)
- Heating Controls: Comprising delayed start, weather compensation, time & temperature zone control
- Ventilation: Natural ventilation with localised extract fans

7 Low Carbon Technology Review & Recommendations

Having set out an energy efficient design, the next step is to incorporate low carbon technology for energy generation. A number of technologies exist and should be specified where they:

- compliance with planning policy
- are feasible for the site
- are cost efficient
- are appropriate for proposed development form and function
- protect against fuel poverty
- promote fuel security
- reduce reliance on fossil fuels
- reduce carbon emissions
- reduce resource depletion
- reduce pollution

Site location and development form and function will influence the suitability of different technologies through:

- Orientation
- Space (inside and outside of the buildings)
- Surrounding topography, structures, and natural features
- Wind speed
- Overshading
- Geology and ground conditions
- Building form, function, and density

In determining the most feasible renewable technologies for the dwelling, the following have been reviewed:

- Wind turbines
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Biomass
- Combined Heat and Power
- Photovoltaic Panels
- Solar water heating

WIND TURBINES

Wind turbines are used to produce electricity. They can be either pole mounted (in a suitably exposed position) or building mounted; building mounted systems need a sufficient wind speed at the structural height and both a structural survey and planning permission.

- Wind speed can be too low on low rise buildings
- Taller systems need sufficient space
- Wind resources very variable and unpredictable
- May need planning permission

Wind turbines technology is **not recommended** for this development

GROUND SOURCE HEAT PUMP (GSHP)

GSHPs use naturally occurring underground low-level heat in areas with appropriate geological features. Heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water through pipes buried within the ground, (closed loop). The water is passed through a heat pump to transfer the heat from this water into a higher temperature water circuit to provide heating. The loop can be fitted horizontally (laid in a shallow trench) or vertically (in a borehole).

- Feasibility analysis is costly
- Suitable ground conditions required
- More capital intensive than air source heat pumps
- Can be more efficient and lower running costs than ASHPs
- Well suited to highly insulated buildings

Ground source heat pump technology is **not recommended** for this development

AIR SOURCE HEAT PUMP (ASHP)

ASHP systems absorb heat from outside air at a low temperature into a fluid which is then passed through an electrically driven compressor where its temperature is increased. There are two main types of ASHP systems: Air to Water systems distribute heat through wet central heating; Air to air produce warm air which is circulated by fans. For an ASHP system to be installed, there needs to be ample outdoor space for the external condensing unit; these units can also be noisy and blow out colder air to the neighbouring environment.

- Requires space for external plant and internal hot water tank for wet systems supplying DHW
- Can generate noise though quieter systems have been developed
- Least efficient when most needed
- Longer life than fossil fuel boilers
- High capital costs vs gas systems but lower than GSHPs
- Well suited to highly insulated buildings

Air source heat pump technology **is recommended** for this development

BIOMASS

Biomass systems burn wood pellets, chips, or logs to provide heat in a single room, or to power central heating and hot water boilers. There needs to be ample space available for both the boiler and the storage of fuel. There will also be regular deliveries of fuel and therefore adequate site access is required.

- Carbon emissions are cyclical unlike fossil fuel
- Requires fuel storage space and bulk delivery
- Carbon 'neutral' fuel in isolation but supply side emissions are still present so not neutral overall
- Harmful particulate emissions impact air quality and health

Biomass technology **is not recommended** for this development

COMBINED HEAT AND POWER (CHP)

CHP is effectively an on-site small power plant providing both electrical power and thermal heat energy. It is an energy efficiency and low carbon measure rather than a renewable energy technology. A CHP system operates by burning a primary fuel (normally natural gas) by use of either a reciprocating engine or turbine, which in turn drives an alternator to generate electrical power. The heat emitted by the engine and exhaust gases is recovered and used to heat the building or to provide hot water.

- Reduces consumption of and reliance on grid electricity
- Works best with high and consistent heat and hot water demand
- Recovers waste energy
- Can export to the grid
- Uses fossil fuel
- Emissions on site rather than upstream
- Efficiency is sensitive to sizing

CHP **is not recommended** for this development

DISTRICT HEATING

District Heating systems provide multiple buildings or dwellings with heat and hot water from a central boiler house, or 'energy centre'. The system can provide heating or cooling which is transferred from the energy centre through a network of highly insulated pipes carrying the heated water to each dwelling.

- Economies of scale
- Frees up space in habitable areas of development
- Variety of systems
- Can make use of waste heat from industry
- Can be fossil fuel based and dependent

District heating **is not recommended** for this development

SOLAR PHOTOVOLTAIC (PV)

Solar PV cells (which are mounted together in panels or tiles on the roof) convert sunlight into electricity. The cells are made from layers of semi-conducting material; when the light shines on the cell, an electric field is created across the layers. Although PV cells are most effective in bright sunlight, they can still generate electricity on a cloudy day. The power of a PV cell is measured in kilowatts peak (kWp). Each PV panel produces 0.25Watts to 0.35Watts depending on the manufacture.

- Passive technology, requires no energy input from grid
- Does not require sunny days to generate power
- Capital costs can be high although payback is effective
- Needs sufficient roof space and orientation
- Zero site or upstream emissions
- Can export to the grid

Solar PV technology **is recommended** for this development

SOLAR HOT WATER

Solar hot water systems absorb energy from the sun and transfer this energy using heat exchangers to heat water which can then be stored. Systems should be roof mounted and oriented to face between a south-east and south-west direction.

- Mostly passive technology but requires pump energy
- Not suitable for combi boilers and developments without roof space
- Lower CO2 reductions than other technologies

Solar hot water technology **is not recommended** for this development

Low Carbon Technology Summary

The low carbon technology review indicates that Air Source Heat Pumps and Solar PV would be potentially feasible. The following low carbon technology is recommended:

Air Source Heat Pumps & Solar PV

This technology is deemed optimal for meeting the needs of the development and achieving policy compliance. It has been incorporated into the energy model and the results are presented in the next section.

8 Low Carbon Technology – Renewable Energy Generation - Be Green

The selected Low Carbon Technology has been incorporated into the calculation and the results are set out below.

Table 8.1: Baseline vs Be Green CO2

	CO2 Emission Rate (kg CO2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	17.98	3,757	67,550.86	N/A
Be Green Design	15.77	3,757	59,247.89	-12.3%

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be **8,302.97 kg/year**.

Table 8.2: Baseline vs Be Green Energy Demand

	Energy Demand (kWh/m2/year)	Floor Area (m2)	Total Baseline Energy Demand (kWh/year)	Reduction in Energy Demand
Baseline	194.79	3,757	731,826.03	N/A
Be Green Design	170.05	3,757	638,877.85	-12.7%

The **Energy Demand reduction** as a result of energy efficient fabric and services is shown to be **92,948.18 kWh per year**.

9 Conclusion

Proposals are for the development named as Pen Y Don, Pendine Park, Summerhill, Wrexham, LL11 4YE comprising of a new build specialist & extra care Facility falling under the requirements of Wrexham County Borough Council.

Under the local planning policy the proposed development is required to meet or exceed the CO2 targets set by Part L of the 2021 Building Regulations.

Energy modelling software has been used to calculate a baseline against which compliance with the above can be measured.

The proposed development will be designed to limit energy demand through the inclusion of a thermally efficient building fabric and energy efficient services.

Low carbon technology will be incorporated and is to comprise of Air Source Heat Pumps and 48.75KW of Solar PV.

This results in a reduction of 12.3% in CO2 emissions and 12.7% in Primary energy over the 2021 Building regulations.

This Energy Statement and the calculations on which it is based demonstrate that the proposed development complies with the local planning policy requirements.

10 Appendix 1 – BRUKL Outputs

BRUKL Output Document HM Government Compliance with England Building Regulations Part L 2021

Project name

Pen Y Don - As Designed

As designed

Date: Wed Jul 12 14:42:18 2023

Administrative information

Building Details

Address: Pen Y Don, Pendine Park, Summerhill, Wrexham,
LL11 4YE

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.1.4

BRUKL compliance module version: v6.1.e.0

Certifier details

Name: Base Energy

Telephone number: 0151 933 0328

Address: Base Energy 202 Stanley Road, Bootle, L20 3EN

Foundation area [m²]: 1864.3

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	17.98
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	15.77
Target primary energy rate (TPER), kWh _{tp} /m ² annum	194.79
Building primary energy rate (BPER), kWh _{tp} /m ² annum	170.05
Do the building's emission and primary energy rates exceed the targets?	BER <= TER BPER <= TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{g,limit}	U _{g,calc}	U _{g,calc}	First surface with maximum value
Walls*	0.26	0.26	0.26	GF - Bedroom 27_W_8
Floors	0.18	0.18	0.18	GF - Bedroom 27_S_3
Pitched roofs	0.16	0.13	0.13	FF - Waiting Area_R_4
Flat roofs	0.18	0.18	0.18	GF - Circulation Area_R_5
Windows** and roof windows	1.6	1.4	1.4	GF - Bedroom 27_G_9
Rooflights***	2.2	-	-	No external rooflights
Personnel doors*	1.6	1.6	1.6	GF - Staff Room_D_7
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{g,limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{g,calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{g,calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

* For fire doors, limiting U-value is 1.8 W/(m²K).

NB: Netter roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	5

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Floor area [m ²]	3756.5	3756.5		Retail/Financial and Professional Services
External area [m ²]	6246	6246		Restaurants and Cafes/Drinking Establishments/Takeaways
Weather	MAN	MAN		Offices and Workshop Businesses
Infiltration [m ³ /h.m ² @ 50Pa]	5	3		General Industrial and Special Industrial Groups
Average conductance [W/K]	1748.76	2110.96		Storage or Distribution
Average U-value [W/m ² K]	0.28	0.34		Hotels
Alpha value* [%]	22.92	20.28	88	Residential Institutions: Hospitals and Care Homes

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Residential Institutions: Residential Schools
Residential Institutions: Universities and Colleges
Secure Residential Institutions

12 Residential Spaces

Non-residential Institutions: Community/Day Centre
Non-residential Institutions: Libraries, Museums, and Galleries
Non-residential Institutions: Education
Non-residential Institutions: Primary Health Care Building
Non-residential Institutions: Crown and County Courts
General Assembly and Leisure, Night Clubs, and Theatres
Others: Passenger Terminals
Others: Emergency Services
Others: Miscellaneous 24hr Activities
Others: Car Parks 24 hrs
Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	12.62	16.97
Cooling	2.77	6.83
Auxiliary	8.84	11.79
Lighting	9.81	8.98
Hot water	87.64	87.02
Equipment*	28.01	28.01
TOTAL**	121.68	131.6

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	9.98	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	9.98	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	196.88	240.25
Primary energy [kWh _{tp} /m ²]	170.05	194.79
Total emissions [kg/m ²]	15.77	17.98