

CARBON NEUTRALITY REPORT

Site: Crowthorne

Client: Barchester Healthcare





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1 Executive Summary

The planning stage energy strategy 'Energy Statement – Proposed Class C2 Care Home (#001588)' produced by Hoyle Dean is proposed to be updated as part of the build out by Barchester Healthcare. This is to alter the PV array size so that it can be accommodated within the constraints of the roof plan and to incorporate air source heat pumps into the space heating system.

The proposed energy will follow the recognised energy hierarchy of; Be Lean – Use less energy, Be Clean – Supply energy efficiently, Be Green – Use renewable energy. Through the incorporation of an air source heat pump the proposed energy strategy will decrease the primary energy of the development along with the associated carbon dioxide emissions. Gas boilers are 95% whereas ASHP's are over 300% efficient resulting in a reduction in energy input per kWh of heat from 1.05kWh to 0.34kWh equating to a reduction of 68%.

Achieving a development that is carbon neutral is not feasible as this would require sufficient on-site electric generation such that the electricity usage on site is equal to or less than a sufficient amount of energy is generated on site and exported to offset the emissions from the development. However, the maximum PV array that can be accommodated on the roof of the proposed development is 76no photovoltaic panels which would only generate c.34kW_p which is lower than what the development will use.

Whilst the updated energy strategy will differ from the planning stage from it will reduce both the carbon emissions and primary energy demand of the development which aligns with the Wokingham Borough Council's local plan policies and planning condition 12. The measures incorporated bring the development closer to NET zero emissions than at planning stage whilst not precluding NET zero in future should new technologies allow for their incorporation.



2 Introduction

The proposed development at Lower Wokingham Road, Crowthorne, Wokingham, RG45 6BX comprising of a 72 Class C2 Care Home briefly comprising of 72 bedrooms with dedicated en-suites, main reception area, kitchen and Café, lounges, dining rooms and activity areas.

Condition 12 for the proposed development at Crowthorne states the following;

‘The development hereby permitted shall not progress beyond base course level until a report demonstrating whether it is practicable and viable to provide carbon neutral accommodation is submitted to the local planning authority. Where it cannot be demonstrated that carbon neutrality could be achieved the development, measures to bring the development closer to this target shall be submitted to and approved in writing by the local planning authority before the development progresses beyond base course level. The development shall be constructed in accordance with the approved targets and maintained as such thereafter.’

This report produced by Harniss Consulting on behalf of Barchester Healthcare to demonstrate compliance with the above condition 12.

The planning stage energy strategy, ‘Energy Statement – Proposed Class C2 Care Home (#001588)’ by Hoyle Dean, outlines an energy strategy in line with CP1 section CC05: Renewable energy and decentralised energy networks.

Barchester’s installed energy strategy will follow the energy hierarchy, the same as the Hoyle Dean report, of ‘Be Lean, Be Clean, Be Green’.

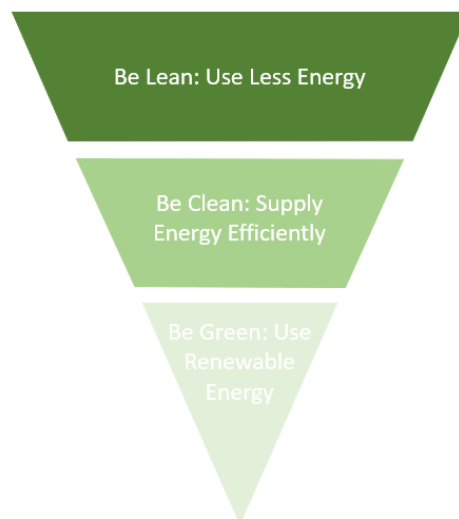


Figure 1 – Energy Hierarchy



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3 Carbon Neutrality

3.1 Heating Equipment

The planning stage energy strategy incorporates natural gas fired boilers to serve the developments space heating. To work toward a NET zero strategy the use of fossil fuels should be minimised. There are various low and zero carbon technologies that can generate heat whilst emitting less carbon dioxide per kWh than natural gas systems as outlined in the below feasibility table.

Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
Solar Thermal	Solar thermal energy can contribute towards space heating and hot water requirements.	Low maintenance.	Must be sized for the building base load hot water requirements. Panels ideally inclined at around 30 degrees and facing southerly direction	Yes
Biomass	Modern wood-fuel boilers are highly efficient, clean and almost carbon	Stable long-term running costs. Potential good CO ₂ saving.	Large area needed for fuel delivery and storage. Reliable fuel supply chain required. Regular maintenance required Significant plant space required. Air pollution / Clean Air Act limits use.	No
Ground Source Heat Pump (GSHP)	GSHP systems tap into the earth's considerable energy store to provide both heating and cooling to buildings.	Minimal maintenance. Unobtrusive technology. Flexible installation options to meet available site footprint.	Large area required for horizontal pipes Full ground survey required to determine geology. More beneficial to the development if cooling is required. Integration with piled foundations must be done at an early stage. The lack of space to locate the underground pipework loops and the associated plant around the site.	No



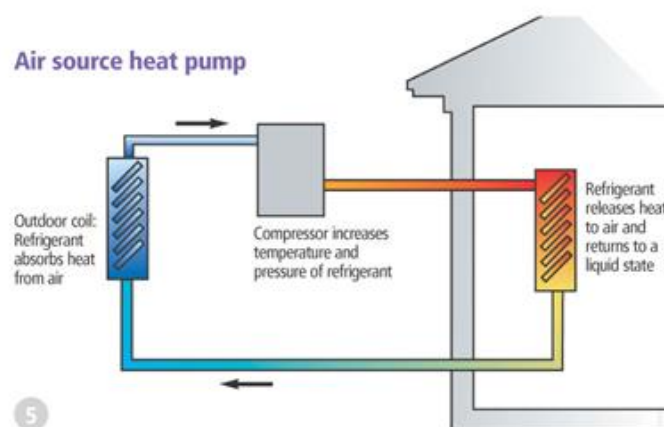
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Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
Air Source Heat Pump	Electric air source heat pumps extract thermal energy from the surrounding air and transfer it to the working fluid (air or water).	Efficient use of fuel. Relatively low capital costs.	Specialist maintenance. Some additional plant space required. External proximity to boundary and noise generation with units cycling. Impact of the required external plant and associated noise within the domestic setting can be a nuisance to residents.	Yes
Earth Ducts	Passive pre-treatment of fresh air	Low cost Free energy	Requires significant air loads and riser space	No

As can be seen in the above table the 2no feasible LZC Technologies for heat generation would be solar thermal and air source heat pump. However, given that there is a proposal for a photovoltaic array on the roof the use of an air source heat pump would be the best application of either technology as the electricity generated from the PV array will reduce the ASHP's grid electricity use and the associated carbon emissions.

Transferring the space heating from natural gas fired as outlined within the Hoyle Dean to an ASHP will reduce the emissions of the system though even when operating from grid supplied electricity. This is due to the carbon factors associated with the natural gas and grid supplied electricity at 0.210 kg/CO₂.kWh and 0.136 kg/CO₂.kWh, respectively,

Heat pumps operate take a low-grade source of heat e.g. external air, and through a process similar to that of a domestic refrigerator, 'upgrade' the heat for use in a heating system. This means that for each 1kWh of energy inputted into an ASHP 3kWh+ of useful heat out compared to a gas fired boiler which would produce 0.95kWh of useful heat per 1kWh of gas inputted. Taking into account this the carbon factors per 1kWh of useful heat would be 0.045 kg/CO₂.kWh, and 0.221 kg/CO₂.kWh, for an ASHP and gas boiler, respectively.





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3.2 Electricity Generation

For the proposed development to be carbon neutral the building would have to generate sufficient electricity on site for the proposed development.

As part of the Hoyle Dean energy strategy a 92kW_p photovoltaic array is proposed. An array of this size would require c.217no. photovoltaic panel to be installed which could not be accommodated on the roof. The roof drawing produced by Harris Irwin Architects confirms that there is only available space on the roof for 76no. An array of this size shall contribute towards the electricity usage of the building as based on a typically installed panel this array would be c.34kW_p.

An array of 34kW_p would be less than the electricity demand of the proposed development. The below table outlines methods of the electricity generation.

Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
Wind Turbine	Wind generation equipment operates on the basis of wind turning a propeller, which is used to drive an alternator to generate electricity. Small scale (1kW – 15kW) wind turbines can be pole or roof mounted.	Low maintenance/ On-going cost. Excess electricity can be exported to the grid.	Planning issues. Aesthetic impact. Background noise Space limitations on site. Minimum wind speed requirements. Wind survey to be undertaken to verify 'local' viability.	No
Combined Heat and Power	A Combined Heat and Power (CHP) installation is effectively a mini on-site power plant providing both electrical power and thermal heat. CHP is strictly an energy efficiency measure rather than a renewable energy technology.	-	Maintenance intensive. Sufficient base thermal and electrical demand required. Additional plant space required. Noise and air quality constraints. Is a more carbon intensive method of producing electricity than grid electric.	No
Onsite Battery Storage	PV Battery Storage able to charge the battery during periods of low electrical load & discharging battery power at times of low/no solar radiation	Battery discharges power during periods of low solar radiation. Reduce electrical energy supply costs.	Specialist Maintenance Additional Plant space required Low Electrical Baseload, battery storage not economically viable	No

Aside from a photovoltaic array that is already proposed on the development there is no other feasible electricity generation or storage method that would be feasible for the development.



4 Conclusion

The energy strategy of the home will be altered compared to the Hoyle Dean report at planning. This is to allow for a photovoltaic array in accordance with the spatial constraints of the roof plan and incorporate air source heat pumps to generate low temperature hot water for the space heating system.

The PV array will generate zero carbon electricity for the home to use and the air source heat pumps will utilise this electricity whilst minimising the developments reliance of fossil fuels, reduce the primary energy demand and associated emissions from the system.

To be a carbon neutral development given the constraints of the site it is not feasible however a number of the systems are electrically including the space heating, comfort cooling and kitchen. All of the electrically driven systems can be considered NET Zero ready as once grid supplied electricity is fully decarbonised through renewable methods of generation the carbon factor of this fuel will be 0 kg/CO₂.kWh, and as such the associated systems will be carbon neutral.