

Approach to energy and carbon dioxide. Enabling a zero-carbon development.

Ambition.

Buckover is a development designed for tomorrow, to the benefit of all today. By combining high quality construction with efficient systems and renewable generation, the ambition is to create homes which maximise their contribution to reducing the UK's greenhouse gas emissions, minimise energy bills, and facilitate residents being healthy and prosperous.

Drivers.

Global

The World is in the midst of a climate emergency and unless greenhouse gas emissions are reduced by at least 80% over 1990 levels, the global climate will warm by more than the 1.5°C threshold identified to be the tipping point at which the environment may not recover.

National

On 2nd May 2019, the Committee on Climate Change published their Net Zero report, which recommended the UK strengthen its emissions reduction target from 80% to 'net zero' greenhouse gas emissions by 2050. In response, the Government debated the proposal in parliament and the net zero target was accepted on 11th June 2019.

In line with the targets in the Climate Change Act, the UK has, thus far, met its carbon budgets. This is due in large part to progress in decarbonising the nation's electricity grid. Since 2012, the carbon intensity of electricity has fallen by 65% as a result of the increase in low and zero carbon generation. This trend is expected to continue, with electricity set to decarbonise by a further 70% by 2035 – less than one tenth the intensity in 2012.

Homes accounted for 18% of the UK's carbon emissions last year with 83% relying on gas boilers for their heating and hot water. The carbon intensity of natural gas is now 19% higher than electricity and with the continued greening of the National Grid making electrically driven systems increasingly favourable, the Chancellor has announced plans to ban the installation of new gas boilers in homes from 2025.

Regional and local

South England receives the greatest amount of solar energy per year of anywhere in the UK, meaning homes in this area are optimally placed to exploit this source of zero carbon energy.

As per South Gloucestershire's Climate Change Strategy (20180-2023), the county is aiming to meet 6% of local energy demand through renewable sources by 2028, rising to 25% by 2036. In combination with this, the council is targeting a 50% reduction in greenhouse gas emissions over a 2014 baseline by 2035.

Domestic sources of carbon emissions in the area account for 32% of emissions, with 9% of households (10,800) living in fuel poverty. This reinforces the importance of building energy-efficient homes.

Response.

Buckover will follow the 'Be Lean, Be Clean, Be Green' energy hierarchy, maximising passive design and energy efficiency measures, supplying energy efficiently, and deploying low and zero carbon technologies to minimise operational CO₂ emissions.

Be Lean.

A 'fabric first' approach will be taken to reduce the energy demand and CO₂ emissions with the overriding objective for the façade design of each home to achieve the optimum balance between providing natural daylighting to reduce the use of artificial lighting, the provision of passive solar heating to limit the need for space heating in winter, and limiting summertime solar gains to mitigate the risk of overheating.

Be Clean.

Whilst commensurate with the area, the density of housing in Buckover does not lend itself to the deployment of a heat network. Instead, the focus of the development is to facilitate innovative future systems which centre on the decentralisation and democratisation of energy (see below).

The benefit of local heating systems is that residents retain ownership and control of their heat with no loss to the efficiency of supply and avoiding complex management and billing contracts.

Be Green.

By leveraging the projected continued decarbonisation of electricity in the UK, an all-electric servicing strategy provides a clear path to a net-zero carbon development.

Electric heat pumps can generate heating and hot water much more efficiently than direct electric heaters, making the cost to occupants comparable to that of a gas boiler. However, in combination with the reduced energy demand afforded by an efficient building and extensive provision of solar photovoltaic (PV) panels, it is the aspiration for residents' energy bills to be significantly reduced compared to an average home. We are also exploring opportunities for smart 'demand-side response' management systems that would enable lower-carbon and lower-cost to end-users by choosing to use power at times of reduced cost on variable pricing 'time-of-use' tariffs.

Benefits.

Smart energy system

Electricity distribution networks in the UK are constrained nationwide. However, with appropriate solutions and management, an all-electric development can positively contribute to the local grid resilience.

It is the intention to provide hot water storage and the potential for electric batteries is also being explored. In combination with the electric heating system and solar PV generating panels, homes could begin to fit the 'buildings as power stations' model. By generating energy on site, which can either be used immediately, or stored as electricity or hot water for use at a later point, homes will minimise their demand on the local electricity grid and maximise their use of zero carbon, renewable, and free energy. Residents will also experience a level of energy autonomy which should enable them to live comfier, happier, more secure lives whilst minimising their energy costs and carbon emissions.

Positive energy blocks

With high performance homes reducing heating and hot water demand, combined with efficient heating systems and on-site renewable energy generation, homes could generate more energy than they consume, leading to so-called 'positive energy' buildings. These homes would have net negative carbon emissions and contribute to reducing the annual CO₂ emissions of other homes in the area.

Zero combustion

An all-electric strategy would result in zero combustion on site for heating, benefitting local air quality and allowing residents to breathe cleaner, healthier air.

Looking to the future, and the phase-out of petrol and diesel cars, the development would facilitate a truly zero combustion scenario. Infrastructure for electric vehicle charging will be provided and the inclusion of

necessary provision to exploit the batteries in EVs as distributed storage – further contributing to the smart energy system – will be explored.