Energy Strategy Input

DTS
Development & Technical Solutions LTD

Proposed Residential Development

A48, Pyle
Bridgend

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1 Introduction and Context

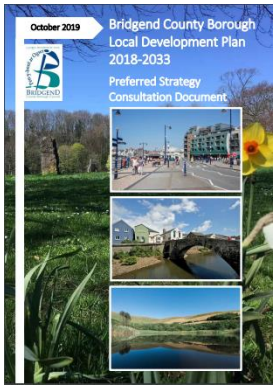
As part of its Utility Services to DTS for a planned development east of Pyle, SMS has been asked to provide a review of future decentralised energy options to act as the basis of a future energy strategy report should the development as a whole proceed.

The new development is at feasibility stage located east of Pyle between the railway and M4 either side of the A48. It is proposed to have around 1,500 homes with supporting non-domestic buildings such as a primary school and a local centre.

The main requirements for the development's energy performance are stipulated by Planning Policy and Building Regulations. Bridgend Borough Council is collaborating with BEIS and the Energy Systems Catapult in the Smart Systems and Heat Programme (SSH) to unlock the commercial opportunity of low carbon heating. As part of this project, a Local Area Energy Strategy has been developed and Bridgend is currently aligning its planning policy with this strategy. The relevant elements of the Preferred Strategy Consultation Document are summarised below.

Bridgend County Borough Local Development Plan 2018-2033

Preferred Strategy Consultation Document



The preferred strategy identifies new detailed planning policies for the Replacement Local Development Plan relevant to the development's energy strategy:

- **Low Carbon Heating Technologies for New Development** – *proposals will need to be accompanied by an 'Energy Assessment' which investigates the potential to incorporate on-site zero and low carbon equipment and establish connections to existing sources of renewable energy. Opportunities for linking with district heating networks and where appropriate sharing renewable energy with the wider public should also be explored.*
- **Energy Efficiency Provision within the Design of Buildings**
  - *The design and standard of any new development should aim to meet a high level of sustainable design and construction and be optimised to achieve energy efficiency and zero carbon emissions.*
  - New development should incorporate *energy generation technologies to meet as a minimum 25% of the energy needs of the development.*

Alongside planning policy, large-scale, phased developments, such as that planned east of Pyle, need to consider evolving Building Regulations. In Wales, the regulations directly relevant to energy and carbon performance (Part L) are expected to become more demanding in 2020 and then tighten further in 2025, as summarised below.

Building Regulations Part L and F Review Llywodraeth Cymru Welsh Government	• More demanding energy carbon standards in building regulations (Approved Document L1A) will become applicable in 2020. • From 2025 onwards "very high fabric standards that limit heat loss" are envisaged. • It is anticipated that an average semi-detached home built to meet the Part L 2025 standard would produce 75-80% less carbon dioxide emissions than one built to current (2014) Part L requirements. • It is anticipated that new homes from 2025 will make use of heat pumps and/or district heating.

As well as the planning policy and building regulations context, large building developments need to consider the wider context of the UK's energy system, including markets, incentives and infrastructure transformation. This is going to change significantly within both the medium term before 2030 (i.e. the period of the site's development) and the long term up to 2050 (during the first decades of the buildings' occupancy). A helpful framework for considering potential changes is the National Grid's Future Energy Scenarios report (2020), which models four scenarios as summarised below.

	Steady Progression	Consumer Transformation	System Transformation	Leading the Way
Summary	Slowest credible decarbonisation	Primarily demand changes to decarbonise	Primarily supply changes to decarbonise	Demand and supply change at fastest credible rate to decarbonise.
Heating and Hot Water	• District heating in 1.5 million homes in 2050. • Net reduction in gas grid connected homes by 2050.	• District heating in 5 million homes in 2050. • No new homes connected to gas grid from 2025.	• District heating in 3 million homes in 2050. • New homes have electric heating or hydrogen-ready boiler from 2025.	• District heating in 4 million homes in 2050. • No new homes connected to gas grid from 2025.
Electricity	• 40% reduction in supply carbon intensity by 2033. • 23% of homes have smart appliances by 2050.	• Carbon neutral supply by 2033. • 73% of homes have smart appliances by 2050.	• Carbon neutral supply by 2033. • 47% of homes have smart appliances by 2050.	• Carbon neutral supply by 2033. • 83% of homes have smart appliances by 2050.

The four scenarios summarised above illustrate the range of potential risks and opportunities for new development energy strategies. There is also significant uncertainty in the context of planning and building regulations requirements. Early consideration of options for the development is needed to navigate this context and it is recommended that the following elements of assessment are prioritised:

1. **Whole life value** – maximising the development's whole life value by minimising:
    a. Development costs, e.g. by avoiding the installation of infrastructure which becomes redundant and conversely avoiding the need for future upgrades of infrastructure due to inadequate initial provision.
    b. Operational costs, e.g. ensuring homes' energy bills will be affordable and energy technologies do not have high maintenance or replacement costs.

2. **Risk Minimisation** – prioritise low regret or no regret measures which will be beneficial irrespective of future energy scenarios, as well as measures which provide flexibility.

The next section summarises whole life value and risk considerations for a range of energy systems and technologies and the final section proposes next steps for the energy strategy.

2 Technology & System Evaluation

An energy assessment should be undertaken for the development as part of concept design. Two key aspects of energy strategy should be included in the assessment:

	1. Passive Design & Energy Efficiency	2. Energy Supply Technologies & Systems
Recommended Energy Assessment Contents	Principles and standards to support elements of architectural design and to form the basis of predictions of the energy consumption of the development and its phases.	Evaluation of technologies and systems to provide carbon reduction based on whole life value and risk minimisation.
Example Whole Life Value Considerations	Balance the increased development cost associated with higher standards of fabric insulation with reduced costs for energy supply systems and infrastructure + reduced energy bills for residents.	See below for examples for each category of technology/system.
Examples of Risk Minimisation Consideration	Passive design measures are typically regarded as low regrets or no regrets options for minimising carbon emissions as they work irrespective of the type of energy supply systems and future changes to infrastructure and markets.	Risks can be managed through an appropriate energy services company (ESCo) delivery model, to manage on-site energy generation, distribution, storage and supply flexibly with agreed requirements for affordability and carbon emissions.

In addition to the examples above, the following considerations are applicable to all energy types, technologies and systems:

- **Carbon emissions** – predictions of carbon emissions – using the Standard Assessment Procedure (SAP) – must meet specific targets set in the Building Regulations and reductions in actual operational carbon emissions should provide an effective long-term strategy for minimising residents' energy bills as markets increasingly support the transition to net zero carbon.
- **Impacts on infrastructure connections to development** – the on-site energy strategy will affect the connection required to the electricity distribution network and potential connections to the gas distribution network and planned neighbouring district heating networks.

The table below highlights technical, economic and other considerations that should be included in an energy assessment for specific energy technologies and systems for the new development.

Energy Type	Technology/ System	Considerations
Heating and Hot Water	District Heating (DH)	• Cost of distribution network, which is strongly affected by the density of dwellings. • Phasing of any distribution network and central plant installation. • Heat generation – e.g. air source heating, CHP or alternatives for central plant, heat interface units or water source heat pumps for buildings. • Location(s) of energy centre(s). • Potential connections with district heating systems in neighbouring areas.
	Building Level Systems	• Energy source – e.g. electricity (e.g. for heat pumps), natural gas (expected to be discouraged) or hydrogen. • Heat generation technology – e.g. direct electric, air source heating, gas boilers or hybrid heat pump / boilers. • Heat distribution – e.g. radiators, underfloor heating, direct electric, air-based.
Electricity	Solar Photovoltaic (PV)	• Roof area, form and orientation for building-integrated solar PV. • Land available for new ground mounted solar installation. • Operation and control – e.g. balancing within the development via a private wire network. • The development site is on the edge of an area identified by Welsh Government as high priority for solar developments. • Engagement with the operators of neighbouring existing solar farms should be considered – 3.7 MW farm beside the M4 and 2.5 MW beside the Severn Trent AD plant and Stormy Down wind turbine.
	Wind	• Wind generation is most effective at large scale. Bridgend County has more than 70 MW of wind generation already installed and parts of the county (to the north and east of the development site) have been identified as priority areas for wind energy. • There is an operational 1.5 MW wind turbine across the M4 from the development with a typical capacity factor of greater 30% (currently operated by Stormy Down Energy).

	Combined Heat and Power (CHP)	• Applicable as part of a DH system. • Gas CHP could be cost-effective, but its carbon impact is dependent on the fraction of natural gas in the fuel vs non fossil fuel derived gases (e.g. hydrogen or biogas). Wales and West is encouraging the entry of gas from renewable sources like biomethane into its network. • Other CHP technologies – incl. solid biomass and fuel cells – are less well proven but could be retained as options as part of DH systems. • Severn Trent should be engaged regarding the scope for recovering heat and power from its 2.8 MW_e anaerobic digestion facility on the other side of the M4 from the development.
	Battery	• Potentially increases the benefits of on-site electricity generation such as solar PV. • Can be installed at building level or development level as part of a private wire network. • Potential savings in electrical infrastructure costs as batteries could reduce peak demand.

3 Next Steps

As concept designs start to be developed for the site, an energy assessment should be undertaken, considering the measures and following the principles described above. The two key objectives of the energy assessment are:

- To provide the developer and other members of the project team with:
    - A whole life cost and risk assessment of energy strategy options for the site.
    - Design recommendations for the development.
- To provide the local planning authority with evidence of how the development complies with local and national planning regulations (as part of an outline planning application).