Duchy of Cornwall Case Study - Poundbury: Implementing a Sustainable Energy System

Organisation

The Duchy of Cornwall is a well-managed private estate which funds the public, charitable and private activities of The Prince of Wales and his family. The Duchy consists of around 54,648 hectares of land in 23 counties, a large proportion of which is in the south west of England. The Prince of Wales is actively involved in running the Duchy and his philosophy is to improve the estate and pass it on to future Dukes in a stronger and better condition. Inherent in this philosophy is the principle of sustainable development.

The Duchy of Cornwall plays an interesting role within the construction value chain. It not only owns the land, but commissions and oversees masterplanning and building design according to its own Building Code, obtains the required planning permission, and develops the necessary on site infrastructure. Private developers build according to these parameters and then sell them to businesses and consumers in the normal way.

Background/issues

Poundbury, part of the Duchy estate, is an extension to Dorchester in Dorset, which is being built over a series of stages. It will have approximately 2500 units upon completion (expected to be by 2025), and is currently around 40% complete. It is famous internationally as a pioneering example of urban development, which integrates residential units with commercial premises and community facilities, to encourage walking and minimise car travel. Buildings to date have a number of measures which bring sustainable benefits (including environmental and aesthetic benefits), for example rainwater harvesting and use of natural materials.

Work is now underway in planning the next phase of development – the South West quadrant. It is intended that this phase will achieve greater levels of sustainability, particularly in the area of energy use, achieving substantial carbon savings whilst retaining expected residual land values. It also aims to demonstrate the feasibility of doing this in traditional buildings.

Carbon emissions savings will be achieved both through construction of the building envelope to a standard of energy efficiency above that required by Building Regulations, and through implementation of a sustainable energy system based on multi-fuel CHP. The units CHP will provide heating and hot water to homes connected to the system (which will be installed with 'heat exchangers' instead of traditional boilers) and will provide power via a private wire electricity network.

The Process

Energy efficiency of the building envelope:

The target for energy efficiency of the building envelope is currently being determined, but will be at least a 25% improvement on Part L (2006) of the Building Regulations.

Experience suggests that existing Poundbury properties already secure a premium upon sale based upon the existing sustainability features including use of natural materials. The Duchy of Cornwall expects this premium to be extended with an integrated sustainable energy system, therefore offsetting the additional capital cost of insulation. At present the additional cost to gain this additional efficiency is approximately 5%.

Sustainable energy system:

One of the key challenges in moving towards more sustainable communities is the need to integrate more sustainable building design with sustainable energy infrastructure. This will necessitate new ways of working between energy companies and construction companies. The Duchy of Cornwall sought to facilitate this link by setting up an Energy Service Company (ESCO) – which brings together partners willing to invest in sustainable energy infrastructure with a view to making a return on this investment. The sustainable energy infrastructure would act as a 'plug and play' system for developers, which they will connect their properties on to, achieving improved environmental performance against recognised benchmarks, for example the Code for Sustainable Homes.

In setting up the ESCO, the Duchy and its potential partners have been through a detailed process to consider system design. This has included choice of technology for both heat and power supply, and identification of all possible revenue sources to ensure commercial feasibility of the system. Early stakeholder communication resulted in all parties involved inputting their demand needs and preferences for fuel supply before the ESCO business plan was formed.

In choosing the technology for heat and power supply, the following key factors were considered:

- Ability to deliver a minimum of 60% carbon emissions reduction target now and in the future
- Extent to which the technologies were 'proven' Reliability and / or access to inputs (e.g. fuel)
- Environmental robustness
- Cost
- Potential for securing additional revenues
- Acceptability to potential purchasers
- Positive impact to local environment, community and economy.

The final decision was made for a larger off-site facility physically connected to the individual energy centres. The multi-fuel energy centres allow for shut down for maintenance and non reliance on one fuel allows for taking advantage of market forces for fuel supply.

In respect of the power generated by the CHP plant, the Duchy and its partners have decided to set the tariff slightly lower than that available through a grid based power supply (10%), in order to compensate homeowners and business for the removal of 'choice' in power supplier. The private wire electricity network is commercially feasible based upon this tariff combined with ROCS**.** Although the business model could stand alone without the ROCS the inclusion of them provides a more robust and satisfactory proposal due to the perceived risks in undertaking such a project.

Achievements and Outcomes

The Duchy aims to have a combined CO2 reduction from the heat and power supplied and increased thermal efficiency to the building envelope of 80% for the 200 units to the South West Quadrant. This figure will be increased over the next phases of the development. The 80% saving will be in the order of 6,000 tons.

Only time and detailed measurements over the next 5 to 10 years will prove the effectiveness of this project.