



Helpu Cymru i leihau  
ei Hôl Troed Carbon

Help Wales reduce  
its Carbon Footprint

## Case Study 05

# Hazel Court



Llywodraeth Cymru  
Welsh Government

[www.cymru.gov.uk](http://www.cymru.gov.uk)

### Developer:

Family Housing  
Association (Wales)  
Limited

### Contractor:

Cowlin Construction

### Location:

Sketty Park, Swansea

### Building Type:

Residential  
(sheltered housing)

### Project Description

The Hazel Court development is a partnership scheme between Family Housing Association and The City and County of Swansea. The first phase of the development comprises a 120-apartment village for the over-55s, with a range of communal facilities and is serviced by a centralised biomass fuelled boiler and gas fired combined heat and power (CHP) units.

### Key Drivers

The development was constructed to replace two 13 storey Local Authority tower blocks which were no longer serviceable but had an established, ageing community.

There was a desire to create a vibrant village environment for older people through the creation of a scheme where residents could maintain a full and active life with care provided where needed. A secondary aim of the new development was to make the rents and running costs as affordable as possible.

A key developer aim was to create an environmentally efficient building with a practical approach to the use of renewables.

### Key Features

- Biomass boiler fuelled by wood pellets;
- Gas fired Dachs CHP system (50 kW);
- Under floor heating; and
- Centralized Energy Centre.

Other sustainable features of the Hazel Court development include:

- Rainwater harvesting; and
- Highly insulated building envelope.

### Procurement

Family Housing Association Wales Ltd (FHA) procured the delivery of the scheme with a collaborative approach with the early appointment of the design team and contractor. A focus group consisting of FHA, the Council's commissioning team, prospective tenants and other agencies took the original brief to create a commonly accepted project brief from which scheme designs were created.



Hazel Court  
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### Renewable & Low Carbon Technologies

- Biomass boiler
- CHP System
- District Heating

Wood pellets for the biomass boiler are sourced from PBE Fuels limited, a local supplier based in Narbeth, Pembrokeshire. PBE Bio Energy supplies the Hazel Court development with virgin timber wood pellets from Balcas, a wood supplier in Northern Ireland. While suppliers of more locally sourced wood pellets and wood chip were available, the client opted to use the Balcas pellets due to their superior quality compared with other fuel suppliers.

### **Scheme costs and finance**

The total cost of the scheme was approximately £18.55 million, with the mechanical and electrical (M&E) building services aspect costing at £3.2 million, including all services.

Each of the Dachs CHP units cost approximately £15,000 to purchase, with an additional £5,000 installation cost, putting the total cost of the CHP system at around £80,000.

A £9.2 million social housing grant was obtained, with £1.75 million provided by the City and County of Swansea. The remaining £7.60 million was funded by Family Housing Association (Wales) Ltd.

### **Technology selection process**

Reliable space heating was a prerequisite for the development and consequently a comprehensive heating strategy study was undertaken which assessed the options available at the time. Considerations of the study included primary and secondary heat sources, renewable and low carbon energy, heat distribution and control, capital cost, cost in use and payback periods.

The high density and high hot water demand of the development lent itself to district heating and CHP. The client elected not to utilise solar hot water or solar photovoltaic due to the relatively long payback period.

The final technology selection comprised a centralised heating system with a wood pellet biomass boiler acting as the primary heat source. This was supplemented by four Dachs CHP units, each capable of generating approximately 12.5 kW of heat and 6.0 kW of electricity with an overall fuel efficiency of 79% to 92%. A 600 kW gas boiler was installed to provide back-up during high heating loads should the biomass boiler need to be taken offline.

Heat distribution around the development is achieved using a below ground pumped flow system which serves underfloor heating to all areas. Tenant accessed heating controls have been installed in each flat, with zoned controls used for communal areas.

The project ensured that energy demand reduction was prioritised before looking at energy efficiency and renewable technologies. Other sustainable aspects of the development include rainwater harvesting and high insulation levels.

### **Monitoring and operation**

Initial technical issues with the biomass boiler resulted in long periods of downtime, during which the gas-fired back up boiler was used to heat the development. However, all issues were quickly resolved and the boiler now runs constantly except for periods of downtime for maintenance purposes. Clinker and bottom ash from the biomass boiler is



emptied on a weekly basis by the Hazel Court site caretaker. The caretaker also undertakes minor routine maintenance and monitors performance and fuel use. The complete heating system can also be monitored remotely via a web based Building Management System.

Local production of electricity by the CHP units reduces the quantity of electricity purchased from the grid.

As tenants pay FHA for electricity consumed in communal parts in addition to that consumed within their flats, any cost reduction achieved by local generation is reflected in their bills.

All monitoring and operation is done by FHA. Overall monitoring and control is achieved on site, or remotely via an internet linked Building Management System. Day to day management and initial fault diagnosis of the system is undertaken by an onsite operative, who also undertakes fuel management and user maintenance of the biomass boiler. The remote BMS is accessible by the biomass boiler installer and by the energy consultants for the development to monitor performance and identify faults.

Remote monitoring of the CHP system is undertaken by the CHP supplier, Baxi-SenerTec UK. Data from the first three years of operation indicates that after operating for a total of 23,860 hours, the four CHP units had generated around 132 MWh of electricity and 295 MWh of heat. The total estimated carbon dioxide savings made over the first three years of operation has been just less than 43 tonnes.

CHP Unit	Electricity generated (kWh)	Heat generated (kWh)	CO <sub>2</sub> saving (kg CO <sub>2</sub> )
Master	33,641	75,200	10,942
Slave 1	33,539	75,148	10,913
Slave 2	30,854	68,996	10,037
Slave 3	33,908	75,986	11,056
TOTAL	131,942	295,330	42,948

CHP power and heat outputs  
Data provided by FHA

During the initial operation, there were issues relating to the integration between the Biomass boiler and CHP system due to the nature of the control strategy between the CHP, biomass boiler and gas boiler. The Baxi units operate when there is a heating system return temperature of 73°C or less. If the return rises above this value (indicating a reduction in heat demand) they will switch off in sequence and will remain off until the return temperature falls below the required temperature.

## Lessons learnt

### Occupant involvement:

- The scale and concept of some of the current social housing older persons schemes coupled with the introduction of new technologies and systems can create issues in relation to customer perception and scheme management; and
- Heating controls need to have clear displays and intuitive programming for elderly users.

### Technological supply issues:

- One of the greatest challenges faced was ensuring the CHP was able to operate without the boiler plant overriding the system. Careful system control



was therefore critical to ensure the CHP units were always leading. This was achieved by maintaining set point temperatures and time periods to prevent fire up of the gas plant unless absolutely necessary;

- Biomass boilers, even with automated fuel delivery and ash removal, require a greater amount of on site management and monitoring than traditional gas fired systems. This creates additional staffing costs that must be set against the overall cost in use and which is an additional cost to the end user
- The existing biomass design, installation and management supply chain is still comparatively inexperienced on schemes of this nature which fall between individual domestic installations and larger, more commercial installations where there is on-site facilities management; and
- Thorough clarification of responsibilities for installation, maintenance and operation of CHP system and biomass boilers should be made at an early project stage. Additionally, mixed heating sources must be carefully balanced to optimise the predicted fuel consumption.

## Awards and Achievements;

- Achieved BREEAM 'Very Good'.

## References and Acknowledgements

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Family Housing Association (Wales) Ltd

Geraint Hopkins  
McCann and Partners

David Shaw, Business Manager  
Baxi-SenerTec UK

## Further information

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These case studies are presented to show examples of how buildings can be designed and built to be low carbon and incorporate renewable and low carbon technologies. This case study is part of a series of case studies supporting a separate practice guidance document on low carbon buildings. **For further information see [www.wales.gov.uk/planning](http://www.wales.gov.uk/planning)**

