Forestry Commission



Woodfuel community heating at Kielder

Kielder Forest in Northumberland is the largest forest in England. It was established by the Forestry Commission in 1926 as a strategic reserve of timber and an experimental site for the cultivation of conifers. Today timber from Kielder Forest provides a range of sustainable wood products, including 400,000 tonnes of sawlogs and roundwood for the construction industry and 30,000 tonnes of biomass for woodfuel. The forest park and Kielder Water are a big draw for visitors, with holiday cabins, water sports, an activity centre for the disabled and a new multi-purpose track around the lake. The 18th century Kielder Castle, a former hunting lodge, is one of three visitor centres in the area. Its learning centre, café and bike hire facility attract 100,000 visitors a year. Kielder village, in the heart of the forest, is one of the most remote villages in England. Originally created in the 1950s to provide homes for foresters and their families, it now has a population of around 200 people – a village shop, community centre and school serve the local community. A regeneration initiative, funded from the European Regional Development Fund with support from the local council, enabled 12 new affordable houses to be built in the village. A wood-fired district heating system was installed in 2004 as a practical low-carbon solution to providing heat and hot water to the new homes, as well as the Castle, community school, youth hostel, local arts and crafts workshops, and a salmon hatchery.



A wood-fired district heating system, one of the first of its kind in Britain, provides a low-carbon source of heating to the Kielder village community

District heating is the use of a centralised boiler to provide heat for a number of buildings. Woodfuel heating is environmentally-friendly and sustainable, with large-scale installations of a few hundred kilowatts proving to be an economically viable source of renewable energy. District heating is common in Europe, and a number of successful systems have now been set up in Britain providing heat and hot water, and also co-generated heat from electrical power in combined heat and power (CHP) installations.

Woodfuel boiler

The 300 kilowatt Austrian woodfuel boiler at Kielder is fuelled by locally-grown Sitka spruce. The trees are felled, stacked in the forest to season for 12 months, transported to a depot for chipping and then stored in a purpose-built facility that holds up to 450 cubic metres of woodchips. A tractor and trailer transports four loads of woodchips weekly to the boiler house fuel store in the centre of the village. The delivery trailer has a 'push off' action to empty the chips into the store. Inside the boiler house a moving floor pushes the chips towards the screw augers which conveys them into the boiler where they are burned. The system has a rotating firebox designed to burn all types of woodfuel, including chips, pellets, and briquettes. Boiler efficiency is 90%. Annual wood chip consumption is 1700 cubic metres at a cost of £11.20 per cubic metre. An integrated oil-fired system automatically comes into operation should the temperature fall below 50 degrees, and when the boiler is undergoing maintenance.

Heating and hot water

Hot water from the boiler is stored in accumulator tanks and piped round 950 metres of insulated underground piping to the surrounding buildings, where heat exchangers transfer the hot water into the central heating and hot water systems within each building. The heat exchangers are layers of corrugated plates brazed together with copper, and supported in a frame so that a series of parallel flow channels are created between the plates. Two separate water flows circulate around the heat exchanger, one from the boiler and one circulating around the buildings transferring heat between the two water flows. The water is heated to 85 degrees and returns a little cooler at about 70 degrees, before being reheated and pumped round the system again. Each building and dwelling has its own meter. Customers are billed monthly for their individual usage. Costs range from 3–5 pence per kilowatt hour which proves more cost effective than using oil at 6–8 pence per kilowatt hour.

The system is quiet, and produces a minimal amount of smoke and ash (around 2–4 dustbins per year). Total emissions are estimated to be less than a single domestic coal fire and are less harmful to the environment as burning wood does not release sulphur dioxide into the atmosphere. The whole system costs £31,500 per year to run, including maintenance.

Benefits

- Woodfuel provides a low-carbon source of energy as the carbon dioxide produced through the burning of wood is absorbed during the life of the tree – and for every tree that is felled another is planted.
- Customers do not need to install their own fossil fuel systems, or have to store fuels on site.
- Community heating systems boost the local economy and can provide employment.

Our advice

- Recommend a project manager to oversee the project and manage the distribution network.
- Locations with an abundant supply of wood are ideal for woodfuel community heating, especially areas not serviced by mains gas.

Achievements

- It is estimated that the Kielder Woodfuel system will save 400 tonnes of carbon per year compared with a traditional oil-fired system. (That is the equivalent of 104 one-way flights to Australia!).
- The woodfuel heated homes have been shortlisted in the Royal Institute of Chartered Surveyors (RICS) North East Renaissance Awards 2010.

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