RUMOUR

Collytown, Bere Alston, PL20 7ED

SOLAR PV, SOLAR THERMAL, INSULATION, SOLAR CAPTURE, INNOVATIVE HEAT PUMP AND HEAT STORE, FULL HOUSE HEAT RECOVERY

Peter & Helen Silcock are half way through building a partially underground house. Their goal is to reduce energy consumption to a minimum but not to compromise on modern living standards.

Peter's motivation is a desire to prove his ideas could be done … and to prove the technologies he is installing.
The project developed from a sheet of white paper and ideas and will be proved in operation!

Energy reduction and conservation

Passive solar design

The house faces 10 degrees west of south so the large windows and roof give solar gain. An overhang before the inner glazing to the house shades it from summer sun. East and west sides of the house are earth sheltered. The north side is dropped into a disused quarry, giving protection from the coldest winds. In addition, trees cut out the north and east winds. Passive design is important for a solar house.

Insulation

The concrete base of the house is completely insulated (except under the larder). The average is 150mm of polystyrene under the base with another 50mm above to fit the under floor heating pipework (U value = 0.13 W/m2k). The walls are Insulated Concrete Formwork (ICF) from Nudura, providing a very strong, airtight structure (U value = 0.15). 140mm of insulation is standard but an extra 50mm is fitted inside the rear wall and externally to the underground walls. The roof is a Dutch ICF system called 'Op-Deck'; insulated roof sheet, polystyrene 'top hat' sections that form a concrete covered roof, the form and the steel allowing for large open spans (U value = 0.15). Careful attention has been given to eliminating all thermal bridges and insulating the perimeter of the concrete base. The front windows are Shuco aluminium with thermal break. The rear are externally frameless 'Vision' from Camel Glass. The glazing is Planitherm coated and Argon filled, giving a U value = 0.15.

Nudura wall system

This system should only require 1kW to maintain +20°C inside when it is -2 °C outside, before air change losses. The construction method includes blockwork internal walls to give a high mass house. A high mass house reacts slowly to changes in weather and temperature and is comfortable to live in.

Green roof

This should modulate the internal temperature and attenuate rainfall run-off to a small degree.

Heat storage

The main heat store is 150m^3 of insulated stone. This heat store to the side of the house has 500m of 25mm pipework buried within it to transfer around 2kW of heat to the store and back out for use. This is enough to heat the house but when 'filling' the heatstore a buffer of water will be needed where the heat can be swiftly stored before the slower transfer to the heat store. The models show this will be enough heat for 6 weeks without any sun.

Water storage

2500 litres of water will be used. A 500 litre 'hot' tank for domestic hot water and two 1000 litre warm and cool tanks, the warm tank also acting as buffer to conservatory heat. When a lot of heat is available, all will be hot. The heat is taken for use from the hot side with the warmed water moving though the system.

Monitoring

Computerized system with 200 temperature sensors for energy monitoring and conservation as the weather and power use is also logged.

Energy generation

Heat sources

The major heat source is the conservatory. In sun, the heat gain through glass, is around 1kW/m^2. The glass will therefore give in excess of 20kW with the sun out. The heat from this is gathered by high efficiency radiators into water.

Solar hot water

Vacuum tubes will be fitted as they give the highest temperature of water giving useful heat in marginal weather. We have the ability to dump heat into a store, so a large number can be fitted. Stagnation during hot weather when the heat cannot be used generally limits the number of tubes that can be installed.

Solar PV

A 4kW system will run all the pumps needed for the systems above. All spare power will be stored as hot water in immersion heaters, then transferred to the heat store.

Log burner

Both as a heat source and a satisfying feature in the evening!

Boiler or small water to water heat pump

Peter expects either to run out of heat during grey days or to have a lot of low temperature water. For hot showers, a boost will be given either by a heat pump or a boiler.

Potential problems

Heat losses are expected from the heat recovery ventilation system and Peter is unsure how efficient it will be in reality.

Contact details

Pete Silcock
Rumour
Collytown, Bere Alston, PL20 7ED
Tel: 01822 841005
info@active-services.org.uk

Additional Information

'Energy use planned for the house' document available from www.transitiontavistock.org.uk