

## STOURTOWN FARM

Stampford Spiney, Yelverton PL20 6LD



DAMP RESOLUTION; INSULATION METHODS; GROUND SOURCE HEAT PUMP; WOOD STOVE, UNDERFLOOR HEATING; PHOTO VOLTAIC ARRAY; ADVICE ON PROPERTY RENOVATION

**Building category:** Barn conversion in Dartmoor National Park (DNPA)

### Project Background

A cabinet maker by trade, converting my parent's barn was the only affordable option to stay in the countryside where I grew up and work. I have the skills and friends to DIY / self-build the project.

The barn is 22m long by 5m wide and one and a half storeys high. DNPA would not allow extensions or external changes which required efficient use of the internal space as a family home

The barn had damp floor and lower walls, was draughty and had no insulation. The renovation and improvement therefore required treatment of all elements of the building shell; floors, walls, windows, doors and roof, to achieve a comfortable and efficient home.

Each detail had to be learned - often the hard way  
The work took nearly 6 years to complete 2003-09



### Energy reduction and conservation:

**Damp Treatments:** Damp floors and walls conduct heat rapidly to the outside - no amount of heating will keep a damp building warm. To resolve the dampness we excavated the floors and put a drainage layer of gravel below the new floor slab. A gravel drain was also laid along the outside of the building to intercept flows into the base of the walls. The lower half of the inside walls were lined with 'Safeguard' a stiff stippled plastic tanking membrane which was extended down into the gravel below the slab. The stipples hold the sheet off the stone face to allow moisture passing through the wall to condense and drain.

**Wall Insulation:** To minimise the loss of internal space a 'thin' multi-layered 'Tri-Iso Super9' insulation fabric was fitted to horizontal battens before OSB and plaster board wall finish.

**Floor insulation:** 70mm of rigid 'Kingspan' insulation board was laid on the concrete slab before the under-floor heating system was installed.

**Roof Insulation:** 'Tri-Iso Super9' multi-foil fabric was also used in the roof plus 50mm of rigid insulation board between the rafters. The fabric also provides effective draught proofing

**Windows:** All the replacement window and glazed doors are double glazed with detailing to ensure insulation around the oak frames and draught proofing.

**Cold Bridges & Air Tightness:** I learned that the detailing of every junction between materials has to prevent cold bridging which can bypass the insulation and air leakage through the structure.

### Heating Systems

As a farm we have extensive hedgerows which I manage as a commercial source of fire logs. Therefore we installed a wood burning stove in the main living space for use in very cold periods.

A Ground Source Heat Pump (GSHP) was installed to provide domestic hot water (DHW) and hot water to an underfloor heating system throughout the ground level of the home.

The underfloor heating is a series of small bore pipes laid over insulation and set in a concrete screed below timber and tile floor finishes.

### Ground Source Heat Pump (GSHP)

I installed a 6 kW Ice Energy IVT GSHP with about 200 m of ground loops set in trenches about 1m deep in the garden. These loops take heat from the ground (at about 10°C all year round) and the heat pump extracts that heat (in the same way as a refrigerator) down to about 4°C before flowing back to be reheated by the ground.

The GSHP provides both domestic hot water, and underfloor heating when required (such as when the wood stove is not in use).

The GSHP uses electricity in the same way as a fridge (to power a compressor and a condenser), and to pump a volatile liquid (refrigerant) around the ground loop system. This uses 1kW of electricity to deliver about 3.5kW of heat, making the use of electricity cost effective for this form of heating.

The heat being extracted is from the sun warming the soil, and ground water flows are an important part of maintaining the soil temperature around the ground loops. Therefore this is renewable solar energy.

### Photo Voltaic (PV) Array

A 3.8kW Sanyo ground mounted panel PV system was installed by New Generation Energy - a Tavistock company. The PV delivers about 3,700kW hours of electricity per year. The Feed in Tariff (FiT) at that time was over 40p per unit for 20years and will payback the investment cost within about 7 years.

The system was ground mounted as the DNPA would not allow the panels roof mounted in our rural setting.

### Costs and Benefits

All of the above measures, taken together, have resolved the damp and draughty conditions and created a comfortable internal environment which is efficient to keep warm.

A 'Clear Skies' grant of £1,500 contributed to the cost of the Ground Source Heat Pump

The PV delivers savings though reduced electricity bought and FiT payments for exported electricity.

With high levels of insulation and draught proofing the home is easy to keep warm. The wood burning stove is the primary source with logs harvested from our own hedges.

The GSHP efficiently provides both domestic hot water, and underfloor heating when required.

### Contact details

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### Additional Information

Other case studies and information

sheets on: [www.transitiontavistock.org.uk](http://www.transitiontavistock.org.uk)