



Moor Sustainable CIC



GREEN
OPEN
HOMES

Esk Valley and Coast Green Open
Homes

Saturday 5th and Sunday 6th April 2014

Victorian Eco Renovation



Information on this home

This Victorian house was completely renovated to be annually net carbon negative. All external walls, the floor and roof were insulated internally. All windows have been replaced with draught-free double glazing. The house 'envelope' is draught sealed. Heating is from a ground source heat pump (with under-floor heating) and totally enclosed wood-burning stoves. Fuel will be from own coppice.

Current energy balance 2013:
Electricity consumed 8MWH (3.6Te Carbon), Electricity generated 3MWH (1.4Te Carbon), Timber grown (year 7) 1.4Te carbon captured (nett 0.8Te) - so we are not yet neutral.
In 5 years (year 12) the coppice will capture approx 2.5Te (net -0.3Te) – goal reached!

Hot water is from the GSHP and solar thermal panels. Power is from the grid and photovoltaic panels on the

ground.

Whole-house ventilation with heat recovery removes the need for draughty, energy losing, window trickle vents. We are experimenting with passive summer cooling from the GSHP and ventilation system.

LED lights of all types (candles to flood) throughout. Using our kitchen garden and growing green fertiliser reduces food miles.

We have plumbed existing spring water into the house and kitchen garden. It is used now in the kitchen garden and greenhouse. Our next project is to treat the spring water sustainably for use in non-potable duties in the house (such as flushing toilets).

A series of six articles describing the renovation work at this home was published in 2010-2011 in the magazine *Valley News* (see <http://www.eskvalleynews.co.uk/>).

They are now available on the Moor Sustainable web page at <http://www.moorsustainable.org.uk/energy/esk-valley-community-energy-group/esk-valley-community-energy-group-reports-and-articles/>

Details of products and installers are provided for information only and cannot be considered as endorsements by Moor Sustainable or the Esk Valley Community Energy Group



Low-cost improvements

Loft insulation, draught proofing and heating controls have all been included in the overall project.

Issues to consider:- Wiring for controls

'Big' insulation works

All external walls and floors insulated with Phenolic Kingspan 100mm above ground, 75mm below ground. Insulation installed in timber frame inner "shell" then covered in plasterboard.

Thickness 100 mm.

U-value $0.2 \text{ W m}^{-2} \text{ K}^{-1}$

Year of installation:- 2010

Supplier:- www.secondsandco.co.uk/

Installer:- DIY

Costs:- Approximately . £25/sheet



Issues to consider:- All insulation MUST be sealed to prevent air exchange within the insulation. Don't forget between the joists and the window reveals.

Glazing and doors

High specification timber (Accoya) sash windows and doors. Blade and bristle full draught seals, low iron glass, softcoat, warm-edge spacers, Argon filled.

Supplier: Carey & Fox, now www.totali.uk.com/

Costs:- Approx. £800 per window

Issues to consider:- Glass specification, draught seals, timber stability and longevity.

Lighting systems and electrical appliances

Low energy (A+ minimum) white goods. LED lights throughout the house, mostly GU10 and Candle shape

Convinced electricity network operator to reduce the voltage of our supply (this reduces consumption and increases equipment life).

Year of installation:- 2012

Costs:- £5 - £8 per bulb

Suppliers:- www.simplyled.co.uk and www.tcpi.eu/

Issues to consider:- Colour balance. Coverage (spot vs flood). Even though they are low temperature, LEDs still need heat clearance (esp GU10) – don't cover with insulation.

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High specification heating

Under floor heating on all floors.

Year of installation:- 2010-2012

Suppliers:-

Continental Underfloor Heating - www.ufh.co.uk and Jupiter - www.jupiterunderfloorheating.com

Costs:- £3000+

Technical details:- 17mm AluPEX pipe 150 & 100mm spacing. In screed on lower floors – spreader plates on upper floor.

Issues to consider:- Pipe spacing, floor covering. Heat pumps work best at low temperatures. High spacing and carpets reduce heat pump efficiency.

Mechanical ventilation with heat recovery

Year of installation:- 2011

Installer:- Total Home Environment www.totalhome.co.uk/

Manufacturer:- Genvex

Costs:- £2,000 + extra for pipework

Issues to consider:- Plastic ducts on the intake may introduce toxic chemicals into the house – use metal. Rigid/smooth-walled duct is much more efficient than flexible/corrugated. Summer bypass. Location of inlet/outlet. Insulation of duct in unheated areas. Balancing air flows.



Renewables:- heat

Ground source heat pump



Year of installation:- 2010

Installer and Supplier:- Geowarmth www.geowarmth.co.uk/

Costs:- £18,000 including Solar Thermal (see below) and Thermal Stores

Grant scheme:- Low Carbon Building Programme Phase 2 replaced with RHI

Manufacturer / output:- Vaillant 10kW

Issues to consider:- Heat output if using radiators or house poorly insulated. Ground collector (straight vs slinky vs panels vs bore hole).

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Electricity supply (>4kW, >50A peak)
 Noise (less of a problem with modern units).
 Size of ancillary equipment.

Solar hot water

For year of installation, installer, supplier, costs and grant scheme see the section above on the heat pump.

Manufacturer / output:- 2x Worcester Bosch panels with total area of 4.2 m².
 Vaillant controller.

Issues to consider:-

Insulation of pipe-work.
 Expansion vessel size (needs to be properly calculated)
 Usage (e.g. feeding an already heated tank renders it useless).
 Stagnation – if you don't take the heat away from the panel (e.g. power cut, tank full) stagnation can degrade the heat transfer fluid.
 Flat panel (low efficiency/low stagnation issue) vs evacuated tube (high efficiency / high stagnation issue).

Thermal store with heat exchanger

The heat exchanger allows potable hot water with no need for *Legionella* heating cycle.

For year of installation, installer, supplier, costs and grant scheme see the section above on the heat pump.

Manufacturer / capacity:- Hygenik 800 litres + Ariston 300 litres (solar thermal) and Alfa Laval potable water heat exchanger.

Issues to consider:- Heat loss/lagging, floor loading, size, expansion vessel size, *Legionella*.



Wood burning stoves

Year of installation:- 2010

Supplier:- Yorkshire Heating Supplies, Starbeck (company may no longer exist as website not found).

Costs:- £1,800 for two.

Manufacturer / model / output:- Clearview Pioneer 5kW

Issues to consider

Source of combustion air (duct from outside), multi-fuel possibilities, ability to keep glass clean, chimney quality.

Renewables:- electricity

Solar PV. Ground mounted, no concrete, recycled plastic mounting “bins” (i.e. no additional “high-carbon” aluminium frames).

Year of installation:- 2010

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Supplier:- Access Renewables
(May be out of business at April 2014)

Costs:- £17000 including groundworks.

Benefits:- 11 MWh from installation to end of March 2014, giving a 30% return on capital costs in 3.5 years. FIT payments for electricity generated.

Manufacturer / model / output:-
20 panels @ 185 W, giving a total of 3.7 kW. 5KW Fronius inverter.
Mitsubishi PV panels, polycrystalline. Works better in diffuse light with high level cloud rather than full sunshine.

Issues to consider:- Ground vs roof mounting. Orientation.



Water management

Use of spring water, dual-flush toilets, aerated shower nozzle (reduced water flow). Not yet solved the discolouration of the spring water – future project.

Year of installation:- 1850!

Lifestyle changes

Growing food, growing fuel:-
400 trees on 0.8 ha. Planting began winter 2006-7.


Coppice cycles 3 to 50 years (willow to oak).

Kitchen garden fertiliser from Comfrey bed plus 100% vegetative recycle to compost.



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| <p style="text-align: center;">Personal insights</p> <p>Why did you decide to make the changes? Living in the USA for 8 years reinforced how energy-profligate the human species is.</p> <p>Have you discovered any unexpected benefits? Under-floor heating makes for comfortable, draught-free living as well as freeing up wall space (no radiators). Whole-house ventilation improves the quality of life in the whole house (unlike individual room extractors) – no room feels “stuffy”.</p> <p>Do you think the costs were reasonable? Only the insulation and the PV will pay back fully (financially) unless the RHI is actually introduced – the rest are for quality of life and energy conservation. <i>(Note the domestic RHI scheme is due to be launched Spring 2014, according to Ofgem - Editor).</i></p> <p>Were there any hidden costs? Surprisingly, no.</p> <p>Were there any discounts? Always get more than one quote and let the suppliers know you are doing that.</p> | <p>Is there anything unusual about what you have done or how you did it? At the time – yes, now – not so much.</p> <p>Upstairs bathrooms under-floor heating was own design to reduce the floor “uplift”.</p> <p>Double thermal stores are unusual but improve solar thermal efficiency.</p> <p>All equipment was bought on the basis it can have electronic data logging.</p> <p>Accoya timber was practically unknown in the UK (common in New Zealand) – now widely available.</p> <p>Whole-house ventilation was novel and more bespoke than now.</p> <p>Very thin under-floor heating screeds controversial – we wanted responsiveness not stored energy.</p> <p>Difficult to find closely spaced under-floor panels as most were for conventional (high temperature) heating systems with a wide spacing.</p> <p>How disruptive were the different improvements? Very. Internal insulation requires gutting the house. All the services (e.g. light switches/sockets) have to be moved. Ventilation systems require ducts to all floors. LED lighting is easy. Window replacement should be minimally disruptive. Heat pumps and thermal stores require more space than fossil-fuel heating. PV is easy and non-disruptive</p> |
| <p><i>Details of products and installers are provided for information only and cannot be considered as endorsements by Moor Sustainable or the Esk Valley Community Energy Group</i></p> |  <p>The logo for Esk Valley Community Energy Group features a stylized wave graphic in red, blue, and green above the text 'Esk Valley' and 'Community Energy Group'.</p> |