NEW TECHNOLOGIES

WHICH ONES SHOW PROMISE?

14 April 2011

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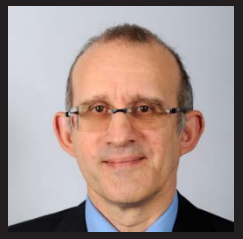
MAX FORDHAM

WHO WAS ON OUR PANEL?



- **Richard Baines** - Director of Sustainable Development at Black Country Housing. An expert in areas including fuel-cell-based CHP systems in social housing and winner of the Green Social Housing Champion of the Year award in 2009

- **Pete Warm** – Founder, Warm: Low energy building practice. A PassivHaus Institute certifier and trainer, and an expert in the practical use of low energy technologies in social housing

- **Andrew Percival** – Consultant, Kinetics. A Chartered Environmentalist, Andrew is an expert on low carbon retrofit for social housing

- **Denys Stephens** – Sustainability Manager at Penwith Housing Association. Denys is an Architectural Technologist and Chartered Environmentalist, and recognised as one of the pioneers in the use of heat pumps in UK social housing.

- **Jim Oswald -** Director, Wattbox**.** Jim has 30 years' experience of designing power systems and is an expert on household energy saving technologies

THE TECHNOLOGIES

- **Heating** – GSHP,ASHP, Micro CHP, Fuel cells, Biomass boilers, Group/district CHP, smart controls
- **Ventilation** – MVHR, compact service units
- **Lighting** – LEDS, compact fluorescents
- **Low energy appliances** – fridges, dishwashers etc
- **Smart meters**
- **Renewables** – PV, solar hot water, micro wind and community wind power

OUR ANALYSIS

- **What is it, and how does it work?**
- **What does it cost to install?** – *roughly for a* three bed semi detached
- **What does it cost to run?** – does it match the claims in terms of energy performance?
- **How easy is it to install?** – what do you need to look out for?
- **What do tenants make of it?**
- **Are there any special maintenance issues?**
- **And then an overall rating – marks out of ten**

HEATING

Remember, all figures that follow assume a new build three bedroom home

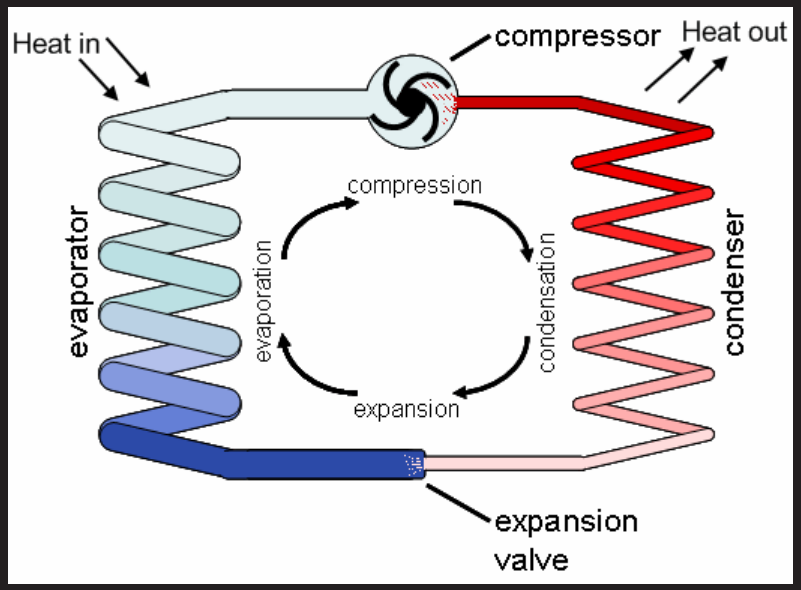
THE ONE TO BEAT: GAS FIRED BOILER

- Cheap to install
- Difficult to beat for running costs and maintenance.
- Very responsive and controllable

BUT

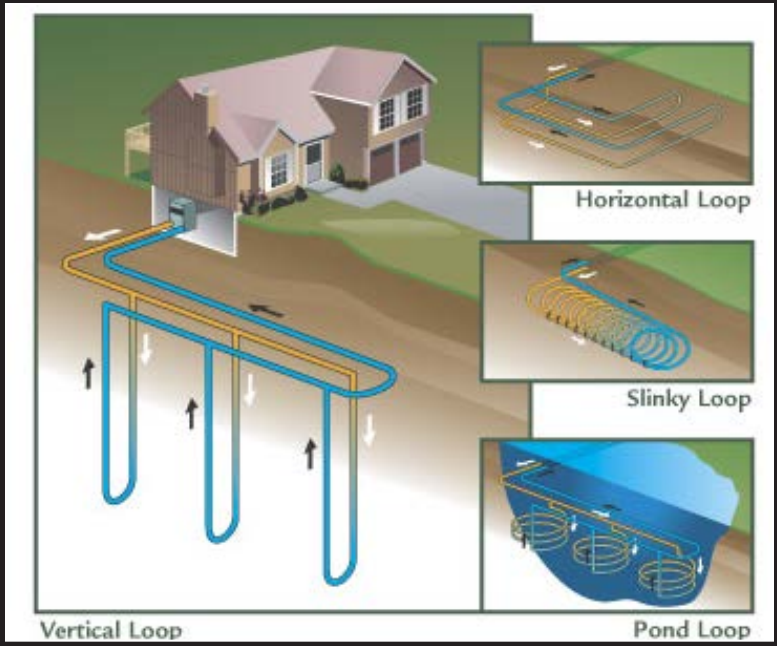
- Gas not always available
- DECC want us to stop using gas !!

HEAT PUMPS



- Takes heat from a cold place and releases into a warm place. A domestic fridge is a heat pump!
- One unit of electricity to drive the compressor will produce 1.5 to 5 times the amount of heat. [COP]
- The closer the temperatures of the hot and cold sides the better [higher] the COP is.
- You need a warm source of heat
- You need a low temperature heating surface
- It needs to be well designed to tight margins

GROUND SOURCE HEAT PUMPS (GSHP)



- Sucking heat from the ground
- Numerous ways of getting to the heat in the ground.
- That heat needs to be replaced!
- Can be used as a source of cooling in the summer!

GROUND SOURCE HEAT PUMPS (GSHP)

- Costs £10-15k per home to install [of which borehole typically £2,000]
- Unit cost is less if part of a community system
- Running costs £300 - £500 per house per year if sized and controlled properly
- *But* sometimes more!
- Must be correctly sized and operated

GROUND SOURCE HEAT PUMPS (GSHP)

- Not always very easy to install – can be disruptive to tenants on retrofit projects
- Best suited to rural sites where no mains gas is available
- Tenants generally like them but they take time to adapt and figure out how to operate them to best effect
- Lifespan is 20-25 years; change anti freeze every three years. Otherwise minimal maintenance
- Ground loop needs pressuring occasionally

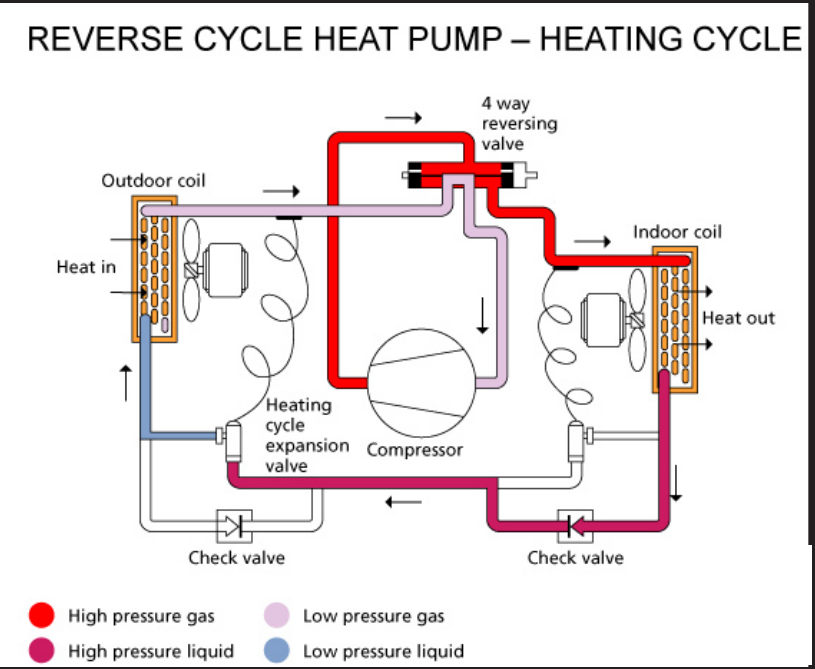
GROUND SOURCE HEAT PUMPS (GSHP)

- **RATINGS FROM THE PANEL**
- 1/10 if on the gas grid
- 2/10 for retrofits
- 6/10 for new builds
- 9/10 for rural situations where no gas is available
- 9/10 for community schemes

AIR SOURCE HEAT PUMPS (ASHP)

- Uses the warmth in the air as its heat source. Coldest when you need the most heat
- Costs £5.5-7k per home to install, but will be more expensive to run than GSHP – typically £600 a year
- Easy to install; but not very pretty!
- Noisy
- Can have problems if air temperature drops below 3 deg Celcius
- Lifespan 15 years, pumps need annual check and often tied to installer

AIR SOURCE HEAT PUMPS (ASHP)

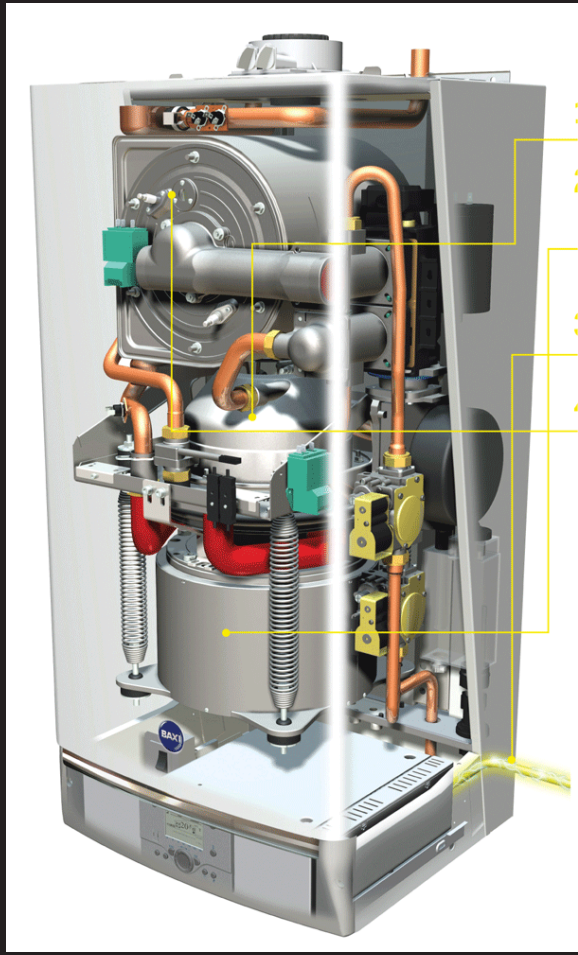


- **RATINGS FROM THE PANEL**
- 3/10 if on the gas grid
- 8/10 where no gas is available

MICRO CHP (Combined heat and power)

- Motor generates electricity for the home, excess goes back into the grid and ‘waste’ heat is used to heat the home
- Currently costs £7-9k per home to install (much more than an efficient gas boiler), but this is expected to drop
- Running costs about £300-600 a year
- Relatively easy to install, though the units are extremely heavy. Noisy?
- Annual checks required, and few engineers around. Reliability is unknown

MICRO CHP (Combined heat and power)

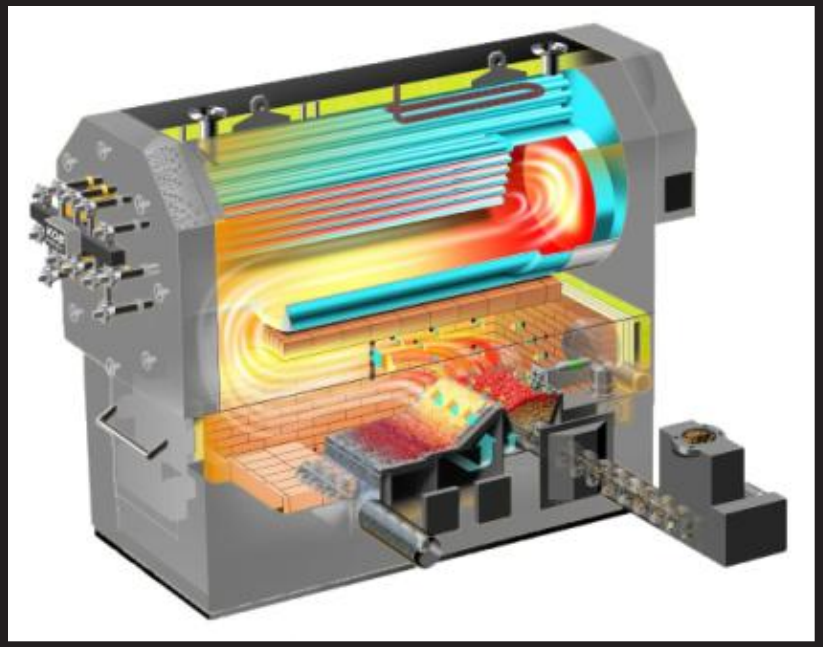


- Very few have been installed so far, so not much resident feedback available
- If you don’t need the heat it is an inefficient generator
- **RATINGS FROM THE PANEL**
- 2-3/10

FUEL CELLS

- Makes electricity and heat from gas with no engine.
- You can't buy one yet, but people like British Gas are working on it
- **RATINGS FROM THE PANEL**
- 1/10 now; but one day 11/10

BIOMASS BOILERS



- Efficient boiler than uses wood pellets or chips
- Currently costs £8-12k to install
- Running costs about £500-600 a year
- Can be difficult to get the pellets
- Needs ***lots*** of space to store tonnes of pellets; flue issues can be a challenge
- Suits residents who like a green technology; won't suit others
- Ash cleaning, pellet jamming, annual cleaning needed for burners

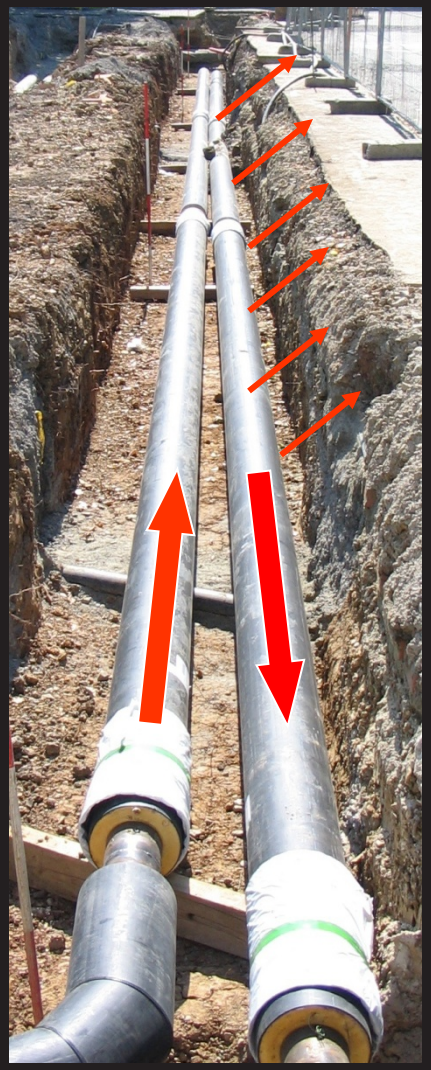
BIOMASS BOILERS

- **RATINGS FROM THE PANEL**
- 3/10 if on the gas grid
- 6/10 for community/group schemes or rural/isolated homes

GROUP/DISTRICT CHP

- Central boiler provides heating to all the homes in vicinity
- Connected by pipes in the ground
- Can be connected to Gas Boiler, CHP, Biomass, Heat pump, or any other heat source.

GROUP/DISTRICT CHP



- Costs are considerable as lots of insulated pipework, metering and controls are required, and often a back up system in each home too.
- Additional pumping energy and heat loss from the pipe work.
- Higher energy and management costs.

BUT

- Centralised maintenance
- No gas in dwellings

GROUP/DISTRICT CHP

- Really needs full time staff to manage and operate.

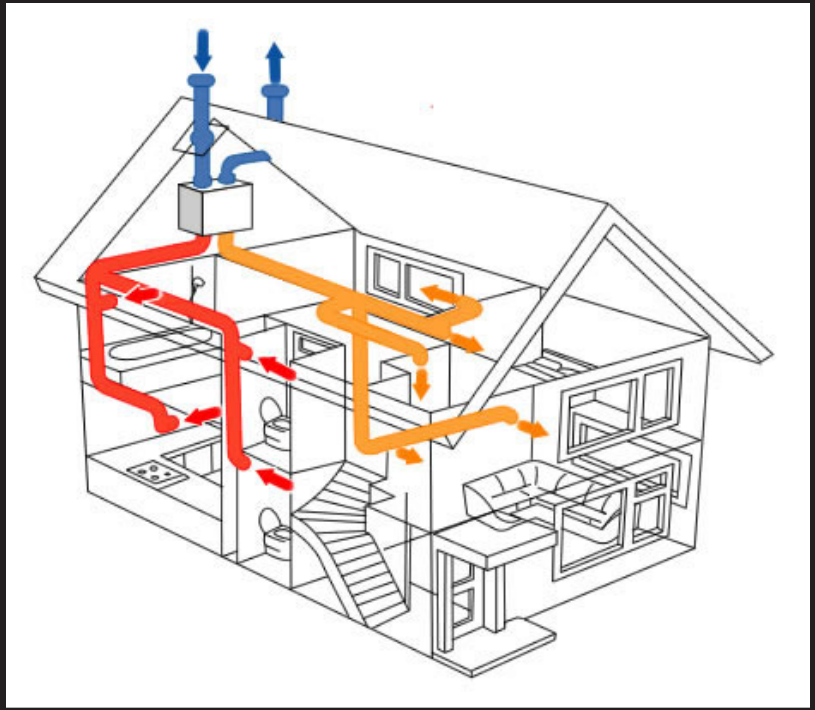
- **RATINGS FROM THE PANEL**
- 1- 5 /10 in the right situation

SMART CONTROLS (eg Wattbox)

- Occupancy based heating controller: it notices and learns household occupancy so it removes the need for users to set time-clocks etc.
- Between £175 and £400 per home plus £150 to install
- Fairly easy to install – but needs sensor on roof and 3G for remote monitoring
- Mixed response from residents – some love it; others struggle
- **RATINGS FROM THE PANEL**
- 5/10

VENTILATION

MVHR
(Mechanical ventilation with heat recovery)

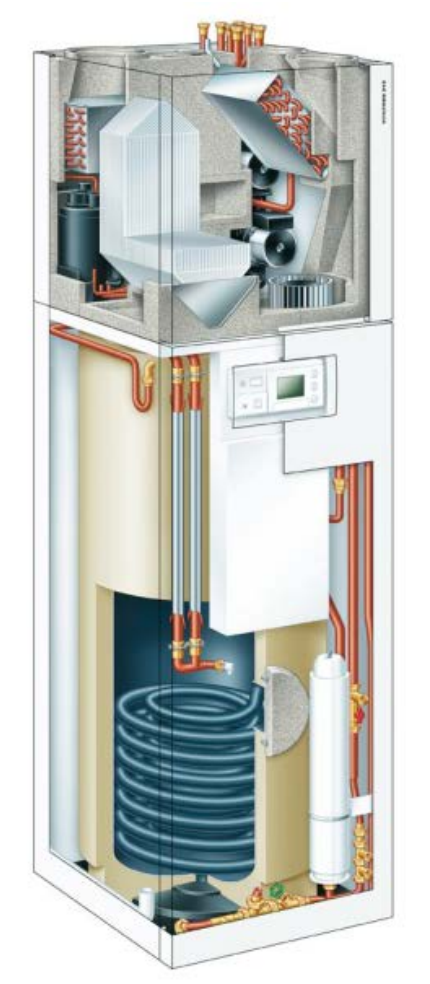


- Warm air extracted from the home is used to heat cool fresh air that is drawn in.
- Only really a benefit in airtight dwellings. Currently costs £3k to install
- Running costs about £50 a year; should save about £100 a year
- Not easy to install/trades still unfamiliar with the technology
- Residents struggle to understand it; needs good instructions. Noisy?
- Filters need changing every six months

MVHR
(Mechanical ventilation with heat recovery)

- **RATINGS FROM THE PANEL**
- 5/10 – but views ranged widely

COMPACT SERVICE UNITS



- New idea that has a heat pump and MVHR in one unit, and also heats the hot water
- Looks interesting, but none of the panel had any first hand experience of the technology – maybe one to watch for the future?

LIGHTING

LEDs

- Currently very expensive - £30 - £60 per 100W equivalent so about £2k per home
- Running costs very low – tenth the energy of conventional light bulb
- Needs purpose made light fitting or Halogen spotlight replacement.
- Bright to look at
- Cool colour rendering
- Minimal maintenance/long life (20 x a conventional light bulb.)
- **RATINGS FROM THE PANEL**
- 4/10 – but views ranged widely

COMPACT FLUORESCENTS

- About £1-2 per 100W equivalent so about £40-50 per home
- Running costs about a fifth of energy used in conventional light bulb
- Easy to install
- Can seem dull, flickers and take time to warm up
- Minimal maintenance/longish life (8 times conventional bulb). Waste disposal challenging
- **RATINGS FROM THE PANEL**
- 9/10

LOW ENERGY APPLIANCES

LOW ENERGY APPLIANCES

- Typically £400 each so around £1.5k per home
- Should reduce running costs by 30-50% - a saving of perhaps £100 per year
- Easy to fit and warmly welcomed by residents
- **RATINGS FROM THE PANEL**
- 9/10

SMART METERS

SMART METERS

- Allow residents to be aware of energy use
- £20-£500, depending on the meter selected
- Negligible running costs
- Difficult to predict savings due to resident behaviour
- Easy to fit and residents usually respond well – initially at least
- **RATINGS FROM THE PANEL**
- 7/10

RENEWABLES

PHOTO VOLTAICS (PV)

- Costs about £6-8k per home to install
- Should save/generate about £500 with Feed in Tariff
- Running/maintenance costs are minimal. (occasional cleaning, inverter replacement £900 after 10 years, PV replacement after 25 years, meter reading, etc)
- Usually easy to fit, though shading issues are an important consideration
- Tenants like them
- **RATINGS FROM THE PANEL**
- 9/10 with FIT - or 4/10 without it

SOLAR HOT WATER

- £2-3k for panels; £1k for solar cylinder
- Should save/generate about £80 a year. Renewable heat incentive should increase this
- Minimal running/maintenance costs
- Tenant needs to buy in to the technology to get the best out of it
- **RATINGS FROM THE PANEL**
- 8/10 with renewable heat tariff
- 5/10 without it

MICRO WIND

- About £2k for a generator capable of delivering 1kW - AT PEAK WIND
- Manufacturers claim they save/generate about £200 a year; but with windy rural site might save £30, and in urban situation only £3-4/year
- Not always easy to install – can be noisy, vibrate and cause interference – so often tenants not happy with them
- Little feedback on maintenance issues
- **RATINGS FROM THE PANEL**
- 1/10

COMMUNITY WIND POWER

- Difficult planning issues to overcome
- Costs about £1k for every kW capacity
- Big construction issues
- Will get a 10% or higher return on capital
- Tenants will either love it or hate it
- Maintenance will be contracted out
- **RATINGS FROM THE PANEL**
- 9/10 (potentially)

SUMMARY

- Reduce the loads through addressing the fabric before doing anything clever on the heating !!
- Heat pumps need to be very well designed, installed and controlled to offer the benefits that are described
- Better controls and metering depend on good resident engagement
- Small scale renewables: Solar works best and is driven by subsidy