



Eco Home Decisions: Practical Steps to Sustainability **Part 3: Services**

Eco Home Decisions

Part 1: Built form and Construction Type

Part 2: Materials

Part 3: Services

Part 4: Finishes & Landscaping



AGENDA

Eco Home Decisions: Part 3 – Services

- Introduction – types of services

Quick poll - what heating system are you considering?

- Heat Pumps, Biomass, Biogas
- Ventilation and Heat Recovery
- Water Efficient Services
- Micro Generation
- Rainwater Harvesting
- Space heating distribution
- Space heating controls
- Renewable Heat Incentive
- Sustainable Drainage
- Lighting & Power use
- **Questions**

Eco Home Decisions

Services:

Types of services

- Space heating (do you need it?)
- Hot Water
- Lighting
- Small power
- Ventilation
- Waste

Eco Home Decisions

Services:

Space Heating

Sources of space heating

- Gas
- Biomass
- Heat pumps
- LPG
- Hydrogen
- (Coal, Oil)

On average, 50% of domestic CO₂ emissions arise from space heating

Reduce heat losses



“Fabric First” approach

Eco Home Decisions

Quick Poll

Which way might you go?

Heat Pump



Biomass



Gas / Hydrogen



Hybrid



MVHR only



Don't know yet



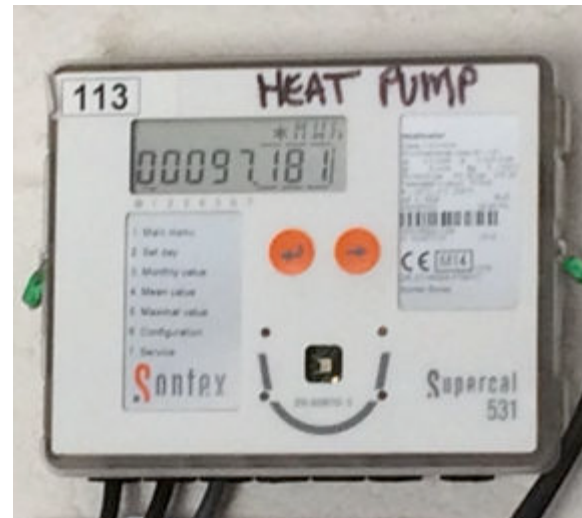
Eco Home Decisions

Services:

Heat Pumps

Heat Pumps

- Space heating and hot water
- Electrically powered
- 3-phase needed in some cases
- Less efficient at providing hot water
- Can be easily metered



Eco Home Decisions

Services:

Heat Pumps

Air Source Heat Pumps

- ASHPs
- Installation costs significantly higher than gas boilers
- Running costs slightly higher than gas
- Performance in mid winter when heat demand is highest
- Noise?
- Visual impact?



Eco Home Decisions

Services:

Heat Pumps

Ground Source Heat Pumps

- GSHPs
- High installation costs
- High impact of installation
- Running costs similar to gas
- Performance drops over a heating season



Heat Pumps: Performance

The Coefficient of Performance

$$\text{CoP} = \text{Heat Output} / \text{Electrical Input}$$

If you get 3 units of heat for each unit of electricity then the CoP would be 3.

Manufacturers'
Claims

Independent
Data

Seasonal Performance Factor

SPF averages the CoP over a whole season

e.g. ASHP 20,000kWh gas / 8,000kWh electricity => SPF of 2.5

Eco Home Decisions

Services:

Heat Pumps

Hybrid Heat Pumps

- Combine a heat pump with a boiler
- Heat pump operates down to a set air temp
- Boiler kicks in when air temperature drops
- Makes best use of renewable heat
- And best use of fossil fuels
- Important step in the road to zero carbon
- Cheaper to run
- More expensive to buy
- But you can retain the existing backup boiler
- Ideal for the retrofit market

Eco Home Decisions

Services:

Heat Pumps

Water Source Heat Pump

Chalk stream!

Little
seasonality

in

flow and
temperature



Eco Home Decisions

Services:

Hydrogen Boilers

Hydrogen Boilers

- Emit no CO₂ at point of use, only water
- Similar size to gas
- Boilers since 2006 can accept up to 23% hydrogen without adjustment
- Hydrogen Ready boilers in production
- Trials on pure hydrogen network
- How do we make hydrogen?



Image: Worcester Bosch

Eco Home Decisions

Services:

Biomass Boilers

Biomass Boilers

- Chip, pellet or logs?
- Genuinely carbon neutral
- Heating and Hot water
- Can be used with underfloor
- Pellets can be automated
- Chip is cheapest to buy
- Chip is expensive to install
- Logs require handling
- Logs require accumulator
- All require storage
- Plant room space



Eco Home Decisions

Services:

Biomass Boilers

Biomass Boilers

- Chip, pellet or logs?



Fuel	Running Cost	Automation	Accumulator	Installation
Logs	Low or Free	No	Yes	Medium-high
Chip	Low-medium	Yes	Yes	High cost
Pellet	Medium	Yes	No	Medium cost

Eco Home Decisions

Stoves:

Stoves

- Pellet or Logs
- Room heaters only
- Or can come with a back boiler
- And a hob!
- Small eco homes . . .



Eco Home Decisions

Services:

Space Heating

Heating type	Typical Installed Cost	Typical Annual Running Costs	Typical Annual CO2 Emissions (based on 10,000kWhpa demand)	Subsidy
Gas boilers	£2,500	£1,200– £1500	4,080kg	N/A
Oil boilers	Slightly higher than gas	£1,000 – £1,400	5,200kg	N/A
Ground source heat pumps	£10,000 – £20,000	£1,300– £1,800 (electricity)	1,887kg*	£6,000
Air source heat pumps	£6,000 – £12,000	£1,500– £2,000 (electricity)	2,264kg*	£5,000
Biomass boilers	£5,000 – £15,000	£450 – £600	301kg	£5,000
Stoves	£1,500	£0 – £200	N/A	N/A
Solar hot water panels	£2,500	Save around £150-£250 per year	N/A	£0

Eco Home Decisions

Services:

Space Heating

Boiler Upgrade Scheme

- Home owners
- Valid EPC with no recommendations for loft insulation or CWI
- Biomass limited to rural, off gas grid, no self-build!

If you own a self build property

Your self build property is eligible if:

- you or the original owner built it yourself or you paid a builder to build it
- it's never been owned by a business or organisation

You'll need to show your installer proof that your property is a self build, for example, a copy of the title deeds.



Eco Home Decisions

Alternative fuels:

Other fuels

- Off-gas grid properties:
 - BioLPG
 - chemically identical to LPG
 - By-product of biodiesel production
 - Biodiesel
 - Minimal alteration to boilers
- On-gas grid properties:
 - Decarbonisation of the gas supply?



Eco Home Decisions

Pause . . .

Eco Home Decisions

Services:

Space Heating

Heat Distribution and Control

- Underfloor heating – no radiators
- Heat pumps need low temperature distribution
- Controls -> The “Intelligent House”



Eco Home Decisions

Services:

Domestic Hot Water

Solar water heating

- Hot water only (“DHW”)
- Long payback for retrofit
- Better payback if new build – as cylinder being installed anyway



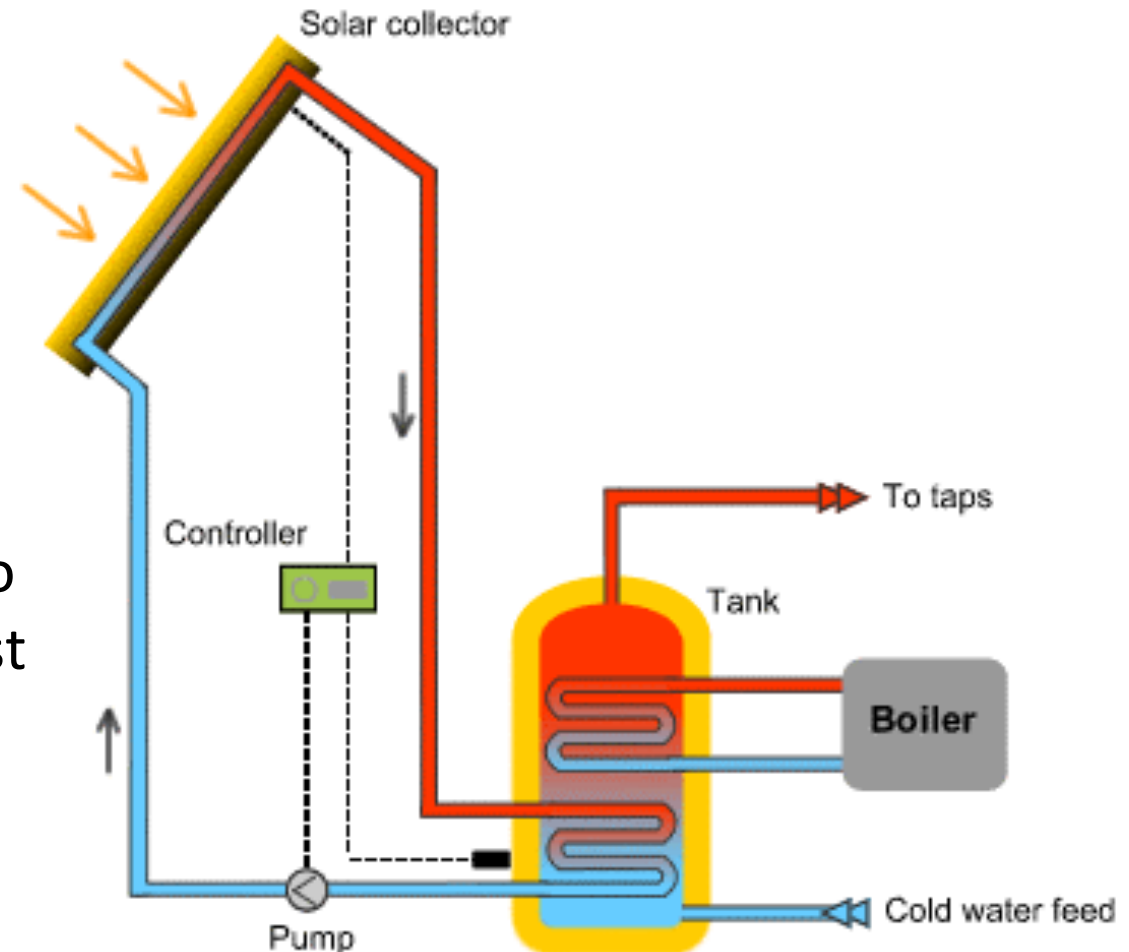
Eco Home Decisions

Services:

Domestic Hot Water

Solar water heating

- Twin coil cylinder required
- Backup DHW can be gas, oil, heat pump, or biomass
- If paired with a wood-burning stove, carbon zero hot water for most of the year.



Eco Home Decisions

Services:

Electrical
energy use

Lighting

- Daylighting
- Lamps
- Controls

Small Power Use

- Specify A-rated
- Drying space



Eco Home Decisions

Services:

Ventilation

Ventilation

- Often ignored
- Rarely enforced
- Critical in today's air tight buildings
- Equally important in Retrofit
- Extract from wet rooms
- Demand control systems
- Whole House systems
- Passive and Mechanical
- Heat Recovery
- Combine with heat distribution ?



Image: LEAP Architecture

Eco Home Decisions

Services:

Ventilation

Ventilation

- MVHR – heat recovery unit

Image: Rega Ventilation



Eco Home Decisions

Services:

Water Use

Water Efficiency

5 main elements:

Low-Flow Taps & Showers

Low-Flush WCs

Water Butts

Low Water use gardens

Rainwater Harvesting

Eco Home Decisions

Services:

Water Use

Rainwater Harvesting

- 50% of domestic water use is WC flushing
- Savings only if metered
- Mains efficiency
- Falling costs
- Easier from new
- Location dependent



Image: Stormsaver

Eco Home Decisions

Services:

Water Use

Rainwater Harvesting

- Above ground tanks
- Note the guttering



Eco Home Decisions

Services:

Water Use

Water Efficient gardens

- Use the water butt . . . for the veggies
- But just as importantly
 - Lawns – they will recover!
 - Drought-tolerant shrubs, bulbs, flowers & trees



Eco Home Decisions

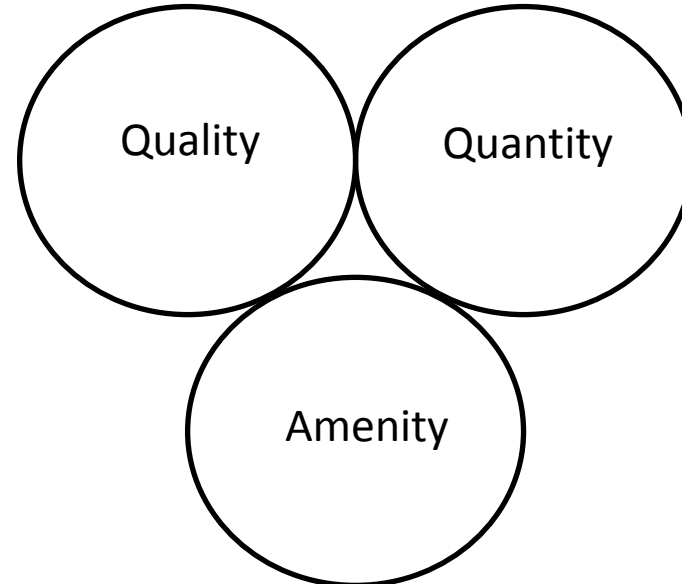
Services:

Drainage

Sustainable Drainage Systems (SUDS)

- Permeable Surfacing
- Attenuation
- Rainwater Harvesting?

The SUDS Triangle



Large
nibbed
blocks



Ecoblock –
stabiliser for grass
or gravel 100%
recycled plastic



Eco Home Decisions

Services:

Drainage

Sustainable Drainage Systems (SUDS)

- Attenuation principles
- Swales
- Ponds



Eco Home Decisions

Electricity Generation

Eco Home Decisions

Services:

Micro-
generation:

PV

Photovoltaics

- Requirements
- Terms: kWp and kWhpa
- Yield: 1kWp -> 800kWhpa
- Size: 4kWp typical domestic
- Longevity
- Inverters & replacement



Logic for installation
(the concept of a house as an energy unit)

Eco Home Decisions

Services:

Micro-
generation:

PV

Photovoltaics

- Seasonality
- Time of use
- Manufacture of panels
- Disposal
- Battery Storage
 - Costs
 - Impact
- Links to heat pumps??

Image: Tesla



Eco Home Decisions

Services:

Micro-
generation:

Micro Wind

Micro Wind

- Location location location
- Min wind speed 6m/s
- Intermittent but not seasonal
- Requires battery storage
- Very little UK installation at present
- Community wind turbines – planning barriers etc
- Ridge generators



Eco Home Decisions

Services:

Micro-
generation:

Micro Hydro

Micro Hydro

- Ancient source of power
- Works in winter!
- Constant power
- Minimal embodied energy
- Local manufacture
- Ideal match with a heat pump
- Rare as hen's teeth



Q&A

Nigel Griffiths

