“Micro-Renewables within the home”

Cifal Findhorn seminar~10/6/09

Stewart S Davidson

Home Renewables Advisor

Energy Saving Scotland advice centre NE

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Energy Saving Trust

- The **Energy Saving Trust** is an independent UK organisation, set up in response to the Earth Rio Summit of 1992. Their aim is to help everyone become more energy efficient.

- The **Energy Saving Scotland advice centre network**, was set up in April 2008, it is funded by the **Scottish Government** and managed by the **Energy Saving Trust**. This network shall help achieve the 80% CO_2 emissions reduction by 2050, as set out in the Scottish Climate Change Bill.

- A range of advice services are available to help deliver such carbon savings: **Home Renewables; Sustainable Transport; Small Business; Community Outreach & Customer Advisors**.

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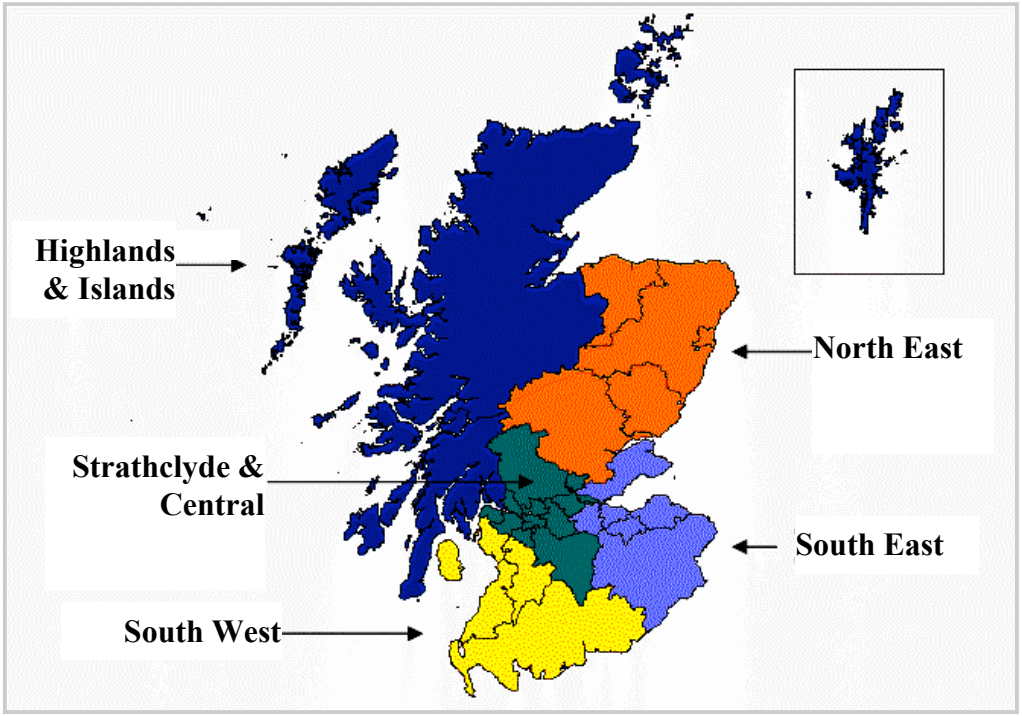
Energy Saving Scotland advice centres



- Advice available by **phone**, **email**, **post** and **in person (home visits, talks, events etc.)**

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Home Renewables Advisor(HRA)

- A free, impartial & site specific advice service. To help support the awareness and need for increased **energy efficiency** measures and **renewable energy installations** within the domestic sector(owner-occupier).

- This service provides support by: telephone advice; a home visit, followed by a personalised report and a post installation visit.

- **The HRA service does not provide: heat loss calculations; system sizing or a full cost analysis.**

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Energy Efficiency Measures

"Energy use in the home"

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Heat loss from an un-insulated house

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Insulate your home

Pay back periods:

• Hot water tank	6 months
• Loft insulation	2 years (depth 27cm)
• Cavity wall	4 to 6 years
• Double glazing	15+ years
• Floor insulation	2 years approx.
• Draught-proofing	5 years approx.
• Solid walls	20+ years

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Renewable Energy Installations

(Micro - up to 50kW)

- **Heat Producing Technologies**
  1) **Solar Thermal** (water & air)
  2) **Biomass** (pellets, chips & logs)
  3) **Heat Pumps** (ground/ air & water)

- **Electric Producing Technologies**
  4) **Micro Wind** (stand alone & roof top)
  5) **Solar Electric** (PV)
  6) **Micro Hydro** (low-medium-high head)

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1) Solar Thermal (water & air)

"Captures heat from the Sun"

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Solar Collector “Flat Plate”

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Solar Collector – “Evacuated Tubes”

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Solar Thermal- Key factors

Can provide 100% of household hot water needs in the Summer & 50% over the year.

- 1m^2 of panel can produce 50 litres of hot water in the Summer.
- Require roof area size of 3-4m^2, facing W-S-E, un-shaded with a 30-45 degree tilt.
- Costs £3000-£4500
- Flat plate collectors are cheaper, more robust and less efficient(30%).
- Evacuated tube collectors are more: expensive; fragile; versatile and efficient(40%).
- Need a larger(dual coil) or additional hot water cylinder tank.
- Further information: www.solar-trade.org.uk

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2) Biomass (pellets/woodchip/logs)

"Burned to produce heat"

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Biomass – Key factors

- Biomass is considered carbon neutral, only if sustainable woodland management is in place.
- Used for room heating or whole house heating needs.
- Lit and fed automatically, timer and thermostat control.
- Automated systems can be 90%+ efficient
- Need to consider space to house boiler, fuel storage and delivery access. May need to manually fill hopper.
- Electricity needed for ignition, fan and feeder.
- Installed Costs : Wood stove (5-20kW) £1000+, Pellet stove (6-12kW) £2500+, Pellet stove/boiler (8-20kW) £3000-£7000), Pellet boiler (12kW+) £12000+
- Pellet cost averaging about £200/tonne (4.2p/kWh)
- Further information: www.usewoodfuel.co.uk

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3) Heat pumps (ground/air/water)

"Extracts heat from the ground/air/water"

Air source

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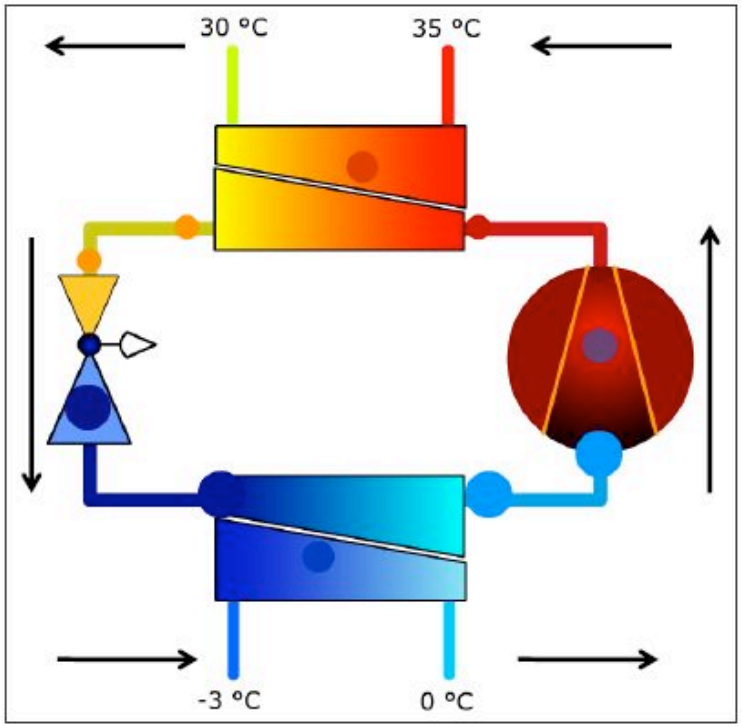
Step 3

(To distribution network - rads/underfloor heating)

Condenser



Evaporator

Step 2

HEAT PUMP

Expansion valve

(Decreased temp.)

Compressor

(Increased temp.)

(From source collector – ground/air/water)

Step 1

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Heat Pumps- Key factors

- Extracts heat from natural sources (ground/air/water)
- Coefficient of Performance (CoP) ranges 2.5 - 5
- Costs £1000 per thermal kW, domestic installation ranges from £8000- £15,000.
- More efficient with underfloor heating due to lower flow temps 45-55 ^{o}C.
- Various specifications: variable compressor/high temp.
- E10 tariffs are available.
- Run on green tariff, or electricity from PV/wind to reduce the carbon emissions created by compressor.
- ASHP good option for retrofit properties (well insulated)
- Exhaust ASHP good option for new build.
- Further information: www.heatpumps.org.uk

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4) Micro Wind

Stand alone turbine

"Converts energy from the wind into electricity"

Roof top turbine

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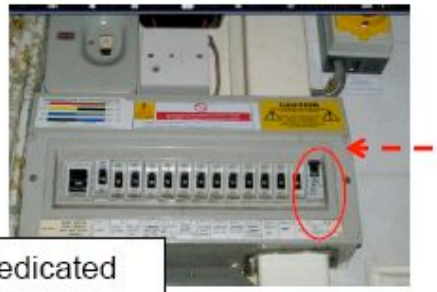
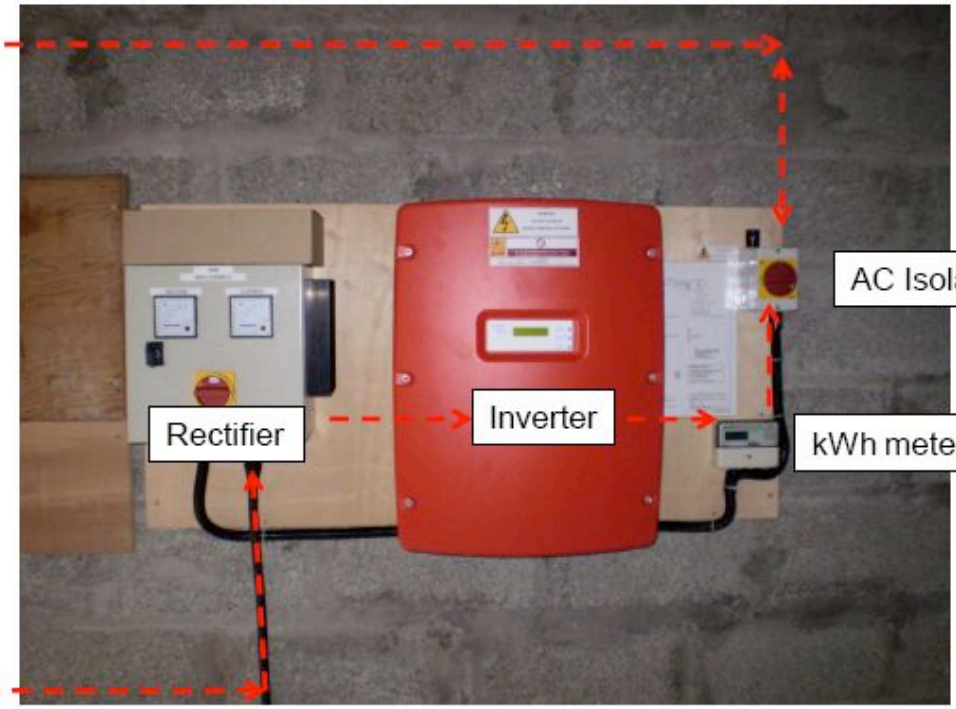
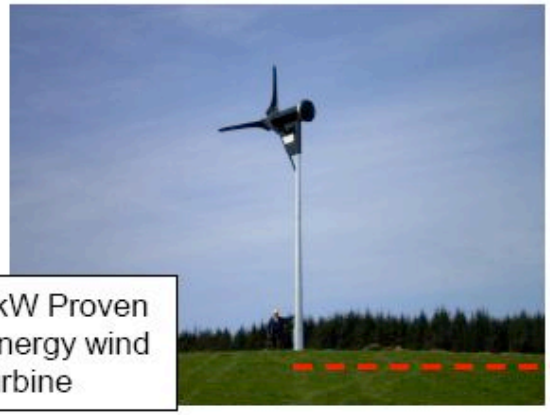
Key components of wind system (grid connected)



To dedicated MCB in fuse box





6kW Proven Energy wind turbine

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Micro Wind - Key Factors

- Converts the kinetic energy in wind into electricity.
- Sizes: small 100w, rooftop 1-3.5kW, stand alone 2-15kW
- Installed costs: 1kW(£2000), 2.5kW(£15,000), 6kW(£22,000)
- Good wind speed, greater than 7 m/s.
- Wind speed can vary greater within a 1km grid.
- Prevailing wind: South West.
- Siting is VERY important, avoid trees/buildings which create turbulence.
- Efficiencies of around 30%
- Systems can be grid connected or stand alone(batteries)
- Roof top turbines are in their infancy, feasibility study available Autumn 2009, www.warwickwindtrails.org.uk
  Further information: www.bwea.com

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5) Solar Photo-Voltaic (PV)

Solar PV array (1.5kWp)

"Converts energy from the Sunlight into electricity"

Solar slates

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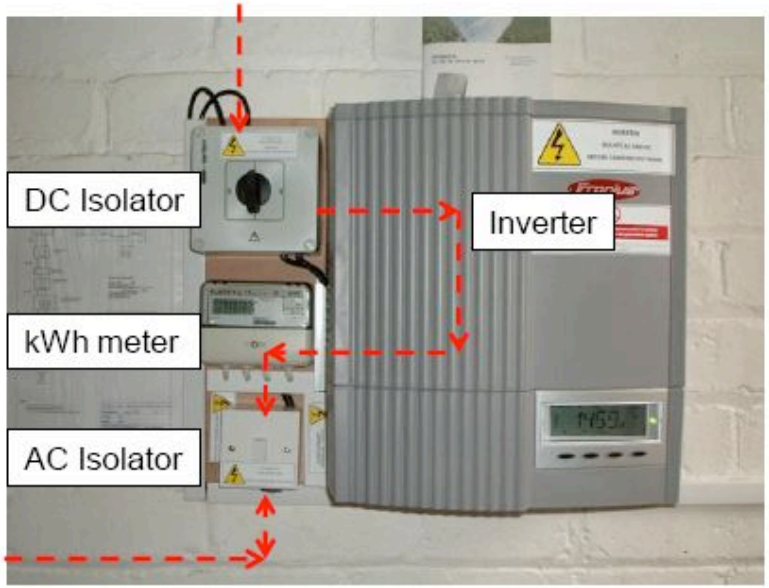
Key Components of PV System (grid connected)

To dedicated MCB in fuse box



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Solar PV - Key factors

- A typical 1.5kWp (12 panels) domestic array will meet 1/3rd annual household electricity requirement
- Will need a roof area of 12-15m^2 facing SE-S-SW, un-shaded.
- Roof integrated PV systems will offset cost of building fabric.
- Cost: £9000 for 1.5kWp
- Virtually no running costs
- Can be grid connected or stand alone (batteries)

Solar PV slates

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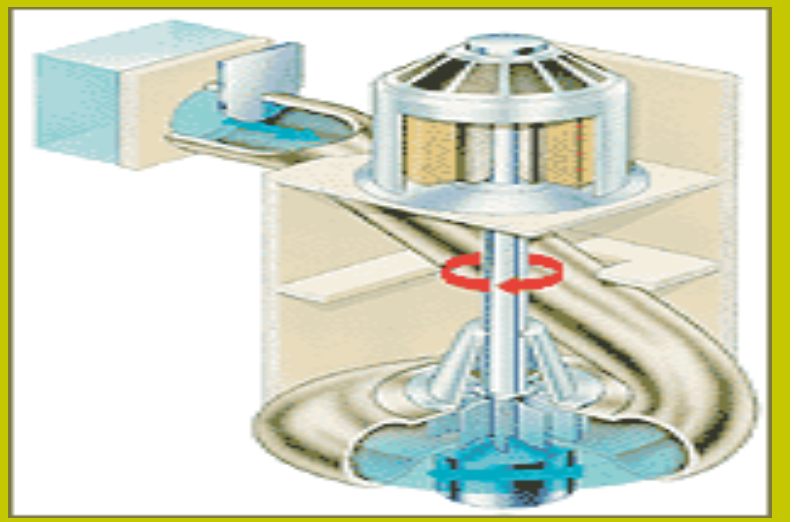
6) Micro Hydro (low /medium head)

"Converts energy from the flow of water into electricity"



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Micro Hydro - Key factors

- Converts potential energy of water into mechanical and electrical energy.
- High efficiency 50-70%
- Key factors for the site are head and flow.
- Low head (<10m) Medium head (10-50m) High head (>50m)
- Lower head sites tend to be more expensive due to larger turbine and civil costs.
- Costs :£3000-4000 /kW for a low head, £2500/kW for medium scheme.
- Planning and water abstraction licence will be required.
- Further information: www.british-hydro.co.uk

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For further advice please contact:

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