



**NORTH ENERGY**

# Overview of renewable technologies for village halls

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# Agenda

- ✿ Introduction to North Energy
- ✿ Energy saving
- ✿ What are renewables?
  - ✿ Solar PV
  - ✿ Wind
  - ✿ Hydro
  - ✿ Solar thermal
  - ✿ Heat pumps
  - ✿ Biomass
- ✿ Choice of technology



# Introduction to North Energy

- ❁ Based in Northumberland since 1992, initially serving local clients, now national and beyond
- ❁ Significant experience of advising rural and community organisations
- ❁ Clients include public, private and community organisations

Bearl Farm,  
Stocksfield



# Our services include:

- ✿ Energy efficiency
- ✿ Renewable energy
  - ✿ Wind
  - ✿ Biomass
  - ✿ Solar
- ✿ Feasibility studies
- ✿ Planning support
- ✿ Carbon footprinting
- ✿ Life cycle analysis



# FIRST - Look at the use of the building and your energy bills

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- ❁ How often do you use the building & each room
- ❁ Heating requirements
  - ❁ Long hours of use?
  - ❁ Occasional use?
- ❁ Size of the bill
- ❁ Firstly, energy efficiency (fast payback)
- ❁ Then add renewable generation (long payback)



# Energy saving – first things first

- ❁ Modifying user behaviour (labels!)
- ❁ Change settings/timings to match use & thermal lag
- ❁ Energy savings in the building
  - ❁ draught proofing
  - ❁ insulation
  - ❁ windows & doors
- ❁ Heating systems (boilers/controls)
- ❁ Hot water heating system
- ❁ Lighting (including security lights /sensors)
- ❁ Appliances
- ❁ Then add renewable generation



# What are renewables?

- ❁ Obtain useful energy from natural flows
- ❁ Well established technologies - wind, solar heat, solar PV, biomass, hydro
- ❁ New and emerging technologies - wave, tidal, anaerobic digestion, bio-diesel, bio-ethanol,
- ❁ Often included - not strictly renewable - ground, water or air source heat pump - very efficient use of electricity for heating



# Electricity producing renewables

- ❁ Solar PV, wind, hydro
- ❁ Electricity generated on-site
- ❁ Feed in Tariff income (next slide)
- ❁ Electricity bills offset - but only if electricity used when the system is generating
- ❁ Connection agreement required above 3.6kW (single phase)



# Feed in tariff (FiTs)

- ❁ Value of the installation is:
  - 1/ Income from Feed in Tariff on every kWh
  - 2/ Income on all electricity exported from site (min is 3 p/kWh)
  - 3/ Electricity used on site when the system is generating reduces existing bills ( >10 p/kWh)
- ❁ Electricity suppliers have a variety of payment schemes
- ❁ Must be installed by Microgeneration Certification Scheme (MCS) installers using approved equipment
- ❁ Payment guaranteed for a period (20 - 25 years)



# Solar photovoltaic (PV)

- ❁ Converts sun's energy to electrical energy
- ❁ High capital cost
- ❁ Low maintenance
- ❁ Feed in Tariff income
- ❁ Generates during daylight hours
- ❁ Needs un-shaded south facing position



# Solar PV costs

- ❁ Typical costs £4 to 5/Watt
  - ❁ House roof sized 2.5kW, cost £10,000 - £12,500
  - ❁ Village Hall size ~6kW £24,000 - £30,000
- ❁ Guarantee of 25 years for FITs
- ❁ Use reputable manufacturers & good guarantees
- ❁ Typical payback for PV - 9 to 13 years
- ❁ Good use for spare cash
- ❁ Matching funding - electricity supplier community schemes & "free solar"



# Small scale wind

- ❁ Siting
  - ❁ Good open site
  - ❁ Flagged trees?
  - ❁ Away from neighbours
- ❁ Grid connection (3 phase over 12kW)
- ❁ Needs planning permission



Micro  
wind



Small scale wind



Medium scale wind



# Small scale wind costs

- ❁ Typical costs (very site specific)
  - ❁ House sized Proven/Skystream 2.5kW, cost £15,000
  - ❁ Farm size Evance/Proven 5kW £28,000
  - ❁ Medium size Evoco/Gaia/Proven 10-12 kW £45 to £50,000
  - ❁ Larger size AOC/Endurance 50kW £220-£250,000
- ❁ Guarantee of 20 years for FITs
- ❁ Use reputable manufacturers
- ❁ Maintain, maintain, maintain! ( & cost!)
- ❁ Planning permission required
  
- ❁ Payback typical for wind on good site - 5 to 9 years



# Hydro

- ❁ Very site specific
  - ❁ Needs good head height and flow rate of the river
  - ❁ 24 hour generation
  - ❁ Abstraction permit required
  - ❁ Environmental sensitivity
  - ❁ High civil works costs
- Example - Whitfield



# Renewable Heat Incentive

- ✿ From June 2011 for non-domestic installations
- ✿ Domestic in late 2012 (intermediate RHPP until then)
- ✿ Income from RHI on every kWh metered
  
- ✿ Available for:
  - ✿ Solar thermal (solar water heating)
  - ✿ Biomass boilers
  - ✿ Ground source heat pumps
  - ✿ Water source heat pumps
  - ✿ Air to water heat pumps (DOMESTIC ONLY)
  - ✿ But NOT air to air heat pumps (hard to meter output!)
- ✿ MCS approved installation
- ✿ Heat metering required



# Solar thermal

- ❁ Converts sun's energy directly to heat
- ❁ Heats hot water for kitchen & bathrooms
- ❁ Need space for a large hot water tank
- ❁ Tubes or flat plate collector
- ❁ Most useful for high summer use of hot water



# Heat pumps

- ❁ Extract heat from air, ground or water
- ❁ Efficient way of heating using electricity
- ❁ Fridge in reverse
- ❁ Work best with under-floor heating
- ❁ Low maintenance
- ❁ Best suited to 'new build' or conversions
- ❁ & Off - gas areas



'Slinky' trenches

Linear ground pipes



Air source heat pump

Water source heat pump



# Air source heat pumps

- Air to air
  - conventional air conditioning technology with heating feature
  - rapid response
  - Good for intermittent occupancy
- Air to water
  - best with underfloor heating
  - Slow response
  - Good for continuous occupancy



# Ground source heat pumps



Drilling a borehole

Photos Earth Energy



Kensa heat pump  
Blackhall Mill  
community  
centre



Installing ground loops



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# Ground source heat pumps

- ❁ More efficient than Air Source Heat Pump
- ❁ So electricity cost for heating lower
- ❁ But capital costs higher:
- ❁ Needs ground loop installation
- ❁ Trench based - needs  $> 2x$  floor area of building, permeable surface
- ❁ Borehole - expensive (£5,000+)
- ❁ Best with underfloor heating (or special rads)
- ❁ Best suited to buildings which need continuous heating



# Biomass boilers

- ❁ Proven technology
- ❁ For larger buildings with external space for store
- ❁ Decouple boiler from heat load by using an accumulator tank
- ❁ Need more space than a conventional boiler
- ❁ Three fuel types - log, pellet or chips
- ❁ Need attention & maint.



Pellet boiler



Log boiler

Wood chip boiler



# Biomass fuel supply

Choice of fuel - logs, chips or pellets

- Choice depends on availability of supply
- Whether competent manual labour is available
- Logs - manual systems
- Pellets - bulk or bagged for smaller automatic systems
- Chips - bulk for over 100kW



# Biomass stoves

- ❁ Log or pellet
- ❁ Need manual input
- ❁ Excellent room heater
- ❁ Available with back boiler
- ❁ Examples - Stannington, Lynemouth



Log Stoves



Pellet Stoves



# Renewable energy example - Ingram Village Hall

- ❁ Solar PV
- ❁ Air to water heat pump
- ❁ Underfloor heating
- ❁ British Gas Green Streets + own funds
- ❁ Cost of refurb £120K



Solar PV



Heat pump

- ❁ <http://www.ingrambreamishvalley.co.uk/Refurbishment-in-Pictures.html>



# Choice of renewable technology

- ✿ Assessment of
  - ✿ Site
  - ✿ Energy use
  - ✿ Building use
  - ✿ Cost
  - ✿ Potential for savings on running costs
  - ✿ FIT/RHI income
- ✿ Compare options
- ✿ Obtain quotes/planning
- ✿ Apply for grants, loans & other finance



## Finally ask:

- ✿ How can you keep the building warm, sustainably, and at the lowest cost?
- ✿ Are renewables the best use for £,000's?
- ✿ If you can get funding or have spare cash, then FITs & RHI give a guaranteed income
- ✿ So, go for it!
  
- ✿ Good luck!





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Thank you

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