WHAT ROLES CAN RENEWABLE ENERGY AND CARBON OFFSETTING PLAY FOR THE METALFORMING INDUSTRY?

Confederation of British Metalforming 28th February 2008

Speaker: Alex Lockton, Director, Freesource Energy Ltd.

Carbon Strategy

Formed by a need to reduce carbon, save short term costs and protect against carbon penalties in future

- Analysis – Carbon Footprinting
- Reduction – Efficiency measures
- Generation – Renewables
- Last Resort – Offsetting

Renewables and Offsetting are seen as a potential panacea, but in truth the benefits they bring are magnified by energy efficiency

A Carbon strategy can contain all elements, but 90% of the effort should go into Efficiency measures.

First Rule of Renewable Energy

- Put renewable energy in context
  - Understand your energy use
  - Finds ways to reduce it
  - Then consider renewable energy

Understanding Your Energy Use

- Things to consider:
  - Position of the buildings
  - Structural characteristics
  - Your natural resources on site
  - Your occupants
  - Your current heating and electrical requirements
    - Administrative
    - Process

Basic Carbon Savings

- Using the following multipliers you can convert Units to Co2 kgs
  - Electricity = 0.43t CO2/MWH
  - Gas = 0.19
  - Oil = 2.68
  - Coal = 2.42
  - Wood = 0.00
- You can then compare the carbon savings for each technology

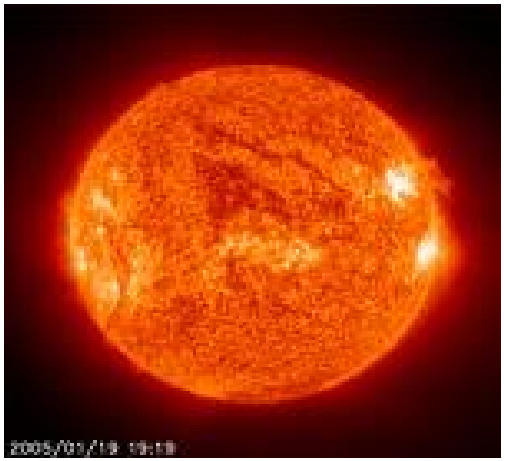
RECAP: Understand Your Energy Context

- How much are you using?
- Can you reduce it?
- Save Energy First
- Tackle the remainder with renewable energy
  - Lower cost of entry
  - Better return on your investment

What Is Renewable Energy?

- Sources of energy which are naturally based and have no Co2 impact on the environment

- Renewable Energy
  - Solar Thermal
  - Solar Electricity (Photovoltaic solar)
  - Wind turbines
  - Heat Pumps
  - Biofuels

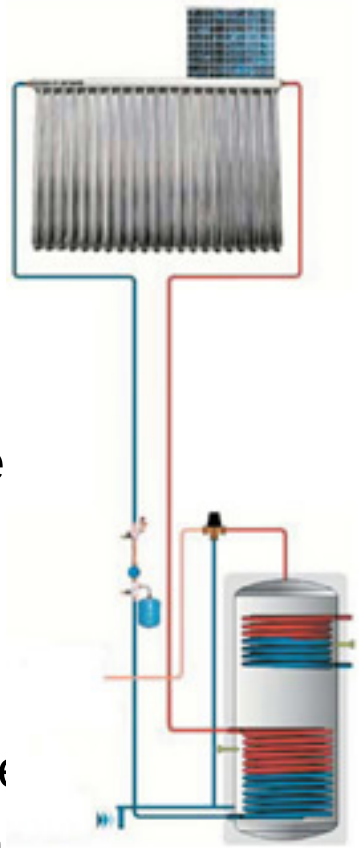


Solar Thermal

- What is it?
  - Produces hot water for buildings from solar panels on the roof
  - Entering mainstream, technology has existed for over 20 years
- How much can it help?
  - Tackles 70% of your hot water annually
- Costs : £3,500 for a 200l system
- Savings : 0.72tonnes+ Co2 annually
- Basic Resource Requirement:
  - South facing roof

Solar Thermal

- **How does it work?**
  - Anti-freeze or water pumped around pipes connecting panels on the roof to a hot wate cylinder or thermal store
  - Pipes are embedded in panels under glass and insulated or in glass tubes.
  - The sun heats up the panels / tubes and the heated liquid is pumped around the system



Potential Applications

- Principally Hot water
  - Administrative offices, WC/showers/gym/pools
  - Process cleaning, washing
- Underfloor Heating

Solar Thermal Case Study 1.

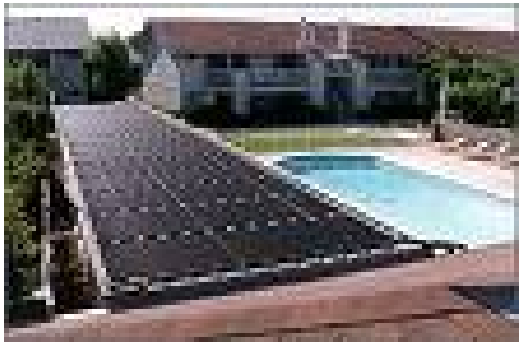
Large manufacturing site with two admin buildings

- 2 systems to provide hot water for kitchens and shower facilities
- 2 x 21 evacuated tubes with thermal stores
- Cost £8,500
- Benefits:
  - Free hot water for 20 years
  - Staff benefits most
  - Good publicity for company and easy to implement

Solar Thermal Case Study 2.

Commercial Leisure facility

- Large solar thermal application to heat swimming pool
- System sized 125m2 with evacuated tubes Cost £28,500
- Benefits:
  - Free heated pool for 20 years
  - Staff benefits
  - Payback within 5-8 years

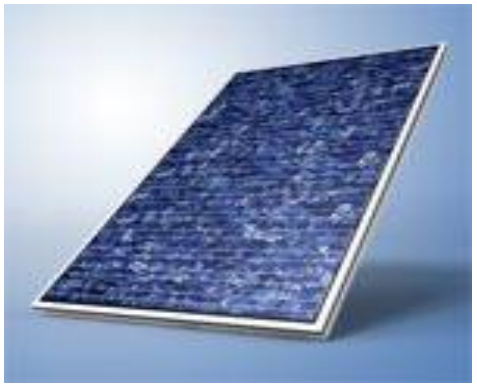


Solar Electricity (PV)

- What is it?
  - Photovoltaic Solar – silicon based panels turning sunlight into electricity
- How much can it help?
  - Can be sized to your requirements or roof size
- Costs : £7,000 / kilowatt / 10m2

- Performance: 1kwp generates 850kwh p.a.
- Basic Requirements:
  - South facing roof
  - Deep pockets

Solar PV



- **How Does It Work?**
  - Sunlight shines on panels constructed using processed silicon
  - Creates a reaction which excites electrons and generates electricity
  - Electricity (DC) is passed through wires and into an inverter which converts it to AC electricity
  - AC power enters the grid or batteries or both

Potential Applications

- Supplementary On Grid Electrical Supply
- Off-grid power for remote locations where grid is not viable

Solar Power Case Study

Apartment blocks or commercial property with communal lighting

- Large residential 5 storey 80 apartment block
- Residents association keen to reduce their energy use and be greener
- Too built up to use wind
- Combination of energy saving measures and PV panels to light communal areas
- “Payback” not required
- Cost £88,000
- Eligible for Low Carbon Buildings Stream 2a or Community Renewables Initiative to cover between 30-50%

Solar Power Case Study

Off grid applications – solar powered pumps – rural, remote locations

- Large cattle farm with remote grazing on Salisbury Plain
- Currently spends £000's sending 4 trucks / day every day to the heard containing water
- Wind and Solar PV powered pump system costs £15,000
- Payback within 2 years….
- Slashes carbon footprint

Wind Turbines

What are they?

- Windmills for electricity generation

How much can it help?

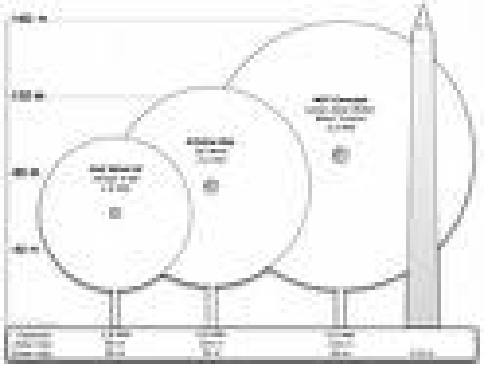
- All of your electricity requirements (depending on your location)

Costs : A 5kw turbine £16,000+ installed

Requirements:

- Westerly facing with no obstacles
- Preferably not in Conservation, Urban or AONB

Wind Turbines



- How Do They Work?
  - Wind drives the blades which rotate and drive a generator in the hub
  - Can involve a series of magnets and gears which generate DC electricity
  - Electricity (DC) is passed through wires and into an inverter which converts it to AC electricity
  - AC power enters the grid or batteries or both

Costs and Performance of Various Grid Connected Wind Turbines

	Size of Blades	Cost	Annual Output at 6m/s (est)
850w	2m	£3,500	2,300kwh
1.4kw	3.2m	£7,500	2,800 kwh
2.5kw	3.5m	£10,900	3,500kwh
6kw	5m	£16,000	7,000 kwh
10kw	7m	£28,000	15,500kwh

Costs and Performance of Various Grid Connected Wind Turbines

	Size of Blades	Cost	Annual Output at 6m/s (est)
20kw	10.4m	£55,500	32,000kwh
80kw	18m	£140,500	96,000 kwh
250kw	30m	£250,900	250,000kwh

Potential Applications

- Supplementary On Grid Power
- Additional Income from sales of excess electricity or ROCs

- Off-grid power solution for remote locations

Wind Turbine Case Study 1.

Large head office of engineering company

- Looking to offset some of their electricity use
- 80kw turbine proposed at 60m height subject to planning
- Cost of monitoring £20k
- Cost of turbine £140k
- Estimated return 60% of electricity bill

Wind Turbine Case Study 2.

Mining Extraction Company

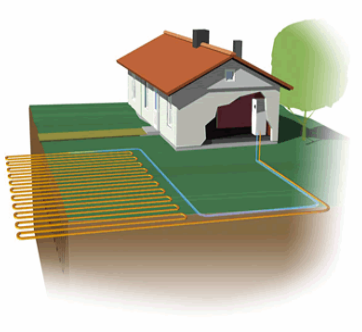
- Multi site operation
- High Water table – surface water management problem
- Duty of care to site when finished mining
- Wind Powered pumps to save oil
- Wind turbines are mobile
- Cost of Wind turbine and Pump £30k
- Savings from oil consumption £5k / yr+

Heat Pumps

- What are they?
  - Pumps which extract solar generated heat from the ground, the air or water sources
- How much can it help?
  - Can tackle 100% of your hot water and heating annually
- Costs : Variable depending on heating load and application
- Savings: Usually oil or gas heating, require electricity to run but for every unit put in you get 3-5 back in heat

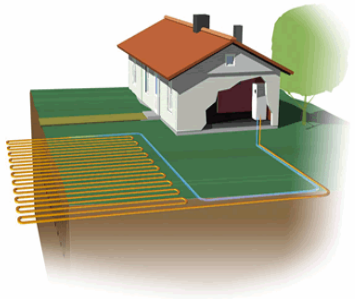
Heat Pumps

- **How do Ground and Water Source HPs work?**

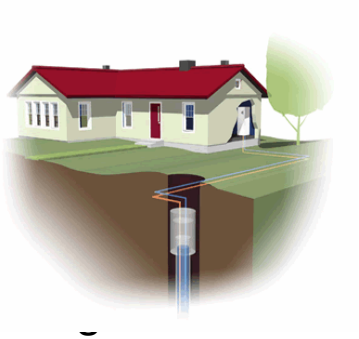


  - Pipes of anti-freeze or water pumped around a circuit. attached to the heat pump sited indoors
  - Fluid collects heat from below ground or water
  - Heated fluid is pressurised and temperature raises from 10degrees up to 50degrees+
  - Usually have some form of back up immersion and can feed extra water storage tanks
  - Insulated building is vital

Heat Pumps



- **How do Air and Heat Recovery HPs work?**
  - Heat pumps draw heat through an air handling unit
  - Air is cleaned and transferred to a heat exchanger pressurised
  - Heat can be used to heat water and wet systems o distributed through vents into other rooms in the bu
  - Insulated building is vital



Potential Applications

- Hot Water:
  - Administrative – offices, leisure facilities
  - Process – cleaning, washing
- Space heating:
  - Administrative - comfort and climate control
  - Process – climate control, drying
- Cooling:
  - Heat pumps are essentially like a fridge working backwards, so they can be made to perform a dual role heating and cooling

Heat Pumps Case Study 1.

Factory with hot process where heat can be re-used

- Paint Curing oven gives off enormous heat which is wasted
- Oven is in same room only partially partitioned from a heated assembly line
- Investigating re-using heat to heat assembly line and adjoining adminstrative offices
- Cost and savings tbc but expected to be 100% of heating bill saved for this building

Heat Pumps Case Study 2.

New build office with incredible insulation

- Weighing up use of heat recovery and ground source heat pumps under carpark and tennis courts
- Designed with large sun space to recover heat as well as passive ventilation
- Will provide 100% of heating and hot water
- Cost estimated £25,000, running cost savings expected to be around £35,000 during lifetime.

Biomass

- **Small Scale**
  - Wood stoves and boilers
- **Large Scale**
  - Combustion – Using heat to create power
  - Gasification – Creating gas instead of heat
  - Pyrolysis – Liquid fuel from decomposition
  - Biochemical – Fermentation, digestion producing biogas
- Three steps prior to this:
  - Harvesting
  - Transport
  - Processing

Critical Issue With Biomass

The whole process has to be efficient to maximise its carbon neutrality

- Whether it be a log stove OR a large scale biomass plant

Your early assessment of resources on site is even more critical for biomass as technically they are carbon neutral

The further your seek this fuel the less green it is

Small Scale Wood Burning Applications

- Why is wood carbon neutral?
  - Burning wood generates the same amount of C02 as if you were to leave it to rot where it stood

- Types?
  - Room heaters
  - Cooking equipment
  - Back boilers for heating and hot water
  - Fuel can be pellets, chips or solid logs

Large Scale Applications
Combustion

- Creates heat and energy through combustion
- Simplest and most developed technology
- Easiest Biomass technology to integrate into normal processes

Large Scale Applications
Gasification

- Produces combustible gas instead of heat
- Gas is produced through use of high temperat and restricted O2
- Can be used for cooking or heating, or genera electrical energy through use of a gas turbine
- More complex than combustion an costs more to implement, but far more efficient = greener

Large Scale Applications
Pyrolisys

- Thermal decomposition in absence of oxygen to produce a combustible oil
- Liquid fuel which can heat or generate electricity
- Main benefit is easy transportation
- In early stages of development and higher investment costs

Large Scale Applications
Biochemical

- Principally for wetter fuels which are harder to burn
- Uses fermentation to create gas, alcohol or specialist chemicals
- Potential future role as producer of hydrogen for fuel cells
- Most common is anaerobic digestion using bacteria
- Also common to produce biofuels such as Biodiesel or Bioethanol

Biomass Case Study

- **Westfield Biomass Plant**
  - 10MW plant in Scotland
  - Fed by Poultry litter from local poultry farm
  - Cost to build £22m co-funded by Bank of Scotland

Biomass Case Study

- **Sawmill in the south west**
  - Recycling wood waste as chips from own process, local landfill and nearby building sites
  - Considering becoming a pellet manufacturer if process is stable

Hybrid Solutions

- Most renewables can be connected to work with traditional heating systems
- They can also work well with each other
- Detailed site survey can identify both of these opportunities

Carbon Offsetting
The Gold Standard

What is Carbon Offsetting?

- An indirect way of tackling carbon emissions
- Finding ways to identify projects or methods to absorb CO2 or generate energy from non-CO2 sources off-site
- Seen as an easy way to avoid dealing with a costly problem
- Companies can buy credits from negative emitters or fund projects
- In it’s infancy and open to some abuse
- Government and Gold Standard style initiatives are trying to find auditable methods

When to Use It?

- The Carbon Trust agrees it is a last resort:

"The Carbon Trust believes that an organisation truly committed to addressing climate change should:

firstly, focus on its direct emissions, reducing their carbon footprint and creating bottom line savings …

secondly, look at opportunities to reduce its indirect emissions, working with other organisations to develop strategies to reduce emissions and cut costs up and down the supply chain"

How Does It Work?

- Identify projects to invest in, producing credits which they can have verified and traded
- Buy credits in existing projects which have already been verified by an recognised independent auditor
- Some companies want to hide their carbon problem until they have to declare it legally
- The good companies tackle the problem first, then invest in credits to tackle the residual

What Is The Gold Standard?

- Gold Standard Foundation set up in 2003 in Geneva, creating a framework where projects can be identified and measured regularly
- Backed by 50 NGOs including Greenpeace, WWF
- Handling projects across the globe
- Project developers submit proposals which are continuously measured
- Registered Gold Standard retailers can sell the credits which include “Certified Emissions Reductions” and “Verified Emissions Reductions”
- Can include projects from large scale biomass to solar power

Gold Standard Criteria

- Must be energy efficiency or renewable energy projects
- Must pass a sustainable development screen i.e. evidence that the project is making a real contribution to sustainable development and that it benefits the local community;
- Only provide an energy service that helps catalyse the transition to non-fossil fuel based energy systems. Projects which generate credits from the destruction of industrial waste gases such as HFC's are not eligible. These projects have little or no wider sustainable development benefits; and
- Must follow a conservative, guided interpretation of the additionality requirement that is necessary to demonstrate that a project delivers real emission savings which would not have occurred anyway under 'business as usual'.
- Furthermore, the Gold standard excludes forestry, large scale hydro power (e.g. over 15MW) and energy from waste (incineration).

What Is The Process?

- Energy Efficiency + Renewables for own site
- Carbon footprint analysis identifies residual carbon problem
- Contact Broker to buy equivalent credits
- Identify a project to fund and submit plan to Gold Standard via an offsetting company
- Funded projects can also trade credits

Examples of GS Offsetting Schemes

- **Yuntdag 42.5 Wind Power Project, Turkey**
- Innores Elektrik Üretim A.S. plans to build a wind power plant near Yuntdag in the region of Izmir, to generate electricity and feed it into the Turkish grid. The Gold Standard VER mechanism shall help to realise this environmental sound alternative to the existing generation mix in Turkey.

TYPE OF PROJECT:
Wind.

BASELINE METHODOLOGY:
ACM0002

STATUS:
under validation.

DNA APPROVAL:
NO
.

CREDIT VOLUME p.a.:
100000

CREDIT PERIOD:
7 years renewable

Examples of GS Offsetting Schemes

Montalban Landfill Methane Recovery and Power Generation Project

The Montalban Sanitary Landfill Methane Recovery and Power Generation CDM Project (“Project Activity”) will be undertaken in the Montalban landfill in the municipality of Rodriguez, province of Rizal, Philippines. Rodriguez is approximately 50 kilometers northeast of Metro Manila. The Project Activity is based on an area 14 hectares in size, which receives approximately 3,000 tonnes of solid waste per day and has been in operation from January 2002.

The objective of the Project Activity is to collect methane (“CH4”) in landfill gas (“LFG”) to generate clean electricity, by installing an onsite LFG collection system, power generation system and flaring system. By capturing the LFG, greenhouse gas (“GhG”) emissions are reduced, local environmental impacts are mitigated, and the operational safety of the site is increased.

TYPE OF PROJECT:
Biogas power.

STATUS:
under validation.

STEP APPROVED (i.e. PIN, PDD, VALIDATED PROJECT, ETC.):
Waiting for final validation report and HCA

DOE:
SGS

CREDIT VOLUME p.a.:
580

CREDIT PERIOD:
10 years

Grants and Other Help

- **DTI – BRE**
  - Renewable Energy grants for R&D investment
  - Marine Renewable Deployment Fund
  - Renewables Trade Promotion Performance
- **Carbon Trust**
  - Enhanced Capital Allowance Scheme
  - R&D funding - £1m – LEDs, Biomass,
  - Carbon Vision
  - Research Acceleration
  - Technology Acceleration
  - Incubators
  - Huge amount of info and case studies

Grants and Other Help

- **Envirowise**
  - Information and case studies focusing on waste and energy efficiency
  - Focus on small and medium businesses
- **Low Carbon Buildings Scheme**
  - Main renewable energy implementation grants scheme
  - Managed by BRE

About Freesource Energy Ltd

- Founded in April 2006
- Independent one-stop shop for renewable energy operating in the UK
- 150 projects in the pipeline in any one period
- Accredited Installers for the Microgeneration grant scheme
- 8 Core teams of installers across wet and electrical functions

freesource energy

www.freesource.co.uk

About Freesource Energy Ltd

- Where do we get involved?
  - As early in the design process as possible
  - Design, Supply and Install

- Product range
  - Solar Thermal
  - PV
  - Heat Pumps
  - Wind turbines – Any size up to 1 MW
  - Rainwater Harvesting
  - Greywater recycling
  - Small and Large Scale Biomass

freesource energy

www.freesource.co.uk

About Freesource Energy Ltd

- Core Services
  - Feasibility Studies and site surveys
  - System design
  - Supply
  - Installation
  - Maintenance
- Other Services
  - Code for Sustainable Homes
  - Breeam Certification
  - Offsetting
  - Training
  - Green Tarrifs

freesource energy

www.freesource.co.uk