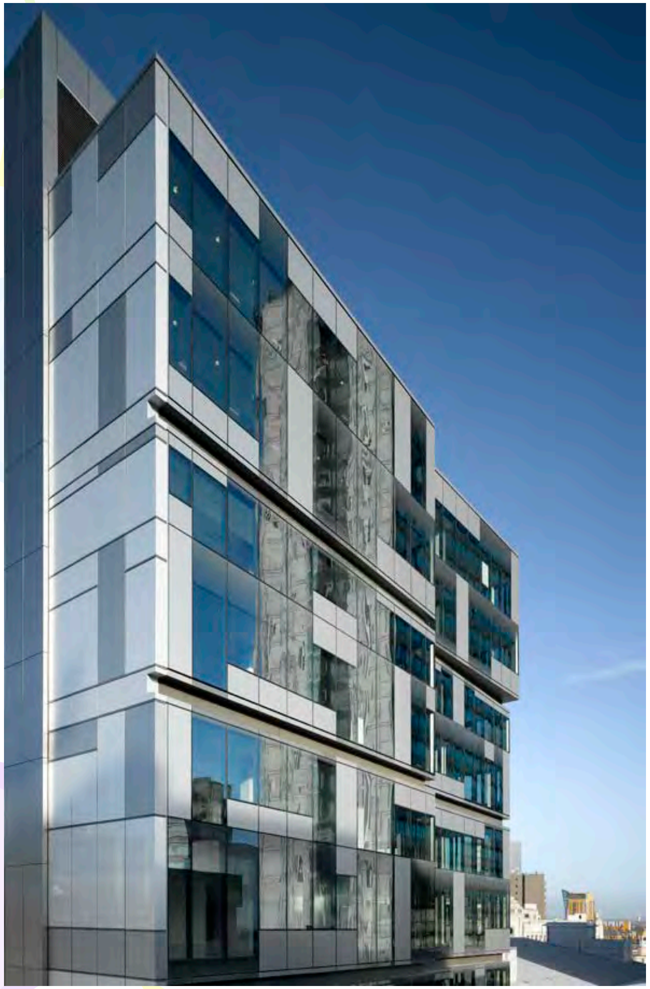
bruntwood



Office Provider

Over 100 Buildings

Manchester, Liverpool, Leeds, Birmingham

Refurbishing Buildings

OK - bring me the energy figures

Bruntwood - The Built Environment

•Buildings are responsible for approx 50% of CO_2 emissions

•Set our own target of a 16% reduction by 2014

•Historically drivers have focussed on new-build and centralised energy generation rather than on-site generation

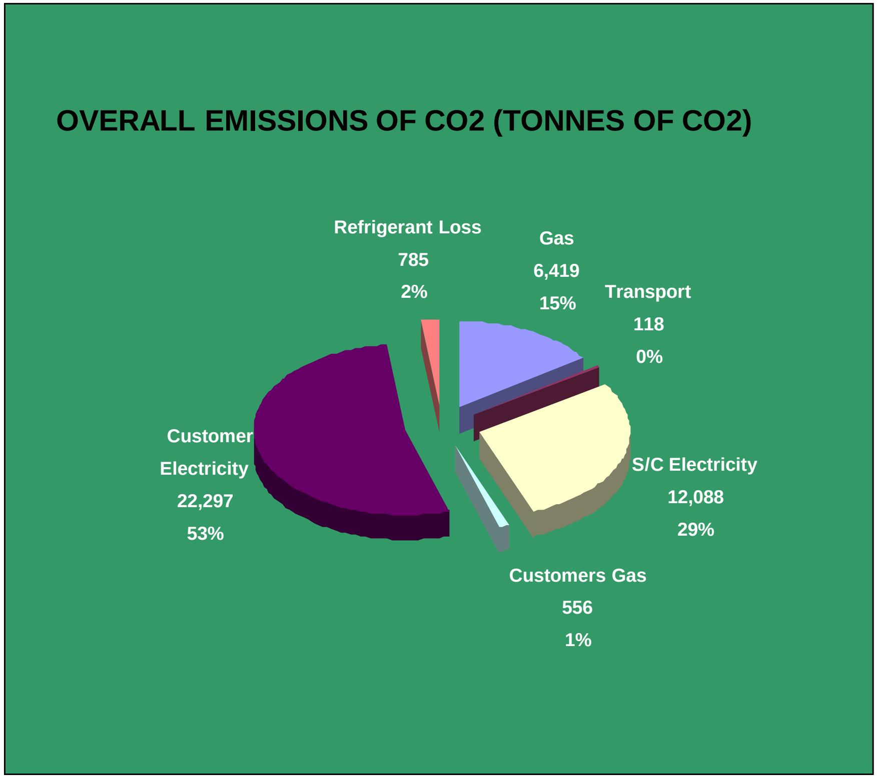
•The way buildings are designed, constructed and managed will determine the UK's ability to achieve its RES goals

Recycle Buildings

The importance of the ARUP project

98% of our measureable carbon emissions stem from energy use within our buildings

41,589 tonnes CO 2e



Why Use Renewable Energy Technologies?

- We want to be 'Greener' (16%)
- Generation at or near site gives local control
- Possible income streams (ROCs, FiTs etc)
- Energy Security
- Pressure from customers
- Price stability
- Sale of Electricity

Other Drivers………….

Energy Legislation
EU Renewable Energy Directive (2020) RE Target (**15% binding target)**

UK Renewable Energy Strategy
- Renewable Heat:
- 34% of overall target
- 14% of heat target

Heat Incentive Mechanism

Microgeneration Strategy

Mandatory GHG Reporting ???

And it only looks set to increase………….

Construction
Zero Carbon Commercial Buildings by 2019 (definitions ?)

Code for Sustainable Homes

Building Regulations Part L –SBEM/SAP compliance

EPiB Directive –Energy Performance Certificates; DECs maybe ??

Building Regs Reviews: 2010, 2013

Prescriptive Planning Policies

And A Big One For Us Is CRCEES

Carbon Reduction Commitment: public and private sector

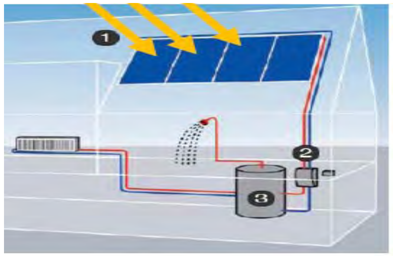
The initial phase of the CRC is compulsory for organisations that consumed over 6,000 MWh (6,000,000 kWh) of half-hourly metered electricity during the period from January 2008 to December 2008.

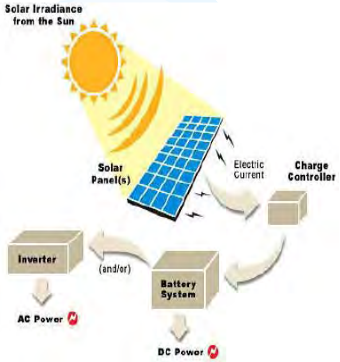
Submit footprint and annual report by July 2011,

Spending Review Changes: no longer trading scheme for year ahead, no recycling of allowances. Allowances now bought for previous year, last working day of July on actual carbon use (2012). Carbon fixed price: £12 per tonne.

Lots of issues for Bruntwood because of the Landlord/Tenant ‘quirks’ in the legislation.

What’s Best For Bruntwood?

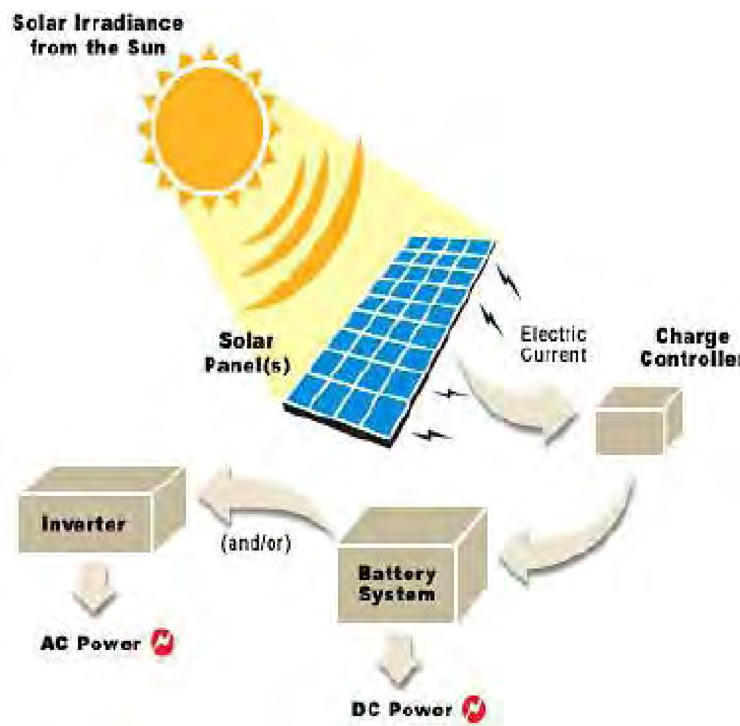




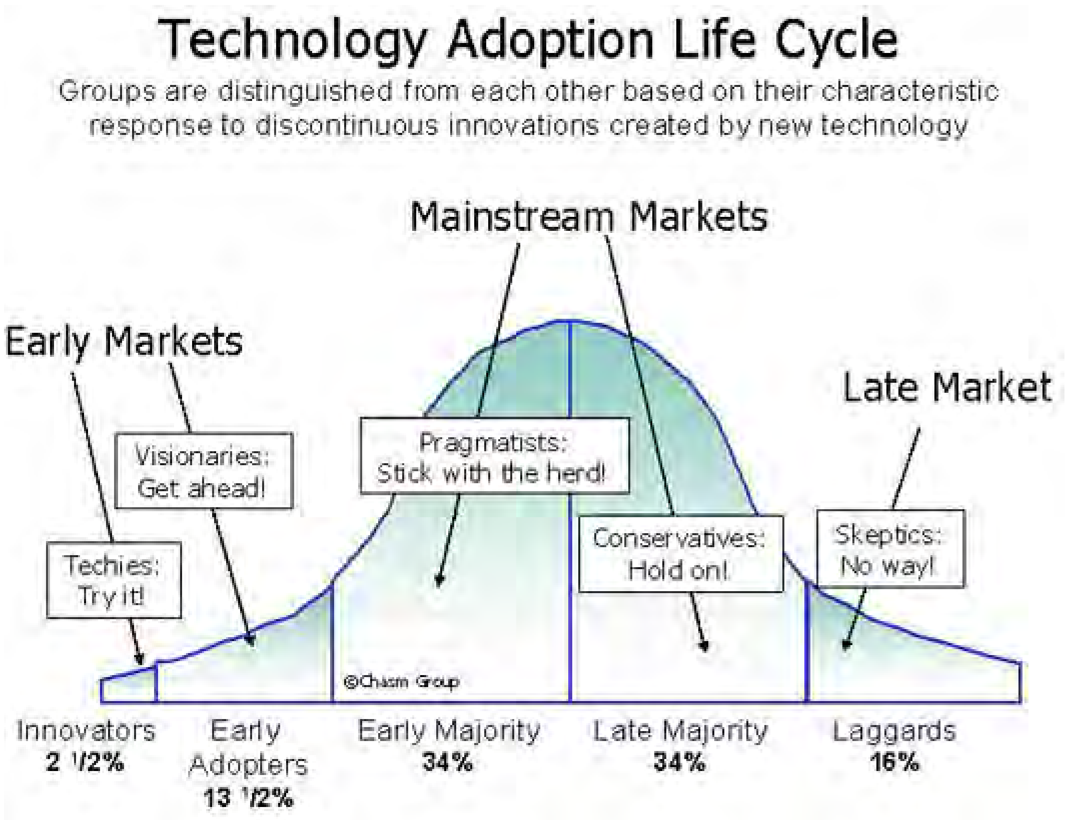
Solar Photovoltaics (PV)

How it works...

- Converts sunlight into electricity
- Electricity can be used at-source, fed into the national grid, or used to charge a battery
- Different types of technology and systems
- Sunlight-to-electricity conversion is 5-19% efficient



Some General Issues:



----------------------------------Board Of Directors ---------------------------(FD)

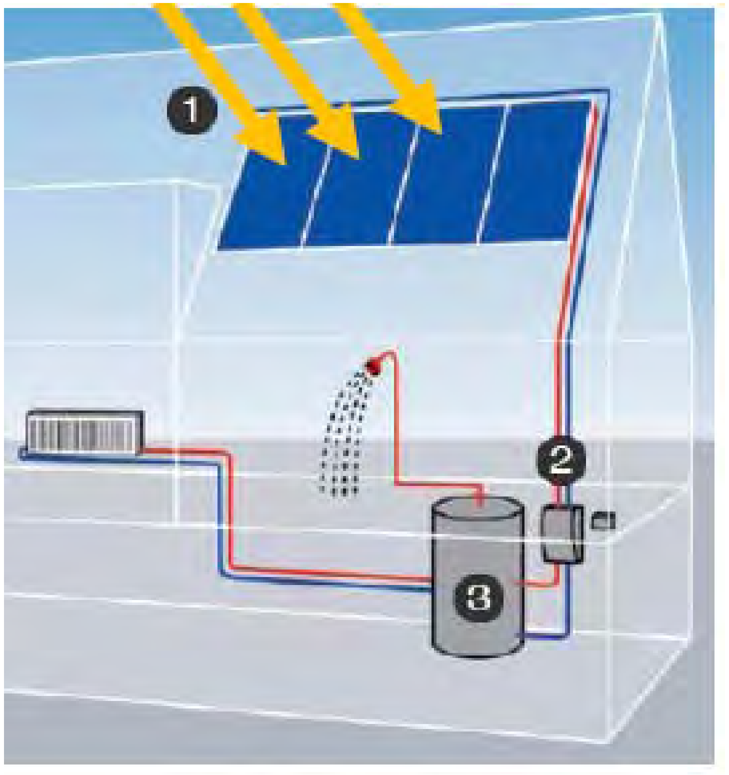
Outcome

- Will definitely do an initial pilot project with a view to rolling out across other buildings if it proves successful.
- However, we still need to look at cost benefit issues on several roof spaces, so may not be suitable for the whole portfolio.
- Some internal procedural issues to address (e.g implications for service charge etc)

Solar Thermal

How it works…

- Converts sunlight into hot water (HW)
  1. Roof mounted Solar panels collect daylight energy to heat a fluid (Glycol) in a closed circuit
  2. The glycol is pumped through a heat exchanger in a hot water storage cylinder
  3. Mains fed cold water is supplied to the hot water cylinder and pre-heated by the heat exchanger
- Only suitable for buildings with a stable HW demand e.g. care homes, housing
- 2 main types of panel (efficiency 50-70%)



PROs & CONs

- Solar water heating systems use heat from the sun to work alongside your conventional water heater. The technology is well developed and versatile with a large choice of equipment available
- Scale of application: from domestic to large-scale public sector buildings
- Flatplate system, evacuated tubes & large-scale Concentrating Solar Power (CSP) systems
- Can be mounted on roofs, facades and ground frame

- Best suited to buildings with a large, consistent hot water requirement.
- Need to allocate space for hot water cylinder/buffer tank
- Fine for new build but our business is refurbishing buildings – so
- need to consider existing heating system and how it can be integrated.
- On small scale projects may have issues as some combi-boilers can't take pre-heated water
- Design considerations: works best on open southerly building aspects with minimal shading.

Outcome

- May look to trial this in one of our bigger buildings

- Possibly coupled with other renewable technology

Wind Turbines

- Converts wind power into electrical power
- Comes in a variety of sizes
- Generally, the bigger the better (if you can build it)

1. Wind drives turbine blades
2. Torque amplified through a shaft connected to a gearbox
3. Mechanical power in gearbox converted to electrical power in generator

10 kW

Already carried out several feasibility studies and may take forward a proposal at one site subject to planning permission

Costs...

Typical Application		Size	Blade diam. (m)	Initial Costs	Savings
	Car Park, Small Farms	10 kW	7 m	£20-30,000	£2,100/yr (14yr PB)
	Open field	1,000 kW	60 m	£1-1.5 million	£150,000/yr (8-10yr PB)

But there are financial incentives!

Which may bring the payback period down to as little as 5 years, so may be worth pursuing if you have a suitable site.

Key Issues...

- **Resource** – suitable wind speeds (>13mph) and land available that is clear of obstructions
- **Planning** – planning permission required for small free standing turbines. Much more onerous requirements (incl. EIAs) for large turbines, especially in/near rural, populated and protected areas
- **Logistics** – site must be accessible for lorries to transport turbines during construction. Maintenance
- **Costs** – high capital expenditures. Govt seeks to get around this by ensuring financial return through the Feed-in Tariff

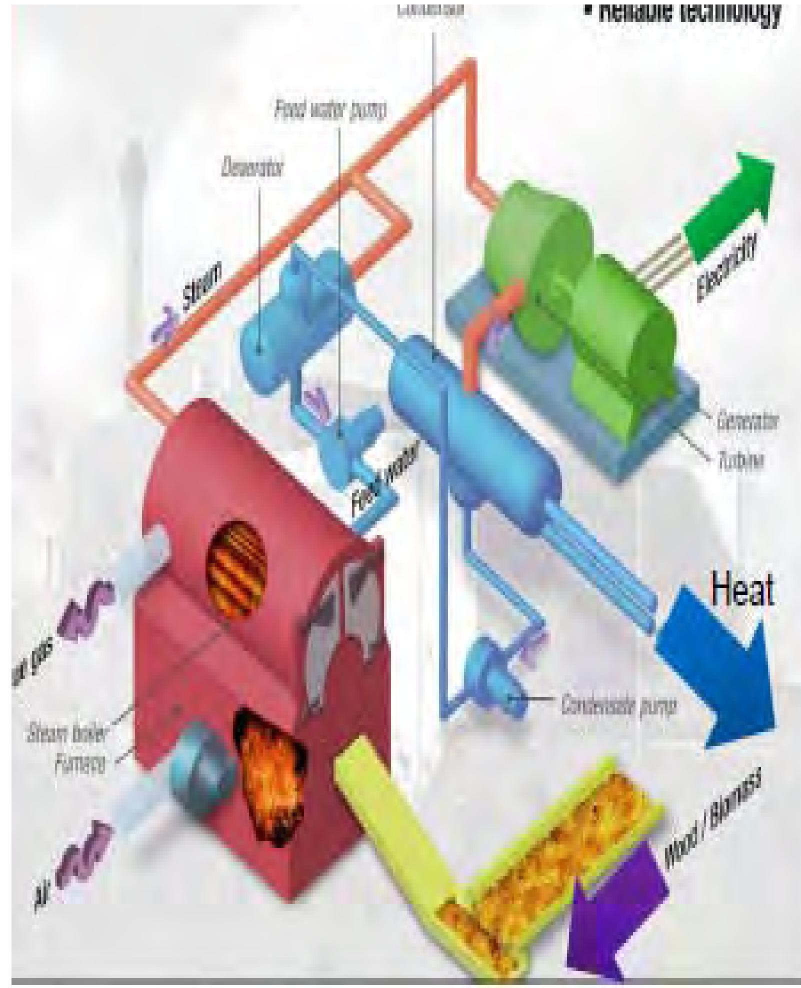
Biomass

How it works…

- Burning of biomass to provide heat (and power, CHP in a 3:1 ratio)
- Many varieties of biofuels accepted



- Scalable – from individual buildings (heat only), to clusters of buildings (district CHP)



Considerations

•Size – in an individual building this may look like a big boiler, but for a large commercial property or a network of buildings it's going to be huge.

Majority of installation problems are associated with fuel supply issues. So it's vital to match an appropriate fuel supply to the plant requirements application and apply fuel-quality standards

•Design Considerations: It's important to have storage space for the fuel, appropriate access to the boiler for loading and a local fuel supplier.

•Air quality issues for larger scale installations >50kWe

Costs...

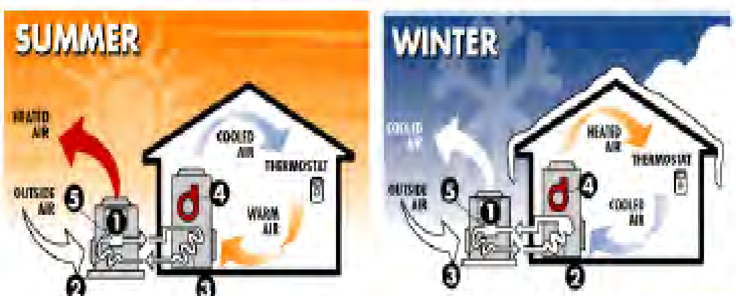
Typical Application		Size	Volume	Initial Costs	Savings
	**Individual building**	15 kWe	2 m³ plus storage	£12-15,000	Low Unless replacing solid fuel or electric heating

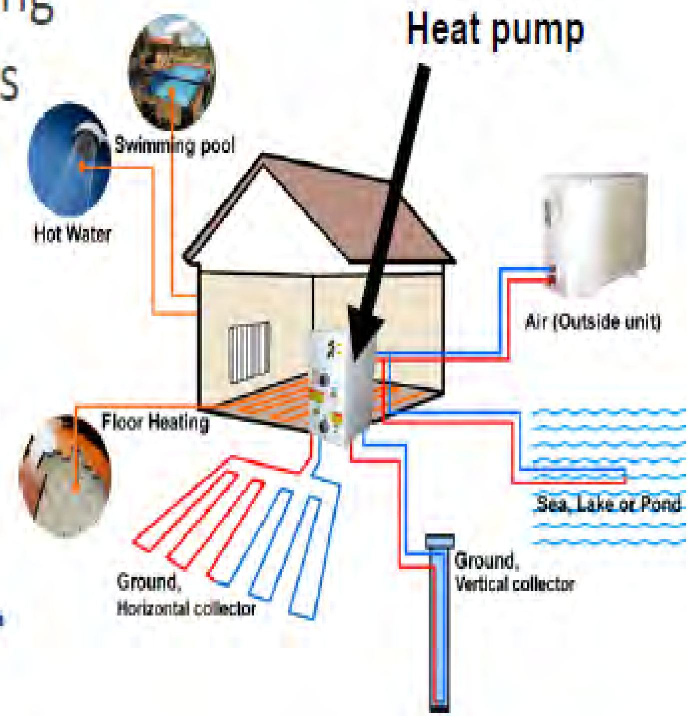
But there are financial incentives!

However there are a lot of boxes to tick if you are going to make this work – and be financially viable - for you.

Heat Pumps (GSHP & ASHP)

- Provides both heating and cooling
- Cooling: takes heat from indoors and 'dumps' it outdoors/ to ground
- Heating: takes 'heat' from outdoors/ground and dumps it indoors
- Different sources of heat exist





What it looks like…

- Ground-source HP: coils laid 1-3m underground connected to indoor manifold and buffer tank, delivering warm **water**
- Air-source HP: one outdoor unit connected to one or more indoor units, delivering warm/cool **air**



Typical Application		Size	Fittings	Initial Costs	Savings
	Air source heat pump (reversible AC)	5 kW	1 outdoor units connected to 3 indoor units (living room, 2 bedrooms)	£1-2000	Low Unless replacing solid fuel or electric heating
	Ground source heat pump	8-12 kW	Closed ground loop connected to indoor manifold and buffer tank	£6-12,000	Low Unless replacing solid fuel or electric heating

Considerations

•Heat pumps produce low grade heat and are particularly suited to underfloor heating or a VRV system. Consequently Bruntwood would probably look to incorporate this into refurbishments or building maintenance rather than as a specific project as it's unlikely to be financially viable.

•Heat pumps require well-insulated buildings in order to work optimally, and don't cope well with rapid building heat-loss as the pump ends up 'chasing its own tail'. This may be a problem for us given the age of our portfolio and the thermal properties of some of our buildings.

•Design consideration: Appropriate geology for a heat pump (not sand!), ensure land is available to accommodate loop or borehole for GSHP,

•Heat pumps are familiar to us -fridges and air conditioners are two examples. Ground source heat pumps (GSHP) transfer heat from the ground into a building to provide space heating and, in some cases, to pre-heat hot water

•For every unit of electricity used to pump the heat, 3-4 units of heat are produced, this is the Coefficient of Performance

Where does that leave us?

1. Select The Right Technology

a) Establish current mix of energy use through a comprehensive energy survey
b) Establish present and future demand profile
c) Establish available resources; biomass, wind, water, geo-thermal etc
d) Examine local energy networks to optimise energy usage
e) Implement energy reduction/efficiency measures where possible

2. Feasibility

a) Assess the physical constraints
b) Cost-benefit analysis to determine economic viability of project. Include possible support mechanisms
c) Carry out risk assessment to address the issues associated with switching to a renewable energy supply
d) Consider planning issues
e) Consider grid connection issues

Thanks For Listening.........

Any Questions?