Hawkesbury Upton Village Hall

A report provided under the Community Action for Energy (CAFE) Project

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How to use this report

All the figures in this report are indicative. They are based on our independent and comprehensive databases of market prices and performance of equipment supplied by quality manufacturers and the property and usage information you provided. Our objective is to give you budget costings and transparent calculations to enable you to approach the project efficiently and with confidence.

Actual prices quoted by suppliers may be higher or lower than those indicated, and individual suppliers may be able to provide good reasons for this based on specific features of their products or particular issues with your property only apparent from detailed site surveys (for example, particularly difficult access to the installation area, incurring extra cost).

Summary

Your current energy costs are shown in the table below

	Annual Cost	tonnes CO_2 / year
Oil	£1,941	18.3
Electricity	£1,182	6.0
Totals	**£3,123**	**24.3**

Due to increasing oil prices you should budget for a 41% increase in your oil bill over the next year to £2637

Key Recommendations

Energy efficiency

Improvements to the energy efficiency of the hall can be made by improving the insulation in the building

Cavity Wall insulation

This can be injected in to any parts of the building that have un insulated cavity walls, heat losses through these walls will be reduced by 75%.

Roof insulation

The building has no conventional attic spaces but insulation could be installed above the suspended ceilings.

Lighting

Florescent light fittings in areas with high usage could be upgraded to T5 units reducing electricity consumption between 22 and 39%

Heating

Installing a new boiler will reduce oil consumption by around 28% CO2 emissions would be reduced by 5.1 tones each year, a wood chip boiler could be considered if space to house it can be found.

Renewable energy

Installing a 6 kW wind turbine on the playing field has the potential to generate electricity worth £2,319 to you each year it will reduce CO2 emissions by 9.1 tonnes each year.

Solar options were considered but the roof faces west/ east and is not ideal for a solar electric system.

1 Introduction

I visited the hall on February 12th and discussed the requirements for the hall with Angelo Sauro and other members of the hall committee.

Hawkesbury Upton Village Hall was built in 1981 and has been extended since. The hall is used for many community activities the hall is used each weekday morning and most evenings.

Services.

The building has mains electricity and water, heating is provided by oil boilers.

1.1 Current Energy Consumption

The hall uses both oil and electric.

	Total consumption	Annual Cost	tonnes CO_2 / year
Oil	6018 litres / year	£1,941	18.3
Electricity	11490 Kwh/ year	£1,182	6.0
Totals		**£3,123**	**24.3**

Your average price for oil over the last 12 months has been 32p / litre today you might pay 45p you should budget for a 41%. This will increase in your oil bill over the next year to £2637

2 Energy Efficiency

Prior to starting a renewable energy project energy looking for opportunities to reduce the energy consumption of the hall is important as often this is much more cost effective.

Insulation

Cavity Wall Insulation

The walls of the building will be of a cavity wall construction; these are unlikely to be insulated with the exception of the newest walls. You should consider installing cavity wall insulation in these walls this will reduce the heat losses from the walls by up to 75%. The cost of installing cavity wall insulation is around £6./ sqm.

Roof insulation

The building does not have conventional attic spaces, there are suspended ceilings installed in parts of the hall and it is possible to lay fibreglass wool insulation over these reducing heat losses to that space. Installing fibreglass wool insulation will cost approximately £2.20 per sqm for material to install 100mm of insulation over the false ceiling tiles.

You will need to ensure that there is adequate ventilation in this space to avoid condensation problems, the lights are installed in the ceiling and no insulation should be laid over theses fittings, this should provide some ventilation and some escaped heat to reduce the risk of condensation.

This will reduce the heat losses and also reduce the heating bills as you will not be heating this space to the same levels as you are currently.

If at some time in the future the building needs to be re roofed then insulation can be added to the rafters at this time.

Lighting

The lighting systems are mainly T8 fluorescent lights or compact fluorescent fittings

Savings can be made by changing the T8 units for T5 units. To avoid the cost of changing the fittings it is possible to buy adaptor kits, I am aware 3 systems saveiteasy , 8to5 and Tubesaver. The savings you can expect are shown in the table below.

Existing Lamp	New Lamp	Run hours for financial payback*	Expected Energy Savings %
5 feet T8 58W	T5 35W	7,400	39
4 feet T8 36W	T8 28W	21,250	22

- assuming £17 installed cost and electricity at 10p per kWh

Lights in the areas used most often such as the main hall are the priority for upgrade.

Lighting controls

You are already using movement detectors in areas such as the toilets; this saves energy by ensuring that these areas are only lit when there are people using the facilities.

3 Heating system

The heating system currently consists of an oil boilers, this is thought to be between 20 and 30 years old.

We discussed heating systems the boiler should replaced when funds permit. Options discussed included an Oil boiler, heat pumps and Wood Chip / Pellet Boilers.

Oil Boiler

The current boiler is rated at 41 kW it will be around 65%. Replacing the boiler with a new condensing boiler will improve this to around 90%..

41 kW Condensing Oil boiler providing heat and hot water Expected oil consumption 4346 l / year	Installed cost	£2,800	
	Savings per year	£752	5.1 tonnes CO2
	Simple pay back	4 years	

The installed cost is to install a boiler in to the existing location extra costs will be incurred if the radiator system requires work and also to upgrade the controls.

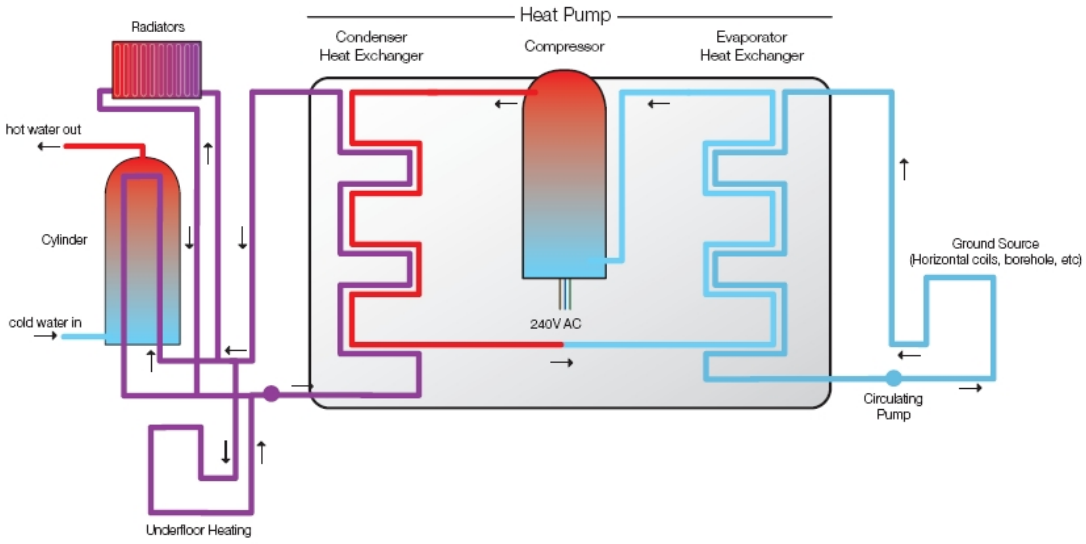
When the oil boiler is replaced a new hot water store should be installed, the current on is poorly insulated with only a loose fitting jacket.

Pipe work in the plant room should be lagged.

Heat pump

Heat pumps make a good heating system for well insulated building and are particularly attractive if under floor heating can be installed, I am not sure that they will the best option for your building.

Heat pumps work by taking low grade heat from outside and using a compressor convert this to useful heat at between 35 and 50 C, for every 1 kWh of electricity the heat pump uses it will provide between 3 and 4 kWh of heat.



A heat pump is best at maintaining a constant temperature in the building, it is not suited to a building with an intermittent use pattern where the building is required to come up to temperature for an event and then be allowed to cool between events. A heat pump works best with building that have underfloor heating installed, the suitability of your building for heating with a heatpump will depend on the specification of the under floor heating system installed. For a heat pump you would want it to operate with a flow temperature of 35C ideally.

Heat pumps really require little in the way of routine maintenance, they operate in a similar way to a fridge. A heat pump will have a life expectancy of around 20 years, the ground collector around 50 years.

Wood boiler

A wood chip boiler would offer a low carbon heating system for the building.

A boiler house would need to be constructed at the site to house the boiler and the fuel store; access would be needed to for fuel deliveries.

The main cost of installing a wood chip boiler is constructing a boiler house; the cost of these works will be in addition to the £13,000 estimated cost for the boiler.

41 kW wood chip boiler providing heat and hot water	Installed cost	£13,000	
Expected consumption, 17.4 tonnes of wood chip a year.	Savings per year	£1,700	16 tonnes CO2
	Simple pay back	7.6 years	

Typical wood chip boiler

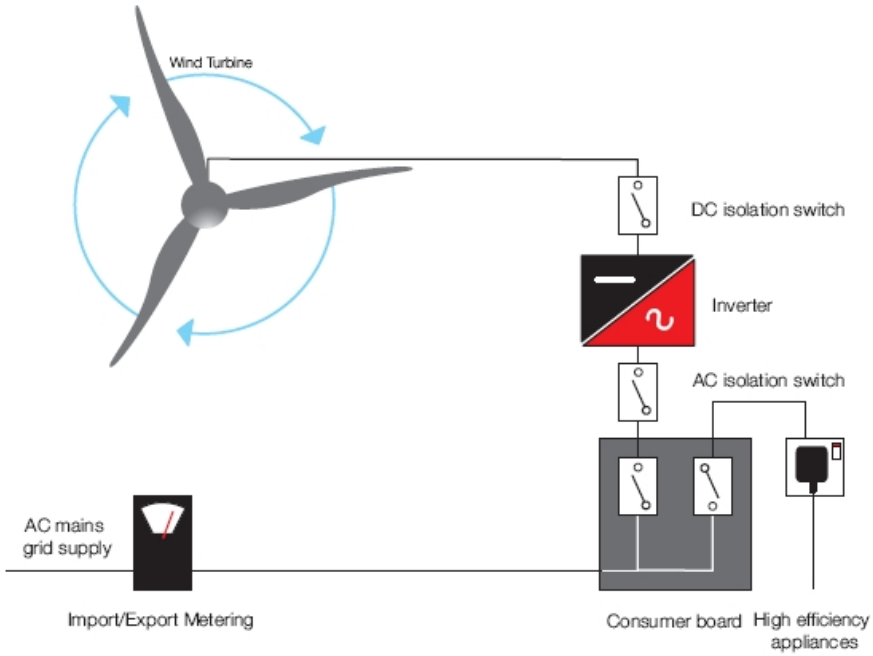
Typical wood chip boiler showing chip store

A wood boiler will require servicing in a similar way to an oil boiler each year, the costs may be slightly higher. A monthly inspection and clean may be required by the halls caretaker.

4 Wind turbine specification

The **wind speed** at 10 M high is shown as **6.2m /sec** in the Noble Wind speed database. The hall is in an open rural area so the impact of turbulence on the turbine should be minimal as long as the turbine is placed well clear of buildings and trees, you should aim to keep the turbine a minimum of 50 m away from these. During the visit we identified suitable sites in the playing fields where a turbine could be located.

The basic components of a small wind turbine are shown in the diagram below; the turbine is connected to the ring main in the building. No batteries are required as no electricity is stored.



There are two standards that apply to small micro generation, for systems generating less than 16 amps per phase then G83/1 regulations allow type approved invertors to be connected directly to the ring main in the building without prior permission from the grid operator. If the hall has a three phase electrical supply all three turbines discussed latter will be able to installed under the 83/1 regulations. If you have a single phase supply t 2.5 kW turbine could be installed under G83/1, to install the larger turbines you would have to consult with the local electricity distribution prior to the installation permission may be granted for larger turbines but that would depend on the impact your turbines will have on the voltage stability in the local areas.

The hall is located in the centre of the village and the playing fields look over open country side. Planning permission will be required before a wind turbine is erected you will need to work closely with the local community to secure this I believe that the hall is located in an AoNB.

To facilitate planning permission it is important to talk to the owners of adjacent properties to ensure that they are briefed about your plans prior to applying for planning this often makes things easier as they have a good understanding as to the

scale and appropriateness of the turbine you are planning and are less likely to raise objections latter. As mentioned Hardenhuish School in Chippenham are planning to install a Proven 6 kW turbine on their site and may be able to give you some advice. They received planning permission for their turbine on the 12th December 2008.

Typical Proven 6kW Wind Turbine.

I have looked at a number of turbines that may be suitable; I have only considered turbines that will qualify for funding under the Low Carbon Buildings Program (Phase 2)

Proven 6 kW turbine

This type of system would be mounted on a 9-15m tower. The rotor diameter is 5.5 m. The tower requires concrete foundations 3m x 3m x 1.2m. In addition a winch point is required with a foundation consisting of a block 1.5m x1.5m x1m .

The turbine would be grid connected; delivering 230/240V AC at 50Hz.

The table below summarises the budget economics for such a system.

		£	t CO2
6 kW wind turbine with a rotor diameter of 5.5m mounted on a 11m tower.	Installed Cost (excluding foundations)	15,600*	
	Net energy delivered per year	17,433 kWh	
	Annual Savings	1,220[1]	9.1 t
	Exported energy	314	
	Potential value of ROCs	784	
	Total savings	2319	
	Payback	7 yrs	

* assuming you obtain a 35% grant from low carbon buildings program

Proven 2.5 kW turbine

This type of system would be mounted on a 6.5 to 11m tower. The rotor diameter is 3.5 m. The tower requires concrete foundations 1.6m x 1.6m x 1m. In addition you will require a foundation for the winch point this will require around 0.65 m3 of concrete.

The turbine would be grid connected; delivering 230/240V AC at 50Hz.

The table below summarises the budget economics for such a system.

		£	t CO2
2.5 kW wind turbine with a rotor diameter of 3.5m mounted on a 9m tower.	Installed Cost (excluding foundations)	15,600*	
	Net energy delivered per year	17,433 kWh	
	Annual Savings	1,220[2]	9.1 t
	Exported energy	124[3]	
	Potential value of ROCs	309	
	Total savings	1,653	
	Payback	10 yrs	

* assuming you obtain a 35% grant from low carbon buildings program

You may want to add an energy display in the hall to show the children and parents how the turbine is performing. You should budget between £500 and £1000 to install such a system.

There are many other turbines available and you may want to look at these, they do not attract grants under the low carbon building program but they may still be cost effective.

Installation and Maintenance

Installation of a wind turbine will take two to three days there are two phases

[1] Assuming 70% of the energy is used on site.
[2] Assuming 70% of the energy is used on site.
[3] It may be difficult to get an export payment for such a small amount of electricity.

1. Foundation preparation
2. Turbine erection and electrical connection

You will need to allow about 3 weeks between casting the foundations and installing turbine.

All three turbines will require a simple annual service, this consists of lowering the tower and checking the security of the bolts, some turbines require oil to be applied to the bearings. This work could be carried out by the ground staff and training would be available during the installation of the turbine. Servicing could be handled by a specialist contractor this will cost around £450 due to the distance they often have to travel.

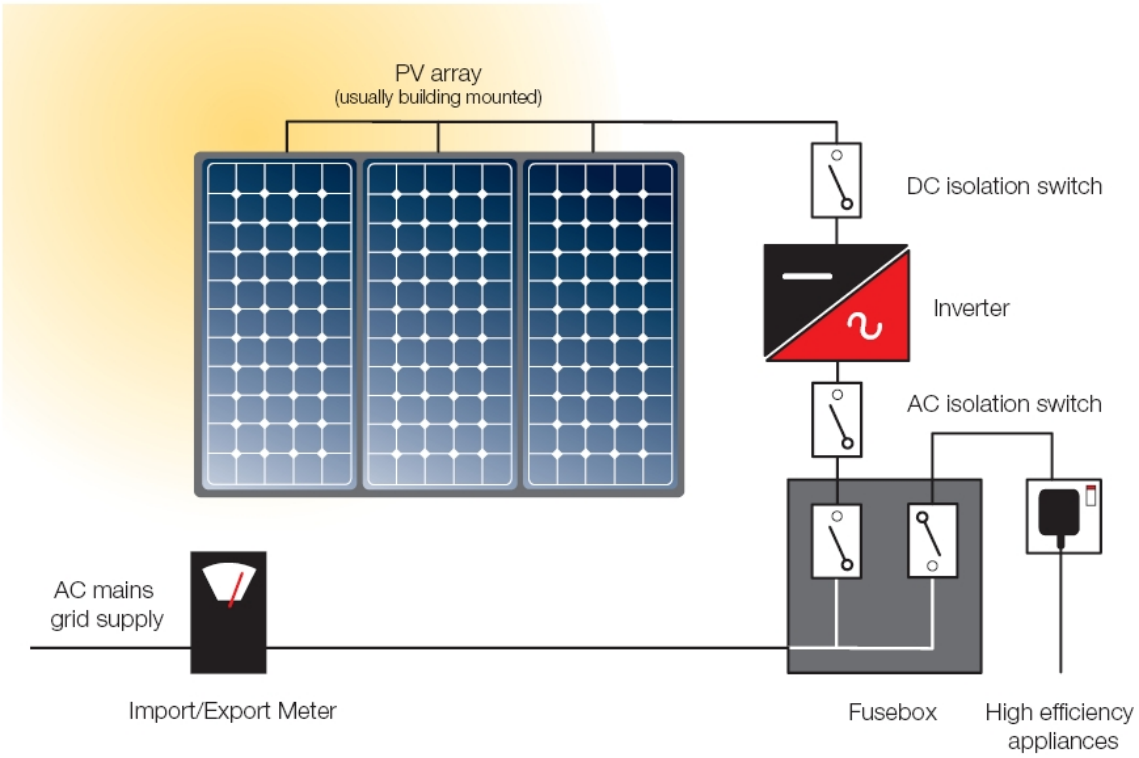
A turbine is generally considered to have a useful life between 15 and 20 years.

5 Solar PV system

Solar electric systems are low maintenance and are best mounted on an unshaded south facing roof.

The south facing roof on your building is quite small and heavily shaded by mature trees, it would be possible to install a system at the north end of the west roof, and this would generate 20% less electricity from a system when compared with one facing south. You will still need to be careful to avoid shading from the trees on this roof.

The panels would be grid connected; delivering 230/240V AC at 50Hz the key components are shown diagrammatically below.



The table below summarises the budget economics for such a system.

		£	t CO2
4.1 kW solar PV system covering 33 sqm of roof space	Net cost to you	12,300*	5.92
	Net energy delivered per year	2400 kWh	
	Annual Savings	£228	1.26
	Potential value of ROCs	£108	
	Total savings	£336	
	Payback	37 yrs	5 yrs

* assuming you obtain a 50% grant from low carbon buildings program

If your roof faced south the system would generate 20% more electricity totalling 2880 kWh, saving £403 a year.

A solar electric system requires no routine maintenance, the panels may have a power guarantee of between 20 to 25 years depending on the brand, this guarantees that the power output will not fall by more than 10% over the period of the guarantee.

The inverter is an item of electronics and could fail after 10 to 15 years and would require replacing, today the inverter would cost around £1,000 to replace at today's prices.

6 Solar Hot Water

Solar hot water systems are best suited to buildings with a high daily demand for hot water, the showers in your hall are used by sports clubs but this is not every day.

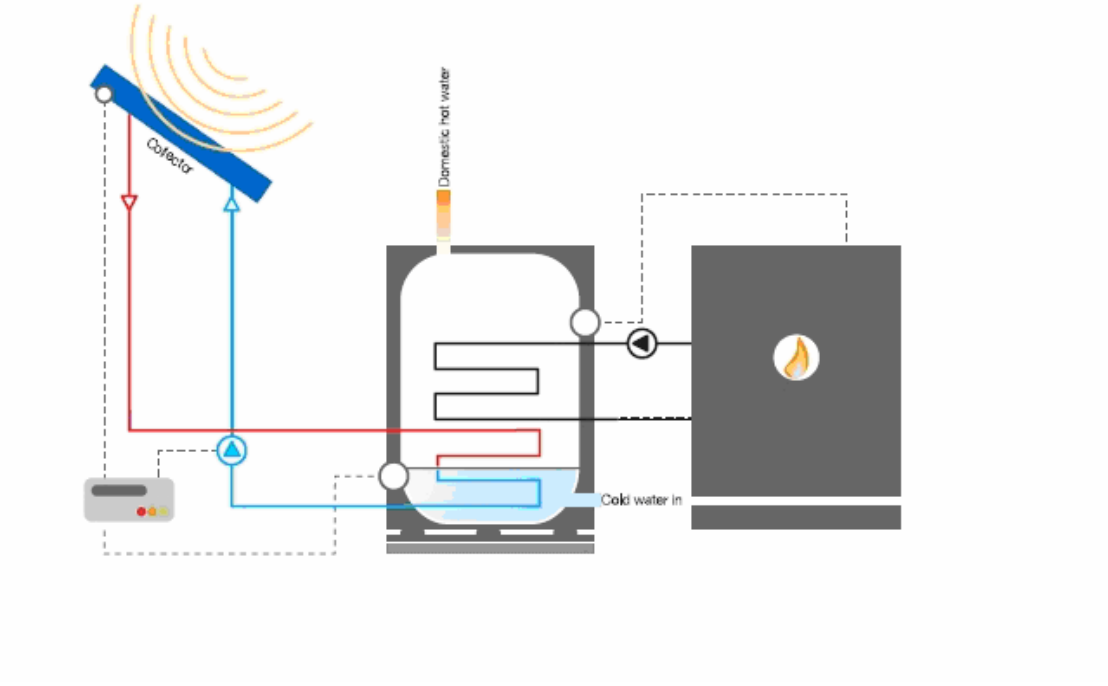
It is difficult to estimate your hot water demand but a building using around 300l of hot water each day would benefit from a system consisting of around 8 sqm flat plate solar collector

A system will cost around £4,500 to install including a hot water storage cylinder (assuming a 35% grant under the low carbon buildings program). The panels would be installed on the west roof; you might choose to install some on the east side as well to benefit from the morning sun. this will require a slightly more sophisticated control unit to ensure that the heating fluid was only circulated through the hot panels.

Solar energy supplied	3300 kWh/ year
heating around 300 l of water per day on average	
Value of oil saved	£212 / year
CO2 emission reduction	1.4 tonne per year

Financial payback 21 years.

The diagram below shows how solar thermal systems work.



If you think that you might like to add a solar hot water system to the building at a latter date when funding permits then you might want to consider installing a twin coil hot water tank when replacing the current one.

Maintenance of a solar hot water is minimal, routine maintenance will consist of an annual check of the antifreeze solution in the collector circuit.

The system has a circulation pump similar to the pump found in a central heating system; this may require changing after 10 years. The panels on the roof will not require cleaning except in exceptional circumstances, the panels should have a minimum life expectancy of 20 years.

7 Sources of Funding For Renewable Energy Projects

Low Carbon Buildings Programme Phase 2 (LCBP2)

Phase 2 grants are open to public sector not-for profit organisations. The scheme will provide £50 million of capital grant funding for the installation of micro-generational technologies in England, Wales, Scotland and Northern Island. The scheme began in December 2006 and aims to commit the bulk of the funding by April 2008.

An organisation can receive up to £1million in grant funds over the lifetime of the programme. This may be for several different sites, although a separate application will be required for each site. A site may consist of more than one installation. A maximum of three eligible technologies can be applied for at each proposed installation.

Organisations can apply for between 30% and 50% of the cost of installing micogeneration technologies (depending on technology), supplied and installed by Framework Suppliers.

Maximum grant as % of total project costs are as follows:

- Solar photovoltaic 50%
- Solar thermal hot water 30%
- Wind turbines 30%
- Ground source heat pumps 35%
- Automated wood pellet stoves 35%
- Wood fuelled boilers 35%

Under LCBP2 Framework Suppliers have been appointed to oversee their supply and installation. In order to qualify for a grant, applicants are required to enter into agreements with one or more of these suppliers.

The following organisations have been appointed as Framework Suppliers:

British Gas
TheEnergyEfficiencyTeam@centrica.com

Dimplex
01489 773243
lcbp@glendimplex.com
www.dimplex-resource.co.uk

E.ON UK
0800 051 5687
lcbpp2@eon-uk.com

Low Carbon Partnership
0845 070 7700
advice@tlcp.co.uk
www.tlcp.co.uk

RES Heat & Power
0845 606 0608
www.lowcarbonheating.co.uk

solarcentury
0207 803 0100
publicsector@solarcentury.com
www.solarcentury.com/grants

Solar Microgeneration Limited
01295 201201
info@solarmicrogeneration.co.uk
www.solarmicrogeneration.co.uk

Technologies supplied by Framework Suppliers are:

	British Gas	Dimplex	E.On UK	Solar Microgen. Ltd	LCP	RES Heat & Power	solar century
Biomass systems	Y		Y			Y	
Ground source heat pumps	Y	Y	Y				
Solar photovoltaics	Y				Y		Y
Solar thermal hot water	Y			Y	Y		
Wind turbines	Y		Y		Y		

How to apply
The Building Research Establishment (BRE) has been appointed by the government to manage the scheme on the government's behalf. Applicants can apply either online or by post. Online applications can be made from www.lowcarbonbuildingsphase2.org.uk . Copies of installer quotations and proof of not-for profit status need to be provided with the application form.
The application will be assessed and the applicant contacted with the decision within 5 – 7 days. The application will be assessed against criteria set out in the application form. A grant offer letter will then be issued to successful applicants. The grant offer letter will specify a deadline, usually 12 months, by which time the installation must be completed. It is a condition of the grant that the system will remain installed and in use for a period of at least 5 years.

Match funding
An applicant is not entitled to receive a grant for the proposed technology if they have or will receive any funding from the national government or devolved administrations in relation to the proposed technology. This includes funding from the Low Carbon Building Programme Phase 1 and the Bio-energy Capital Scheme. However, applicants may receive funding from other public sources (including Big Lottery and Local Government)

Scottish Power Green Energy Trust
The trust was established in 1998. Its purpose is to support the development of renewable energy sources across the UK. The trust is funded by the customers of Scottish Power Green Energy Trust and Scottish Power. So far £680k of money has been awarded to around 70 projects.
The trust can provide up to 50% of the capital costs of the project costs up to a maximum of £25,000. The trust supports projects that are shown to i) advance renewable energy and ii) support communities through education and public engagement. Technologies it funds include all of those supported through the low carbon buildings programme. The trust meets three times a year to consider applications. Further information on the Green Energy Trust can be obtained by calling the Secretary of the Trust on 0141 568 3492.

Esmée Fairbairn Foundation

Esmée Fairbairn Foundation is one of the largest independent grant making foundations in the UK.

They make grants to organisations that aim to improve the quality of life for people and communities in the UK, both now and in the future.
In 2007 they expect to make grants totalling £29 million across the UK for charitable purposes in four programme areas: Arts & Heritage, Education, Environment and Social Change: Enterprise and Independence. £5.9 million has been allocated to the environmental programme for this year to fund a number of priority areas one of which is the adoption, on a nationwide basis, of renewable energy. The foundation can be contacted on 020 7297 4700.

Landfill Communities Fund

The Landfill Communities Fund (LCF) enables waste operators to provide funding to organisations through their tax credits for certain types of qualifying environmental projects. Grants awarded are typically in the region of between £5,000 and £50,000. Before an application can be made, a project must be identified which complies with the LCF objectives. These are:
Reclaiming land, the use of which has been previously prevented by some activity
To reduce or prevent pollution on land
To provide or maintain public parks or amenities within 10 miles of a landfill site
The restoration or repair of buildings for religious worship or architectural or historical interest within 10 miles of a landfill site
The provision, conservation, restoration or enhancement of a natural habitat.

ENTRUST is the regulator of the landfill tax credit scheme. In order to receive money through the LCF from a landfill operator it is necessary to register with ENTRUST as an environmental body

In some areas of the country there are several landfill operators that can be approached.
These include:

Biffaward - www.biffaward.org

Waste Recycling Environmental Limited (WREN) - www.wren.org.uk

The Community Sustainable Energy Programme (CSEP),

A Big Lottery Fund Scheme will be launched in April 2008 to offer capital and project development grants to not-for-profit community-based organisations in England to help you reduce your energy bills and environmental impact. The scheme is also designed to raise public awareness of the social and environmental advantages in reducing energy consumption and carbon emissions in order to combat climate change. The grant money is for the purchase and installation of renewable technologies along with various efficiency measures.

The grant works like this:

Capital grants of up to £50,000 or 50% of the project cost, whichever is lower, for installing microgeneration technologies and energy efficiency measures. Matched funding can potentially be obtained from the Low Carbon Buildings Programme (LCBP) which may mean that your project receives 100% funding. Eligible microgeneration technologies are:

Solar photovoltaics to provide electricity
Solar thermal for hot water
Small scale wind turbines
Ground source heat pumps/Air source heat pumps
Automated wood pellet stoves
Wood-fuelled boiler systems
Micro-hydro Turbines
Energy efficiency measures such s cavity wall and loft insulation, heating and lighting controls

If your project is at the idea stage and needs feasibility study, the SCEP will potentially provide a Project Development Grant of up to £5,000 or 75% of the study cost (whichever is lower). Encraft are registering to deliver support through this program.

