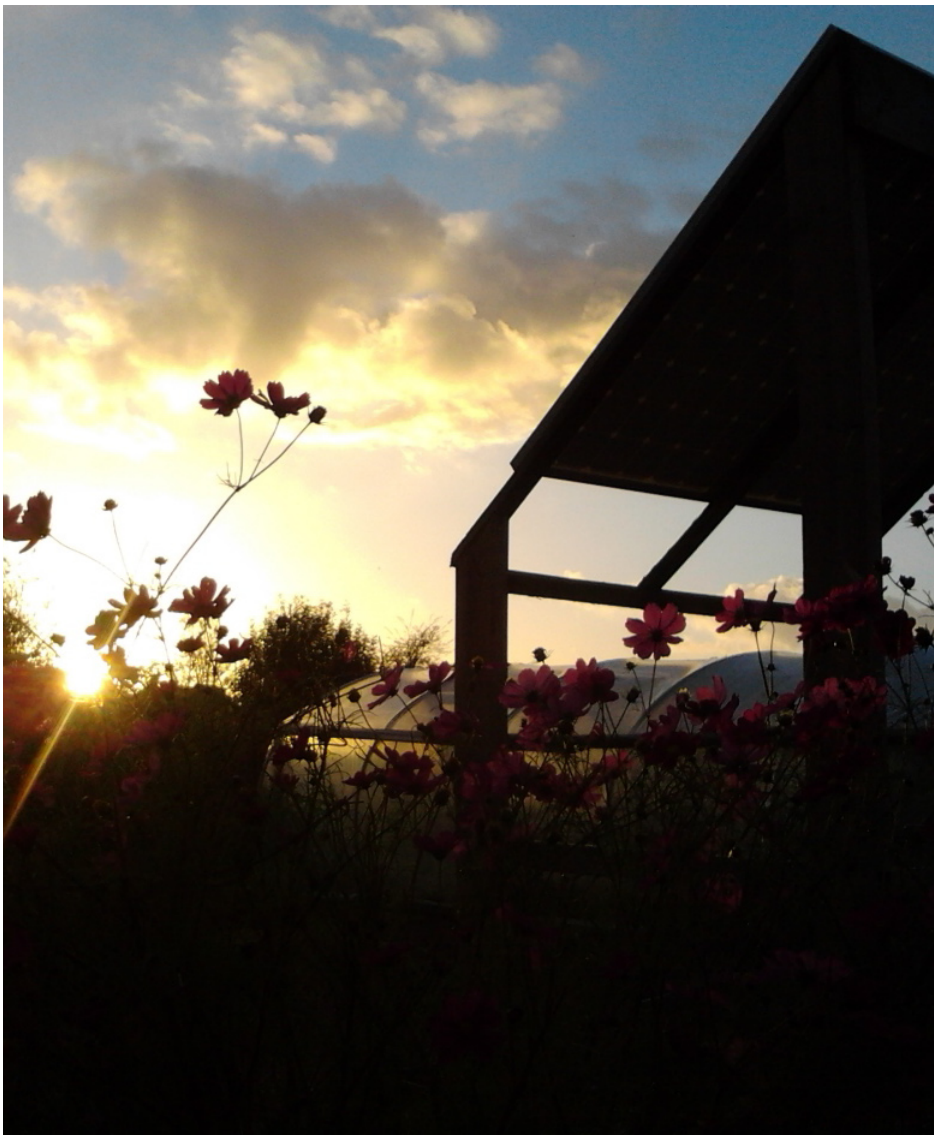
Federation of CITY FARMS & COMMUNITY GARDENS

Factsheet

Renewable energy use on community gardens and city farms

Why consider renewable energy?

There are many benefits to installing and using renewable energy in city farms and community gardens. Renewable sources of energy have a low environmental impact. They are considered 'clean' sources of energy creating less pollution than traditional fossil fuel based technologies. Renewables have lower carbon emissions so don't impact on climate change in the same way as fossil fuels. In the long term they are often cheaper and in many situations funding is available to install renewable technologies. Some systems allow electricity to be sold back to the grid and can therefore actually generate an income for projects.



Sources of renewable enery

Solar thermal

Solar thermal systems heat water directly using energy from the sun, the water can be stored for later use.

Pros: This system can reduce your energy bills and carbon emissions.

Cons: While solar thermal systems do work at any time of year they do need a boiler to top up the water temperature in colder weather.

Biomass heating

Biomass systems burn fuel from renewable sources to supply heating or hot water. Sources of fuel include wood, energy crops, and industrial waste.

Pros: Wood is often a relatively cheap source of fuel. Burning wood releases less carbon than burning fossil fuels.

Cons: There are some pollutants emitted by wood burning systems. Systems require regular maintenance to keep them running. Fuel stores must be dry and large enough to keep the boiler running between deliveries.

Ground Source Heat Pumps (GSHPs)

GSHPs take heat from the ground to use in central heating and underfloor heating systems.

Pros: Ground temperature is consistent so these systems work throughout the year. They have low maintenance requirements and can reduce energy bills.

Cons: GSHPs are more cost effective if replacing coal or electricity rather than gas. The site where the pumps are being installed needs to be accessible to diggers.

Air Source Heat Pumps (ASHPs)

ASHPs heat radiators, underfloor heating and hot water by absorbing heat from the air.

Pros: These systems can generate heat even on cold days. They will decrease fuel bills and are often easier to install than GSHPs.

Cons: ASHPs do need electricity to work so there is some environmental impact, however they will still lower your carbon footprint.

Solar PV

Solar photovoltaic panels convert the sun's energy into electricity. They can be mounted on walls, rooftops or the ground.

Pros: There is a plentiful supply of energy from the sun and once installed solar panels don't create any pollution. The electricity that you produce is free once you've covered the cost of installation. Any surplus electricity that is produced can be sold back to the grid. They require little maintenance.

Cons: Panels are most effective in full, direct sunlight; however, they do still produce electricity even on cloudy days.

Wind turbines

Wind turbines harness the power of the wind, the turning blades drive a turbine that generates electricity. They are one of the more developed and economically viable renewable technologies.

Pros: As with other renewables, once you've paid for the initial installation the electricity that is produced is free. Any electricity that you don't use can be sold back to the grid.

Cons: Wind turbines will need some ongoing maintenance checks which do have an associated cost. They may also need some parts replaced over their lifetime.

Hydro

Hydro systems use running water to generate electricity, power can be produced from rivers or smaller streams.

Pros: Hydro can be a cheaper option for off grid locations, while they can be expensive to install it is often cheaper than connecting to the grid. Along with solar and wind, hydro is a clean energy source and doesn't produce any pollutants. Maintenance costs are usually low and systems have a relatively long lifespan. Hydro schemes are a relatively predictable source of energy.

Cons: You need to have running water on your site to be able to utilise hydro power, not all situations have access to a suitable water course as there are some specific requirements including the flow and head of water.

References

www.energysavingtrust.org.uk

www.localenergyscotland.org/media/1016/cares_handbook.pdf

Case Studies

Solar Panels

Golden Hill Community Garden, Bristol

Solar panels installed on site are used to power a water pump and provide electricity for lighting and the kettle in a straw bale building.

The off-grid site is located at the bottom of a slope and had previously had drainage and flooding issues.

The solar powered water pump can move 15,000 litres of water up a 13m rise and across 400m to the top of the adjoining allotments.

This has alleviated the flooding problem and provides water for the allotments, saving allotment holders money in the process.

The solar panels, water tank and pipes were all funded by a Local Food Fund grant. The system was installed by enthusiastic amateurs, including retired engineers.

There have been some challenges in keeping this unique water pump system in operation, but the solar panel itself has worked well.

http://thegoldenhillcommunity garden.com/the-tower-of-power

Biomass boiler

Parklea Branching Out, Port Glasgow

In 2012 Parklea completed installation of a biomass boiler. The project received 90% of the funding from Community and Renewable Energy Scheme, the remaining 10% was met by capital funding from Parklea. The total project cost £116,725.

The biomass boiler heats water tanks, providing a thermal store and heat source for the glasshouses and outbuilding pipework. The system has saved money, an alternative gas system would have greater ongoing costs. Parklea have a good relationship with the local council and source wood from them for free.

Although the system has been very successful, the Parklea manager advised that projects considering similar systems should consider the time involved in operation a biomass boiler.

Time-consuming activities include sourcing fuel, storing and splitting the wood and operating the boiler. There are biomass boilers available that have automatic feeders but manual systems like the one at Parklea require daily attention.

There are staff on site 5 days a week which means that the water tanks cool down at weekends. Heating them up again can take a day, it is much more efficient to have the boilers running 7 days a week but that of course requires staff to be on site.

These systems can be an excellent option in the correct circumstances.

www.communityenergyscotland.org.uk/userfiles/file/case_studies/Parklea_Branching_Out.pdf

Wind turbine

Camas, Isle of Mull

The Camus site is off grid, all power to the site is provided by a wind turbine and solar panels. The solar panels are used to heat water while the turbine provides power for 2 offices and a staff room. Appliances are limited and include laptops, lamps and a fridge.

The system charges a bank of 25 batteries and is fairy reliable. However, there are times that the power can run out. This is usually during the summer when low winds coincide with higher demand (summer is when they have most residential visitors, up to 35 people a week). Camus have recently installed three new solar panels to top up the power during these times.

The wind turbine system has been in place since 2007, batteries require weekly maintenance and the turbine itself has a service approx. every 3 to 5 years.

The Camus manager advised that anyone installing a wind turbine would benefit from finding a professional engineer to do the maintenance. They don't require much technical knowledge on a day to day basis but if something stops working expert advice is required.

Camus is a residential property and living off grid with this sort of system does require an awareness of what power you are using and what your needs are. It is easy to read and manage the system so you can tell how much power you have left.

https://iona.org.uk/island-centres/camas/

Ground Source Heat Pumps (GSHP)

Camphill, Blair Drummond

Camphill have installed 2 GSHP systems, one is used to provide heat and hot water in 2 outbuilding joinery workshops and the other in a residential semi-detached house for 6 – 14 people. The GSHP in the workshops was 75% funded by Community Energy Scotland. The GSHP for the residential property was self-funded which meant it could be registered with the government renewable heating incentive scheme and make an income.

There have been some challenges with the GSPHs at Camphill. The first system installed failed so they went back to the supplier for help. Unfortunately the company had closed down and Camphill staff found it very difficult to find an engineer to help them. The technology is so new that engineers will often only service systems that they are familiar with or have installed themselves.

There have also been some issues with the residential GSHP. The system is similar to storage heaters in that it can't be adjusted quickly. It can provide heating but not at the high temperatures of conventional systems.

Anyone considering GSHP should be aware that while there are lots of positives there are challenges too. Suitability will depend on the physical location of your property and your specific requirements. Camphill's decision was driven by a commitment to use renewables and the grants that were available at the time. The long payback period makes it hard to review their decisions at this stage but given the same circumstances the manager was confident that they would make the same choices again.

http://camphillblairdrummond.org.uk

Above and below: Turbine house at Dawyck Garden

Below: Dynamo pond house at Dawyck Garden

Hydro-electric

Dawyck Botanic Garden, Stobo

The hydro-electric scheme was installed at the Dawyck Botanic Garden in 2014. Part funded by EDF Energy's Green Fund, the system provides electricity for the visitor centre and gardens maintenance requirements. Surplus power is sold back to the grid creating an income for the garden. The system incorporates some elements from a Victorian hydro scheme on the site including a dynamo pond. The pipework and turbine house are new.

The project has been hugely successful and current forecasts suggest that the capital for the project will be paid back within 8 years. The project manager highlighted the importance of a good feasibility study before embarking on this kind of project. The Dawyck scheme came in on budget and on time which was largely accredited to the comprehensive feasibility study that looked at the suitability of the site and the water course.

The environmental impact also needs to be considered both in terms of groundwork (being a Botanic Garden Dawyck took steps to avoid removing trees) and biodiversity that might be affected by redirecting water from the existing water course.

There have been some challenges with the hydro-electric scheme. In the first year of operation the water intake from the dynamo pond was getting blocked by leaves from the surrounding trees. This needed to be cleared manually up to 3 times a day to prevent the system from shutting down. A new screen was installed after 12 months to alleviate the issue and the system now works more effectively.

Another issue specific to Dawyck is that the site experiences regular power cuts due to its rural location. At these times the hydro-electric system must be turned off as it feeds directly into the grid. To provide power during these periods a bank of batteries that can be charged in advance by the hydro system has been installed. Dawyck are working closely with engineers to install a system to provide power directly during power cuts which is a new technology.

As with the other renewable systems the need for professional, experienced engineers was noted.

www.rbge.org.uk/about-us/news/stories/dawyck-hydro-electric-scheme-powers-ahead

Next steps

For any project considering installing renewable energy technologies there is expert advice and support available from the following organisations:

- The Scottish Government's Community and Renewable Energy Scheme *www.localenergyscotland.org*
- Community Energy Scotland *www.communityenergyscotland.org.uk*
- The Energy Saving Trust *www.energysavingtrust.org.uk*

Do discuss your plans with your local planning department as there may be a requirement for planning permission.

Further info:

http://info.cat.org.uk

www.lowimpact.org/category/renewable-energy-water-utilities

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