Report Title: Community Power Schemes

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Summary

This document contains technical information on solar community power schemes obtained from searching the internet. The schemes described in this document are examples only. There are likely to be other similar community power schemes which have not been included.

The objective in producing the document was to provide information which can be used to help determine the technical options for the proposed Berrylands Community Solar Scheme.

There are a number of options currently being developed for community based solar energy schemes in the UK and overseas:

- Retrofitting solar panels (and in some cases storage batteries) onto existing houses, purchasing in bulk and applying for grants through a community organisation to be cost effective.
- Retrofitting storage batteries onto existing houses with solar PV already installed, again purchasing and applying for grants through a community organisation to be cost effective.
- Retrofitting solar panels and storage batteries into existing multi occupancy apartment buildings effectively creating a microgrid within one building.
- Installing microgrids with solar PV, battery storage and smart metering into new build developments, typically zero or low carbon housing estates.

The Berrylands Community Power concept, as it has been proposed, will be based on solar PV on individual houses and a central battery storage facility. The battery storage facility could be within the footprint of one domestic property. Community projects like this have been proposed in Spain following the changes in the laws there relating to localised power generation.

A system with a central battery storage facility would require some additional infrastructure in the form of cabling between the houses and the central battery storage facility together with smart metering and possibly additional inverters. A simpler system would have battery storage and PV panels installed on individual houses, as in the BWCE Solar Streets Project. This would not require the additional cabling.

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Abbreviations and Technical Jargon

BWCE	:	Bath and West Community Energy
DNO	:	Distribution Network Operator (UK Power Networks for example)
kWp	:	Kilowatts peak (The rate at which the system generates at peak performance)
PV	:	Photovoltaic
Inverter	:	A device which converts the DC output of the PV solar panels to the alternating AC voltage of the power system.
Microgrid	:	A small network of electricity users with a local source of supply. Microgrids usually operate attached, and synchronised, to the DNO's power supply but may be able to function independently. For the microgrid to function independently (in Island Mode) and have the facility to reconnect to the DNO's power supply, there needs to be a method for synchronising the alternating voltage of the microgrid to the alternating voltage of the DNO.

1. Introduction

This document contains technical information on solar community power schemes obtained from searching the internet. Community power schemes based on hydroelectricity and wind power have not been included. Solar farms which do not include photovoltaic, PV, panels on domestic buildings have also not been included.

The community power schemes described in this document are examples only. There are likely to be other similar community power schemes which have not been included.

The objective in producing the document was to provide information which can be used to help determine the technical options for the proposed Berrylands Community Solar Scheme.

2. UK Community Solar Schemes

2.1 Bath & West Community Energy

BWCE was set up in 2010. They have built five solar farms and installed solar PV panels on eleven schools and four community buildings.

Their Solar Streets Project is comparable to the proposed Berrylands initiative. The project was "designed to test the degree to which a collective community approach can be successful in encouraging electricity demand management at a neighbourhood level, enhanced by the integration of domestic solar PV, battery storage and, if possible, a Time of Use electricity tariff."

Open LV monitoring equipment was installed at local substations to provide data on electricity demand across the neighbourhood. BWCE owned solar PV panels were installed on nine domestic properties. Battery storage was installed in these nine properties and in seven other properties which already had solar PV panels.

References:

https://www.bwce.coop/.
https://www.bwce.coop/solar-streets-2/.

2.2 Bristol Energy Cooperative

The Bristol Energy Cooperative does not, at the time of writing, own PV installations on domestic properties. It owns two solar farms and solar PV installations on 13 community buildings.

The Bristol Energy Cooperative has launched a £2million community share offer to part fund a net zero carbon microgrid at the Water Lilies Development. This is a 33 home self-build housing development and is yet to be built. At the time of writing 70% of the plots have been sold.

Figure 1: Artist's impression of Water Lilies Development with solar PV panels

The residents will get most of their energy from shared on site solar and battery storage via a microgrid across the new housing development. There will be a facility to be able to top up the energy supply from the Distribution Network Operator, DNO, when needed.

References:

https://www.solarpowerportal.co.uk/news/bristol_energy_cooperative_launches_community_share_offer_to_fund_solar_pow#:~:text=Work%20has%20already%20begun%20on,sites%20across%20the%20South%20West.

https://selfbuildportal.org.uk/news/design-your-own-eco-home-at-water-lilies-bristol/

3. Non-UK Community Solar Schemes

3.1 The Aran Islands Energy Co-op

The Aran Islands Co-op covers three islands off the west coast of Ireland with a total of 500 domestic properties. At present approximately 50 houses (10% of the total) have been fitted with air to water

heat pumps and 2kW roof mounted PV solar panels. 100 houses have been fitted with solar hot water heating. Battery storage has been installed on a few buildings.

A wind turbine generator is planned with sufficient output to provide all the needs of the three islands. The aim is to be self-sufficient in locally generated energy from renewable sources and free of dependence on coal, oil and gas by 2022.

Aran Islands Energy Co-op – Aran Islands Energy Co-op

3.2 The Harmon'Yeu Project

Harmon'Yeu is described as a "collective self-consumption project and as the "Harmon'Yeu experiment" on the website. The project was launched in 2018. ENGIE Laborelec began installing solar PV panels and inverters on 5 houses on the island, which is off the French Vendee coast. A communal storage battery is installed in the home of one of the consumers. The project is set to last for two years.

There are 64 solar panels with a total capacity of 23.7 kWp. The power is shared between 23 houses using smart software developed by ENGIE.

The project is described as a first in France, with PV panels installed on detached houses, excess power transported to the storage battery and, if there is a surplus, delivered to other homes using the smart software. In the first 3 months of the experiment 96% of the electricity produced was consumed, meeting 28% of the needs of the households involved.

www.engie.com/en/innovative-energy-community-vendee

3.3 Spain

Spain is recognised as being ideally situated to take advantage of the opportunities provided by solar energy. In 2015 a "sun tax" was introduced which made it less cost effective to install PV solar panels. Legal changes in 2018 and 2019 made it possible for **collective self-consumption** which aims to benefit both households and small businesses. Several consumers can be associated with the same installation of solar panels. They will be allowed to install photovoltaic panels on adjacent buildings that have better orientation, if there is an agreement between the owners of both buildings.

Community energy projects involving solar panels on groups of domestic properties are likely to be developed in Spain in the near future. At present solar PV and battery storage on domestic and commercial buildings is increasing but, as in other countries, the systems are installed either on individual buildings or on groups of properties in new build developments.

https://english.elpais.com/elpais/2019/06/24/inenglish/1561389834_185650.html

3.4 Italy

As of 2015, 2.7% of households in Italy were fitted with roof mounted solar PV. These are small scale residential systems rather than community based projects. They typically had a payback period of 6 years. The adoption of the renewable energy Directive in 2021 is expected to accelerate the adoption of solar communities living in multi-storey apartment buildings.

https://greendealflow.com/after-a-long-stagnation-italy-is-re-launching-solar-pv-installations

3.5 Other countries

Many other countries including China, India and Australia are actively encouraging community solar. From the information readily available on the internet these developments are based around solar PV on individual houses. Where battery storage is installed it is also on individual houses rather than at a central location.

4. Discussion and Conclusions

From the information readily available on the internet there are a number of options currently being developed for community based solar energy schemes:

- Retrofitting solar panels (and in some cases storage batteries) onto existing houses, purchasing in bulk and applying for grants through a community organisation to be cost effective.
- Retrofitting storage batteries onto existing houses with solar PV already installed, again purchasing and applying for grants through a community organisation to be cost effective.
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A system with a central battery storage facility would require some additional infrastructure in the form of cabling between the houses and the central battery storage facility together with smart metering and possibly additional inverters. A simpler system would have battery storage and PV panels installed on individual houses, as in the BWCE Solar Streets Project. This would not require the additional cabling.