

Energise Barnsley - Case Study

Energise Barnsley is the largest local authority and community energy solar PV and battery storage project in the UK. The project, based in Barnsley:

- Installed 1.5MW of rooftop solar installations in 2016 and 2017 across 321 sites;
- Installed 40 domestic batteries in 2018; and
- Plans to install another 50 residential batteries in 2019.

The project is led by Energise Barnsley, a registered community benefit society, with Barnsley Metropolitan Borough Council a key partner and custodian trustee. It has the aim of reducing energy bills and promoting sustainability in vulnerable households. The £2mn project has been funded with an £800,000 retail bond and a £1.2 million loan from ethical lender, Charity Bank. All solar PV installed to date has Feed-in Tariff support.

1. Project overview

Energise Barnsley is the largest local authority and community energy solar PV and battery storage project in the UK. The scheme, set up in partnership with Barnsley Metropolitan Borough Council, includes six interconnected segments to deliver the projects' goals.

- Solar photovoltaic (PV)
- Battery storage
- Demand-side response (DSR)
- Peer-to-peer (P2P) trading
- Asset management
- Community funding

The original project had a capital value of £20 million in order to develop community energy at scale in partnership with the local authority. However, launch day at the Town Hall, coincided with the government FiT review, and the project was reduced to the residential systems which could be installed before the end of the year, and the commercial systems which could be installed within twelve months. The capital value of the project reduced to £2 million.

The initial project meetings started in late 2014 with the intention to deploy as much solar PV across the council portfolio through a community energy solar scheme as grid, rooftop survey and tenant consent would permit. 321 Barnsley council homes have been recipients of these solar PV installations so far, which equals approximately 900kWp of capacity (compared to the initial target of 2MW). Of these installations, more than 75% of homes were bungalows inhabited by elderly individuals, with 25% of all residents on pre-payment meters. Sixteen non-domestic properties such as schools and community buildings have also had installations completed.

40 Moixa batteries have been installed into homes owned by social housing providing Berneslai Homes in the Oxspring neighbourhood. 30 of these properties were already fitted with rooftop solar arrays. The homes are 70% occupied by retired consumers, half of which are living alone. Households are equipped with solar electricity monitors to display when solar panels are generating electricity, and so when the greatest largest savings can be made. Residents are free to select their own energy supplier, though Energise Barnsley has been working with tenants to analyse the savings from the solar and battery to see whether switching to a ToUT would be beneficial.

Energise Barnsley took the concept of a P2P trading platform through the initial stages of the Ofgem Sandbox process but did not proceed to a full trial. The ambition is for the surplus power to be sold at an agreed discount to market rates to those tenants without suitable roofs for solar PV installation. The aim of this is to create greater benefit for both generating households and households in receipt of export spills, which would be able to sell and purchase at more favourable rates than if the energy was exported to the grid.

The trial area could be expanded in the future with additional batteries and solar arrays and replicated across the country. Areas for particular attention will include targets of future flexibility tenders from DNOs, where an additional revenue stream will be available.

While the project initially applied for a regulatory sandbox derogation, it has since rescinded the application, deciding instead to await the outcome of other similar trials.

2. Project partners

- Barnsley Metropolitan Borough Council - project partner and Custodian Trustee
- **Energise Barnsley** - lead partner and registered Community Benefit Society (CBS)
 - Owns solar PV assets
 - Signatory to the solar licence and lease, between Energise Barnsley and the Council. The Council has worked with the Energise Barnsley team to develop protections within the solar licence and lease, to give robust protection for the cash flow over the project lifetime

Solar PV Installation in Barnsley



Source: Energise

- **Centrica/ British Gas** - solar asset installer
 - Solar PV design, installation and ongoing operations and maintenance
 - Performance guarantees and warranties for the solar PV assets
- **Northern Powergrid** - local distribution network owner (DNO)
 - Partner in securing Network Innovation Competition (NIC) funding

- Continuously monitor the levels of voltage and generation at the substation local to the Oxspring battery installations
- Collaboration partner for Energise Barnsley BEIS Domestic Demand Side Response project
- **Moixa** - battery installer
 - Provider of Gridshare flexibility services managed as virtual power plant (VPP)
- **Berneslai Homes** - arm's length Housing Management Housing Association and project partner
 - Recipient of assets
 - Leading tenant engagement
- **Generation Community Ventures (GCV)** - community developer and asset manager
 - Generations Community Ventures (GCV) is the development arm of Gen Community, with the purpose to promote, develop and deliver community owned renewable energy, energy efficiency and heat projects nationally. GCV initiated, developed and delivered Energise Barnsley
 - Energise Barnsley uses Gen Community's "Community Energy Model Rules 2015" registered with the FCA
- **Ignite** - £2mn underwriting facility available to Energise Barnsley
 - Ignite is an impact investment fund with a focus on energy. It invests people and money into emerging and mature organisations that have a clear vision of how they benefit society. It made its largest investment to date by making a £2mn underwriting facility available to Energise Barnsley.

3. Financials

Project costs of £2mn were raised through retail bond of £800,000 and £1.2mn loan from ethical lender Charity Bank. Investors in the five year bond have received three years of interest to date of 5% per annum¹. The bond, dubbed the 'Barnsley Solar Bond', raised the £800,000 target in under three months over the summer of 2016, allowing local residents to invest in the scheme to benefit from the returns. Local ownership in the community bond is in excess of 60%.

The full cost of the storage solutions was funded by local DNO Northern Powergrid through the NIC. Total cost of the project was circa £250,000 to cover the two year lifetime costs of all project participants and hardware. Of the 40 domestic batteries installed, half were 2kWh and half 3kWh units. The energy use reduction at the substation - noted as 30kW by Northern Powergrid - created by the VPP's flexible generation and consumption, enabling connection of the solar generation in a region which would not ordinarily have been able to accommodate the power. This will minimise future expenses in upgrading the network. Of the 40 batteries, 28 were connected to solar PV arrays as only 65% of the solar PV was allowed to connect by the DNO.

Moixa's Gridshare platform uses the batteries to maximise on-site use of solar energy, storing electricity during the peak of the daytime generation and using it to power homes when the solar panels are not generating. The batteries are also used to deliver various grid services, which are remunerated by National Grid.

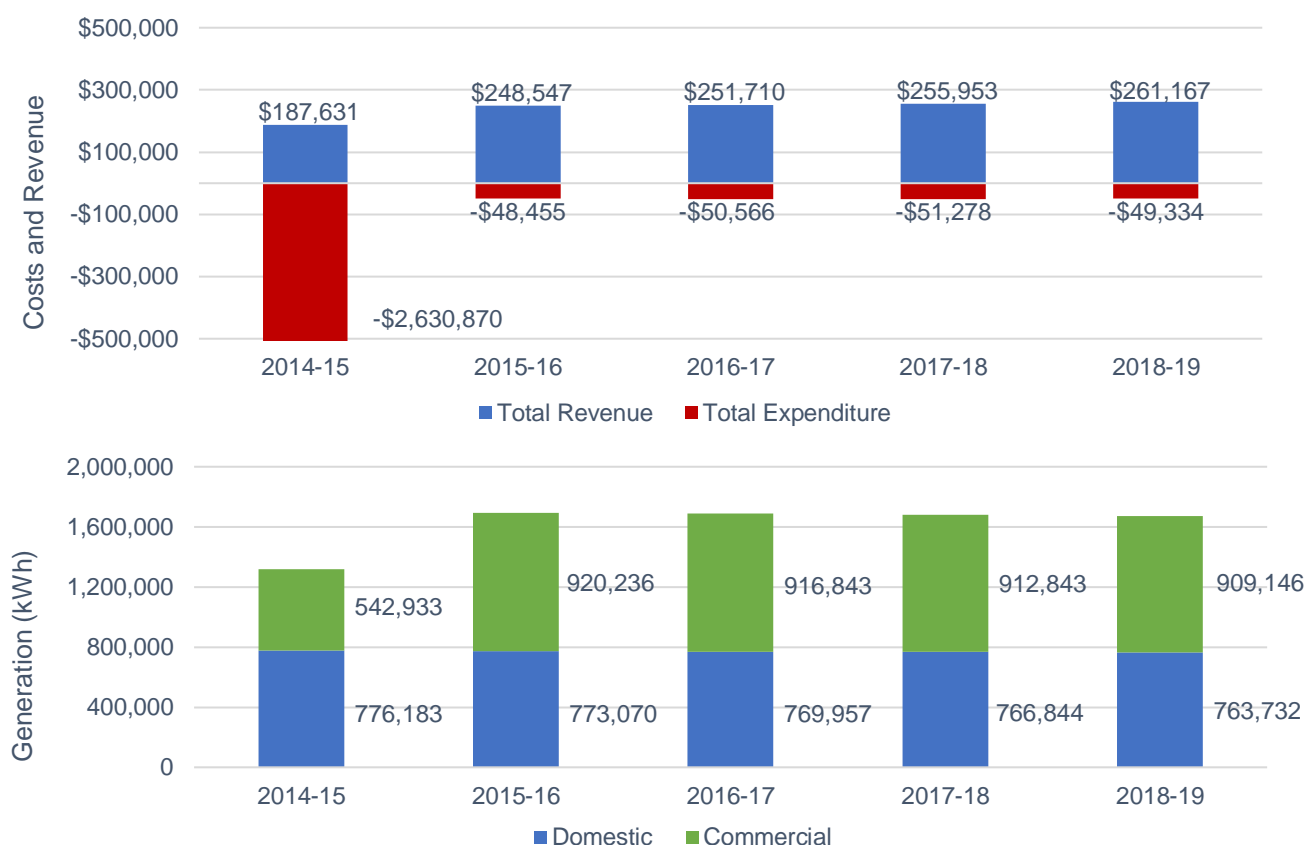
¹ https://www.ethex.org.uk/energise-barnsley_1377.html

The batteries used in this trial project cost approximately £6,250/unit, at the time of installation in January-March 2017, or £2,500/kWh. These costs have fallen considerably to around £1,000 plus VAT and installation for Moixa batteries as of Spring 2019. Other manufacturers have different prices, but costs vary between around £800/kWh for larger units to around £1,200/kWh for smaller ones. These costs are forecast to reduce by as much as another 60% by 2030, improving the economics of similar projects.

Furthermore, Moixa currently offers £50/year payment for using the batteries as part of the VPP. The value and flexibility of VPP is expected to increase, meaning that payments to participants may follow.

In terms of revenue streams, the project has shown a continuing growth in overall earnings, and despite a slight fall in generation levels from 2015-16 to 2018-19 of 1.21% for both residential and commercial arrays, revenue from power generation rose by 5.08% overall (Figure 1). PPA offerings are generating 2.68% higher revenue as well according to the 2018 Directors Report.

Figure 1: Generation, revenue and expenditure per year of the project running time



Source: Ethex

4. Results

Participants in the trial saw energy bills fall around 30% as a result of the installation of solar panel, and 20% more as a result of the battery units. Over £40,000 of savings were made on electricity bills in the project’s first year (2014-15), with more than 800MWh of low-carbon electricity generated during this time.

The Retail Investment Bond is providing 5% returns for investors.

5. Next steps

Energise Barnsley is planning to expand operations through provision of peer-to-peer and demand side response (DSR) activities to provide new commercial models in the face of a subsidy free GB solar market.

The Barnsley Domestic DSR project targets new build properties (Code 4 Sustainable Homes) with already installed dual purpose ASHPs and solar PV, adding a smart battery supplied by Sonnen and a smart control system to generate analytical household energy demand data. The project chose Sonnen for its established heat pump credentials in the German market.

A second set of households, built to post war standards, have been retrofitted with dual-purpose ASHPs and will provide an additional subset of analytical data to test the DSR model. This will in turn form the basis of a DSR commercial model engaging Norther Powergrid and Oxford Brookes.

Over 600 ASHPs have been installed in domestic dwellings, replacing gas boilers, through the tenant management company Berneslai Homes.

Energise Barnsley is also exploring a new business model to make use of the old mining assets within it's community. Low carbon generated high yield hydroponic farming is at a point of raising at risk seed investment.

6. Replicability

The society's main income is generated through the Feed in Tariff (FiT), which is a UK government legislated mechanism which awards a guaranteed unit price for electricity generated and exported from FIT-registered renewable energy generators. Additional income is generated through selling electricity from larger solar assets to Barnsley Council through a power purchase agreement (PPA).

With the closure of the FiT scheme on 31 March 2019 to new installations, a significant portion of the income which is generated from a project like Energise Barnsley is no longer available, unless an asset had accredited or pre-accredited before the deadline. If this project were to be replicated, there would be two key hinderances: no payment of subsidies, and no guaranteed route to market for exported power. The latter problem may be solved when the new Smart Energy Guarantee (SEG) is in place to provide a guaranteed route to export revenue.

BEIS is still consulting on the SEG and therefore it is difficult to foresee the exact requirements and conditions of the tariff. However draft licence conditions issued for consultation in Spring 2019 suggest the SEG will be a mandated route to market for small scale generators (i.e. suppliers over a certain size will have to offer a price for the power). The only limitation on price at this point is that it must be in excess of 0p/kWh.

Regardless, some energy suppliers are offering commercial trials for small scale export tariffs. Octopus Energy, Bulb and E.ON² have all offered prices at or slightly above the final export tariff for FiT installations as a fixed price tariff. Some suppliers also offered flexible options, with prices determined by wholesale power prices.

² Note that these are not SEG tariffs, as the SEG is not yet in place; these are simply post-FiT export tariffs being offered on a commercial basis

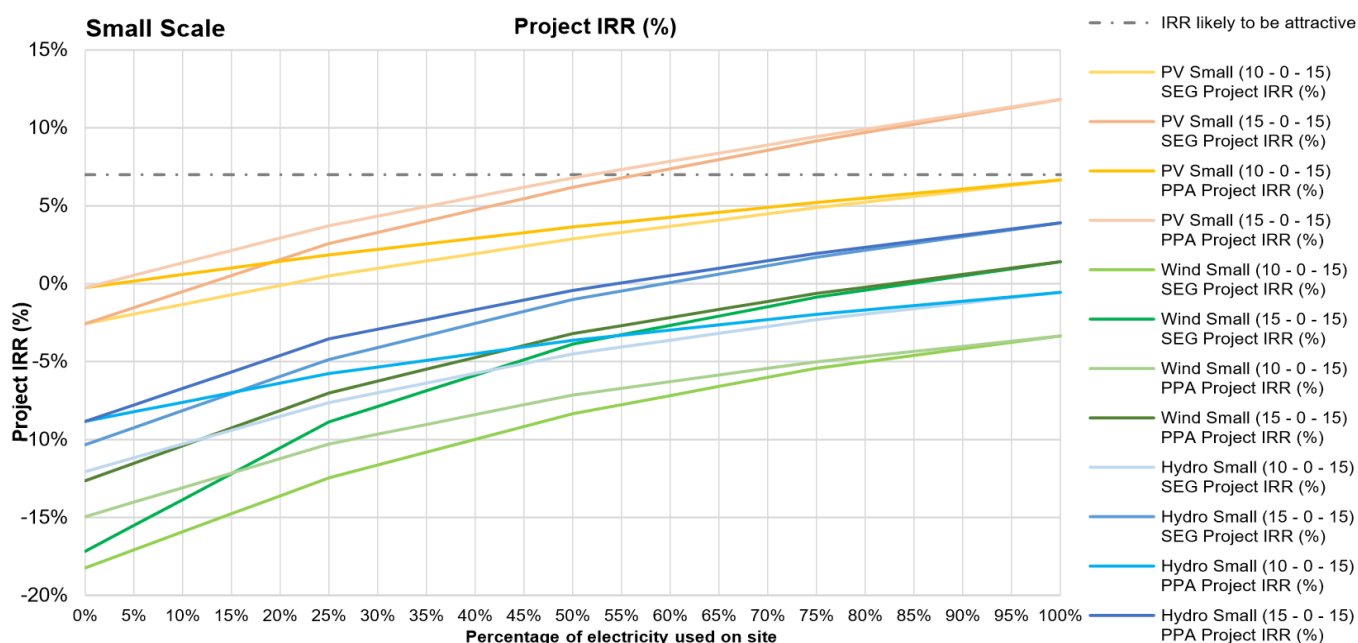
Recent analysis by CARES³ illustrates that the feasibility of small-scale projects relies heavily on the utilisation of generated energy on site by offsetting the retail price. In the model, small scale scenarios are set with either a 10p/kWh or 15p/kWh tariff representative of whether or not the generator owner and bill payer are the same. The economic potential for investment with a suitable IRR starts at approximately 55% on-site usage, where it breaches the 7% IRR threshold as shown in Figure 2. However, this requires the higher base scenario tariff of 15p/kWh.

This concept is also explored further in the local energy guide.

As solar generation technology costs continue to fall and retail tariffs rise, the business case for behind the meter solar (combined with or without battery storage) is expected to improve.

The value of any power exported to the grid will be subject to market uncertainty. Electricity prices in the peak solar generation period may continue to fall due to the cannibalisation effect as more solar comes on the system, creating a generation surplus at peak times. As the SEG is in the early stages of formation, the business case for small-scale solar assets is unclear.

Figure 2: Internal Rate of Return for small scale projects with different site usage



Source: CARES

7. Key learnings

The key learnings from this project were as follows:

- Developing past the original Energise Barnsley model will require focus on DSR and flexibility provision, as well as ongoing subsidy from the Renewable Heat Incentive (RHI) to develop a commercial model post-FiT
- Solar with connected batteries provided the best value for household compared to solar or batteries alone. This value was enhanced substantially if self-consumption was prioritised with levels of 85% or higher

³ CARES Project Viability Modelling: Post Feed in Tariff (2018) - <https://www.localenergy.scot/media/110533/local-energy-scotland-guide-post-fit-viability-modelling.pdf>

- Encouraging self-consumption among households was challenging, requiring appropriate communication and assistance
- Possible reassessment of a tenant liaison program needed
- The duration of the project is key, allowing enough time to engage parties early and secure their interest in the project
- Overcoming the psychological influences of installing renewable technologies need to be considered. Newly installed solar PV reduces tenant bills, which strongly motivates existing tenants to support the project. New tenants do not recognise the benefit (their status quo includes the reductions from the solar panels) and therefore are typically more ambivalent to the project
 - Improving the relationship and communication with tenants will help to counter this in future projects.