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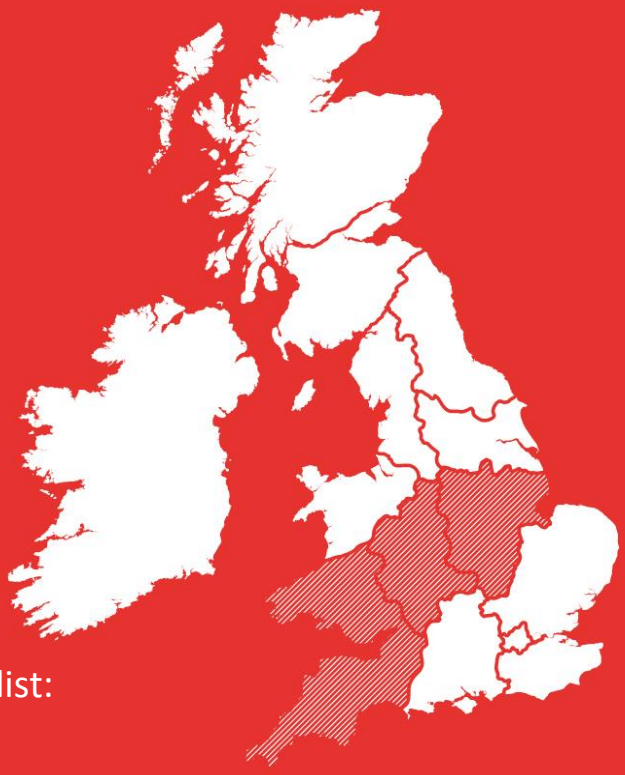
OPEN LV

OPENING UP THE SMART GRID



Community Learning Specialist:
Deliverable 6

Method 2 - Mid-trial Report 3

ea technology

RIIO NIC NETWORK INNOVATION COMPETITION

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Contents

1. Executive summary

1.1 Background

The OpenLV project is trialling an open, flexible software platform called LV-CAP™, which could be deployed in every low voltage (LV) substation in Great Britain. The aim of the trial is to demonstrate the platform's ability to provide benefits to the network, customers, commercial entities and research organisations, and to understand the revenue or savings that they could access by using local electricity substation data.

This report is part of Work Package 'Method 2 – Community Engagement', which in intended to demonstrate the value of providing LV network data and an 'open platform' to communities, housing associations and local authorities who want to know more about local electricity and develop innovation ideas within a smarter grid. Trials are ongoing in seven communities using the OpenLV platforms to provide information and data to their community, in order to better understand their electricity use (and generation) or balance local demand and generation. Alongside the installation of the OpenLV platform in the substation, each of the communities has been given access to the Method 2 Application (App), which has been developed by the Centre for Sustainable Energy (CSE), to allow them to view and analyse the data being provided.

Regen's objective, as the Community Learning Specialist, is to:

- Provide an assessment of the value and benefits of each community project and assess the replicability of community projects using the OpenLV technology and data.

- Review the learning generated by the community engagement and trial process in order to produce a guidebook, so that other communities can start their own Community Project and develop/use an app to access data from the OpenLV platform.

This report is the final of three mid-trial reports for the OpenLV Method 2 community projects. The aim of these reports is to monitor and report on learning from the Method 2 progress during the trial period.

Through the three mid-trial reports Regen has been exploring the key areas of the project that can provide learning for future innovation trials involving community groups or increase the replicability of future community projects using local substation data.

- The Mid-trial 1 report focused on the initial project progress, as well as providing an overview of community attributes and the technology relevant to replicating trials with other communities.

- The Mid-trial 2 report provided an evaluation of learning from the projects and the interim outputs up to the end of April. It looked in depth at the CSE App development process and use of the Method 2 App for the communities, along with a review of the anticipated project outcomes and evaluation approach for each community.

- The Mid-trial 3 report **(this report)** is reporting on project progress from May to July 2019 and use of the App focusing on engagement in the communities and collating

lessons from how projects have communicated App and OpenLV substation information to households and individuals within the community.

Delivery timescales for these mid-trial reports are presented in Figure 1.

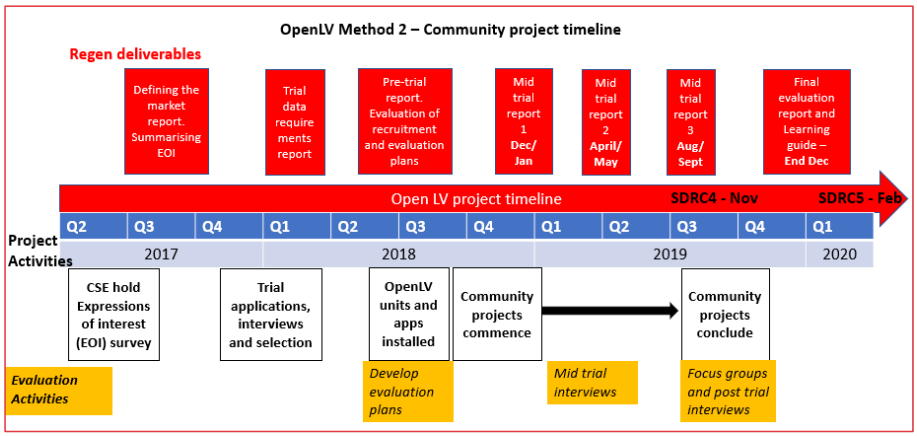


Figure 1: Project timetable and Regen activities

The projects are concluding in September 2019 and CSE and Regen are conducting final interviews. Following this, Regen will be developing the final value and benefit assessment and learning guide for communities.

1.2 Summary of progress

Most of the community projects have continued to make good progress towards their project outcomes, however three projects have reported little progress within the last three months. The issues raised by those projects relate to the difficulty of raising grant finance to fund community group activities and the loss of key community project personnel and leadership. This twin problem of access to funds and having the resource and capability in place to carry-on project activities is a common theme across the community energy sector.

Summaries of each community's progress is provided below.

- **Tamar Energy Community** (Tamar) are continuing to work on developing their own web application to present the OpenLV information to the local community but have reported delays due to their volunteer software engineer having other engagements. They are currently running an online householders' survey to understand how they can better engage residents in local energy and OpenLV. The group plans to carry out a more focused engagement with residents who have expressed interest in the project, across August and September 2019.

- **Bath & West Community Energy** (Bath & West) have completed the first of their demand reduction campaign months, 'Turn Down the Juice in June', which aimed to encourage residents to turn down their electricity demand or shift usage to off-peak periods where possible during June. They plan to measure the impact of this behaviour change on the substation. They have reported that they anticipate the

impact to be more profound when householders have batteries installed, but the project has been delayed due to battery supplier Moixa being unable to install batteries until September. The analysis of the impact of the batteries on the substation may occur after the official close of the OpenLV project.

- **Marshfield** have been discussing how best to use the OpenLV data to feed into the development of a local energy strategy, including understanding local network constraints and headroom of the local substations. CSE will analyse a full year of data in August and feed back to the group in September. The group are still deciding how best to share information and present options back to the community, and how to turn recommendations into projects that can be realised in future. They are hoping to link it with a new 'Sustainable Marshfield' community initiative that has started by in tandem to this project.

- **Owen Square Community Energy** (Owen Square) have engaged with the project sporadically since April. To make use of the data in the way that was originally envisaged, they need to secure grant funding for a community heat project, which they have yet to do.

- **Exeter Community Energy** (Exeter) have been unable to secure funding to finalise a mobile app to use OpenLV data leading to a reduction in Exeter's engagement with the project and use of CSE App. However, the project featured at the group's AGM in July, where board members expressed interest in OpenLV. The group does not currently have the personnel in place to take the project forward.

- **Rooftop Housing Association** (Rooftop) have, for reasons identified in Mid trial 2, made limited progress since April 2019. Although the App and graphs have been accessed by the project manager and infomation displayed in their local offices, further community engagement activities have been impacted by the departure of their community energy champion who was supporting project delivery.

- **WHG group** - it was confirmed that the WHG group have left the project after the second mid-trial report and been replaced by Yealm Community Energy.

- **Yealm Community Energy** (Yealm), have started engagement with a stall at the local county show, displaying graphs from the App to the community to raise awareness of the project, and offering home energy data loggers to residents to link home energy use with substation activity and local generation.

1.3 Key lessons from community engagement activity

Section 3 of this report provides a summary of the lessons that have been identified by community groups who have used the OpenLV substation data to engage with residents about energy usage and related projects. The information in Section 3 comes from those groups where community engagement formed a large part of their project objectives. The most active communities were Tamar and Bath & West, but information also came from Yealm, Exeter and Rooftop.

Each community has developed their own messaging around OpenLV in order to make it most relevant to their organisation and local communities. However, all follow a similar theme for communications which concern individuals taking action or control over their energy or electricity use for the benefit of themselves, their communities, the local economy and the climate.

It is notable that each project has chosen to carry out several different types of engagement activity in the delivery of their projects in order to reach different stakeholder audiences.

The projects reported the following learnings:

- Maintaining momentum is important but can be challenging when dealing with delays in getting technology installed. This was reported by Bath & West following their campaign month which was less successful than they had hoped due to battery installation setbacks.

- It is useful to create a recognisable brand as part of the messaging as it made the topic more memorable for school children who then used the messaging to alert parents. This was reported by Tamar who identified school engagement to be a useful precursor to connecting with the wider community.

- It is effective to use local energy champions to spread messaging about the project within the local communities. This was reported by Tamar who acknowledge this would have helped their project maintain momentum from the start.

- The Exeter focus group indicated that users would have very high expectations of a smart phone application using OpenLV data. A community or volunteer-led organisation is likely to find it difficult to raise the budget or have the capacity to develop and maintain these applications.

A final lesson is that although community engagement using the OpenLV data has been widely viewed as very valuable, it will be difficult to prove that there has been a measurable impact on attitudes and behaviours of those individuals engaged in various activities by the community groups. This is partly due to the relatively short timescale of the community projects and delays to other supporting initiatives like such as domestic batteries.

1.4 Methodology for data and information collection

The data and information for this report was collected via several methods. These are detailed in the bullets below, along with a note about when the information was collected.

- The majority of the information for the report was collected through CSE's regular reports about community project progress. The information has been taken from the reports received on 19.06.2019 and 30.07.2019.

- This report covers the project progress made in the three months between the 01.05.2019 and 31.07.2019

- Information about App usage by the communities was accessed by Regen from the App monitoring software on 31.07.2019.

- In order to get information about community engagement processes within the communities, CSE asked the following questions to each group about engaging communities on OpenLV.
  - What messaging did you use to try and interest communities in OpenLV and why? Can we see an example?
  - What format of data presentation did you go with (if any?) – Can we see an example?
  - What was the reaction to the information? Specific or general - Were they interested, not interested. What thoughts did it tend to prompt within communities?
  - Was there any particular type of person or household who responded or didn't? Any lessons we could take from that about how best to engage with this information?
- No communities responded to the email request for information from CSE, therefore Regen supplemented existing information about community progress and engagement by contacting the communities directly. Exeter and Tamar had separate conversations with Regen during July 2019.

2. Review of CSE App development since April 2019

In the first few months after the CSE App was launched in December 2018, seven updated versions of the App were released which incorporated additional functionality that had been requested by the groups.

Since the second mid-trial report in April 2019, no new versions of the App have been issued although there has been on-going work to improve functionality and also to address issues with data access including some problems with the Lucy server[1] and two instances where the physical units located in substations need to be re-started. This indicates that the App is now working to the requirements of the communities and is supporting the needs of the projects.

In addition, EA Technology and Western Power Distribution have also agreed additional budget to go to CSE App development for the development of two additional features which will (1) improve solar generation forecasting by using real local generation data to make an adjusted forecast, and (2) show the Agile Octopus tariff which is a time of use electricity tariff based on real time electricity markets.

FOCUS: The cost of integrating Yealm into the CSE App

The integration of the Yealm substation into the CSE App took 5 hours of CSE development time. **This suggests that the indicative cost for integrating new substations into the App is around £400.** To note that this does not include the costs from EA Technology and WPD that may be incurred in assessing the substation, installing the LV-CAP unit and deploying the CSE App software.

CSE are planning to integrate both a solar farm API, and household monitor data into the App for Yealm. Integrating these new data streams is expected to take around six days in total (three days for each data stream). This suggests integrating Yealm's additional requested data sources will cost a further £3,500.

Therefore, the total cost to integrate Yealm and the data for their project is expected to be £3,900. Although costs will vary depending on the project, the Yealm project provides a useful benchmark for incorporating an additional community energy group into the App.

A full cost, benefit and value analysis will be conducted at the end of the project to understand what the OpenLV data and CSE App can offer to communities.

CSE is continuing to further develop the App's interface to incorporate information about the communities' low-carbon energy assets for Bath and West and Yealm. Both communities have had delays to their projects that have delayed the development of the App. Bath and West have been delayed by the late installation of low-carbon technologies and Yealm have had difficulties with data sharing agreements.

- **Bath & West** plan to integrate data from the Moixa batteries installed in local homes into the App. The project has been delayed as they await the installation of the Moixa batteries to be able to integrate battery storage data into the App. Battery installations are expected to be completed in September. Ahead of this installation

[1] The Lucy server collects and stores data coming out of the OpenLV unit

Moixa have agreed to send over test data to help CSE's software development. It was confirmed at the end of July this has now been sent to CSE.

- **Yealm** are planning to integrate generation data from a solar farm, owned by Solar Century and InAccess, and household data into the web platform. The community have requested the solar farm's historical generation data from the owners, but they have not yet responded to the data sharing request.

Learning:

- The resource needed to update and amend the App at the beginning of the project was significant in terms of days and cost, as reported in Mid trial 2, but as the project has progressed, enhancement requests from communities have become less frequent. Sufficient resource needs to be provided at the start of the project, but this requirement will reduce over time.
- Historical data from community-owned renewable generation assets may be held by third parties and private companies rather than the communities themselves. Where this is needed to make the best use of the OpenLV data, consideration needs to be given to delays in accessing this information as a result of processes within these third parties.

3. Learnings from Community Engagement

The OpenLV data provides information on electricity usage and local network infrastructure that is directly relevant to communities. Traditionally much of the information that communities or individuals can access is either household level through monitoring or general information that is correct at a national level. For example, 'typical peak times' or carbon intensity of grid electricity. Several of the method 2 communities have been using their community specific information to engage householders local to the substations in conversations about energy and electricity use. This section outlines learnings from where the projects have been working with individuals in the local communities to interest them in the OpenLV project and data.

Several Method 2 community projects have used the CSE App as a tool to facilitate discussions with local people about their energy behaviour, local electricity generation and how much electricity they use individually and as a community. The projects have hoped to encourage people to give more consideration to their individual and collective energy use, as well as explore the various links between electricity usage, carbon, climate change, local renewable generation, energy efficiency, fuel poverty and the local economy.

None of the projects explicitly focused on the message about peak energy use and associated network impacts or local network costs. This is likely to be due to the relative complexity of the messaging and lack of direct consumer costs associated with DUOS.

Examples of how communities have used OpenLV data for local engagement have included:

- **Tamar,** who presented OpenLV data in Eco Clubs at the local school to teach schoolchildren about energy and the link between the electricity they use at home and climate change. Tamar also used the OpenLV data when door-knocking in the community to engage people in conversations around local generation, their energy bills and decarbonisation.
- **Yealm**, who plan to install energy data loggers in people's homes and use OpenLV data to show the link between domestic energy use, substation activity and electricity generation at a local solar farm (Newton Ferrers).
- **Bath & West** are using OpenLV in their Solar Streets project, as part of their offering to households where they are installing domestic PV and battery systems. They have also been using the data as part of their demand reduction campaign months (June and October 2019) where they are encouraging residents to be more energy efficient and 'turn down' their demand where possible, with the aim of measuring the impact on the substation.
- **Rooftop** had hoped to speak to housing association residents about energy use and encourage energy efficiency. They held a community event early in the project to raise awareness of local energy issues.
- **Exeter** were planning to develop a smart phone app for Exeter residents to measure their individual electricity use relative to others in the local community. Users could then enter a competition to score points for energy saving activities.

3.1 Messaging used by communities

Each community has developed their own messaging around OpenLV in order to make it most relevant to their organisation and local communities. However, all have followed a similar theme concerning individuals taking action or better controlling their energy use for the benefit of themselves, their communities, the local economy and the climate.

Examples from the projects are explored below.

3.1.1 Tamar

Tamar was the only group to set up a dedicated workstream with its own branding, 'The Power in Your Hands' to promote the OpenLV project locally.

The messaging used in Tamar's project has been focused on understanding how the electricity system is changing and what this means for consumers: *"The Power in Your Hands is a ground-breaking project looking at how energy networks could be managed better in the future.*

"We all have the opportunity to make a difference to our energy network… you could help shape it for the future."

Figure 2: Picture from Tamar website showing 'Power in Your Hands' branding

3.1.2 Bath & West

Bath & West's OpenLV project was integrated into an existing 'solar streets' initiative, where OpenLV helped them promote and enhance their solar and battery offer to local residents.

OpenLV was also featured in their newsletter during a demand reduction campaign month, 'Turn Down the Juice in June'. This messaging focused on taking action specifically about climate change with a secondary message on cost saving.

"Electricity demand at peak times is often met by ramping up the use of the most carbon intensive and expensive fuels. Therefore, shifting away from peak demand can:

- *Help to combat climate change.*
- *Reduce costs. Currently consumers do not bear the peak costs but in future we are likely to see the increase in time-of-use tariffs which will charge you more for peak electricity.*

Figure 3: Bath & West's April 2019 Solar Streets newsletter

3.1.3 Rooftop

Rooftop are working to improve the Bishop's Cleve estate and so intended to use OpenLV data as part of their broader regeneration programme. They held an event in July 2018 where they explained the OpenLV project and why they were participating. The event aimed to raise awareness of electricity use more generally and was linked to Rooftop's wider regeneration objectives.

The flyer for the event is show in Figure 4 and states the goal of *'helping improve your neighbourhoods energy habits'* and to '*find out more about the community's energy use*'.

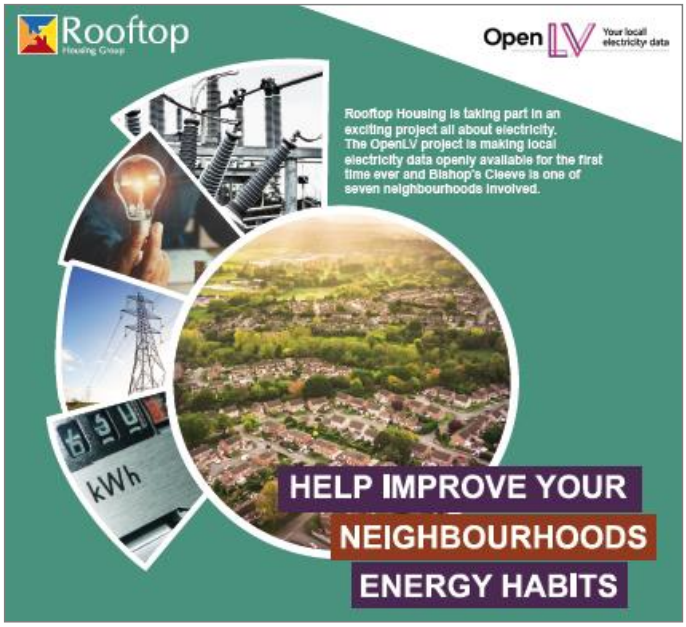


Figure 4: Detail from Rooftop's event flyer

3.1.4 Yealm

Yealm's engagement has focused on introducing local residents to the OpenLV project, explain what the data shows and why it's important.

As part of their engagement they are offering home energy loggers which they intend will supplement substation data with domestic energy use information. The messaging is shown in Figure 5 and highlights how the programme is being sold as being part of a *'research project'* through which hope to explore how household behaviour change might help the balancing between local electricity generation and usage, with OpenLV data helping inform WPD how to better manage the network by understanding how substations are performing.

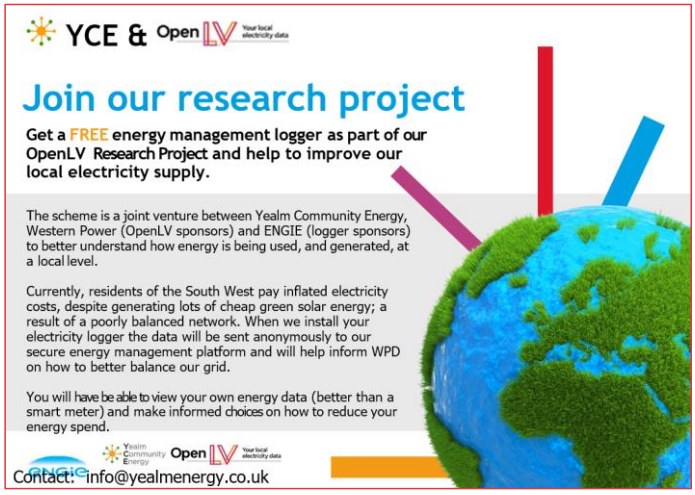


Figure 5: Yealm's flyer promoting OpenLV and energy loggers for residents

3.1.5 Exeter

Exeter had hoped to develop a mobile phone app to display OpenLV data and encouraged competition between users to win the most points for their energy or carbon saving actions. The focus of the engagement was on individual actions. However, the feedback from the attendees also noted that having competitions between individual households was unhelpful but they would support collective rewards for communities who were acting together.

Unfortunately, they were unable to deliver this due to failing to secure funding for a developer to finalise initial work on the app.

As reported in the second mid trial report, the community feedback on the prototype app was positive but highlighted that individuals now have have high expectations of what a smart phone app on local energy would be able to deliver.

To meet the focus group expectations for the functions of a smart phone application (which included real time information, personal and comparative data, sophisticated push notifications and building online communities) would require significant upfront investment and ongoing budget for support and maintenance. It would likely be beyond the ability of an individual community group to raise the money for or manage a project of this scale. However, a local energy application could provide a significant opportunity for a commercial actor, either supplier or network operator. A recent trial by Northern Power Grid[2] suggests that gamification was relatively successful in mobilising a customer response.

Figure 6 shows screenshots from the prototype app, which they displayed at a community focus group in March.

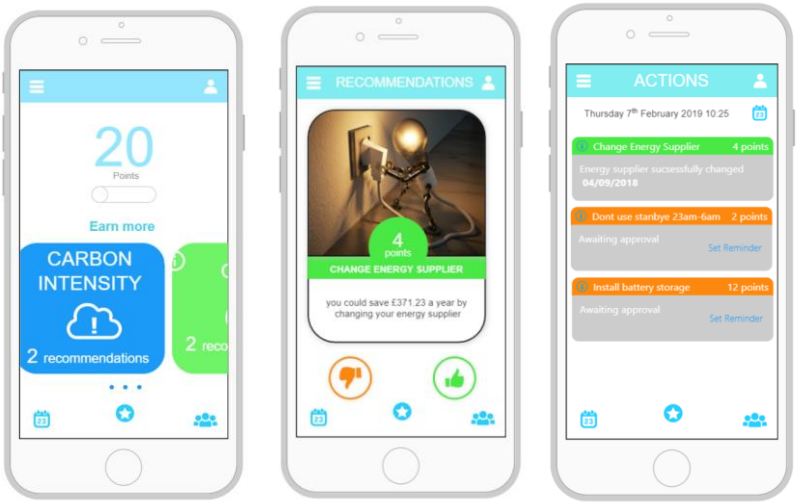


Figure 6: Screenshots from Exeter's prototype phone app

[2] https://www.npg-ace.com/

3.2 Processes to engage communities

The community projects used a variety of different engagement techniques to reach as many people as possible in their community. Methods used included websites, newsletters, emails, door knocking and events etc.

The most active communities were asked what lessons they had learnt and what might be useful for other communities who may attempt to replicate their activities. Responses included the below:

- **It is useful to have or create a recognisable brand or presence in the community.** This was reported by groups such as Bath & West, who identified their familiarity in the community as benefiting their engagement, and Tamar who began engagement with schoolchildren and identified this as a key relationship builder with the wider community.
- **Get early adopters/energy enthusiasts engaged early in the process** and use them to engage others. Tamar reported that they would advise a group starting the project to do this as it is challenging to maintain momentum using project leaders alone.
- **Conduct a variety of different events and activities to capture a larger audience**, build interest and maintain momentum. For example, groups have done:
    - Door knocking of local households by knowledgeable volunteers. Tamar reported this meant you could raise awareness and help people understand how the data was relevant to them.
    - Engaging through existing clubs or organisations (e.g. schools)
    - Providing information flyers for households
    - Having a presence or stand at local community events
    - Conducting surveys to gather information on energy understanding and use.

Additional lessons from the experience of particular communities included:

- **Keeping up momentum is important.** Bath & West's Solar Streets has been impacted by delays outside of their control. They have reported that motivation to get involved with their project amongst residents has reduced because of this. A further lesson from the project would be about risk management and mitigating against dependencies on external suppliers.

- **A school provides a useful point for engagement.** Tamar used their school Eco Clubs to introduce children to various concepts around energy, such as the link between the electricity you use in your house and climate change, and what solar panels on the school roof are for. They encouraged schoolchildren to go home and have conversations with their family about energy use, which built trust and familiarity of the group amongst the local community.

- **Locally relevant information in the App makes energy more interesting to people and facilitates new conversations**. After presenting graphs at the Yealmpton Show, Yealm reported that several people were interested enough to understand the concept and have discussions about how it could be useful for developing domestic demand side response platforms in the future, particularly with EVs.

3.3 Proving engagement has an impact

At the end of the OpenLV project in September/October 2019 CSE and Regen will be working with the groups to understand the outcomes they have achieved. However, based on feedback from the communities, it is now thought unlikely that any of the communities will be able to prove a quantitative or measurable impact on changed attitudes or actions within the timeframe of their projects. The final report will therefore look to quantify this impact instead using existing research that shows higher engagement in energy actions and messaging if it is delivered through community groups and trusted intermediaries[3].

Five of the seven communities had originally aimed to measure the impact of their engagement directly. The methodology for these measures were identified through the project monitoring sheets completed at the start of the project.

However, many of the communities have reported issues in collecting data about the impact of their engagement. Some communities reported that they expect impacts to become apparent outside the relatively short time frame of the OpenLV project, such as with Tamar's Eco Clubs. In other communities, engagement has been conducted on an ad-hoc basis when groups can find the time or there is a relevant community-wide event, meaning that impacts will be difficult to measure quantitatively.

The planned methodology and related issues have been outlined below. In order to get an understanding of the impacts of the projects, CSE and Regen will be holding structured interviews with each project team along with focus groups. These will enable OpenLV to gain a qualitative understanding of perceived impacts from those involved.

1. **Understanding change in attitude or understanding through surveys before and after engagement processes.**
   - Issue: Communities had low responses to surveys and responses tended to be from more engaged individuals which meant they already had relatively high awareness. For example, Bath & West had only nine complete responses to their survey.

2. **Measuring direct impact of actions on substations by communities as a result of engagement**
   - Issue: Most substations have a diverse range of users, meaning that impacts will be difficult to measure unless a large number of households under one substation participated.
   - Issue: Bath & West who may have been able to gauge a substation impact through their battery and solar installations unfortunately faced project delays which meant the turn down event is likely to be held after the end of the project.

3. **Measuring impact on household electricity use or bills as a result of actions taken following engagement.**
   - Issue: Currently time-of-use-tariffs and smart meters are not universal and therefore time shifting behaviours are not at present remunerated in bills or by network companies.

[3] https://www.ssen.co.uk/save/
https://www.npg-ace.com/

4. Method 2 project progress

4.1 Bath & West mid-trial interview and evaluation

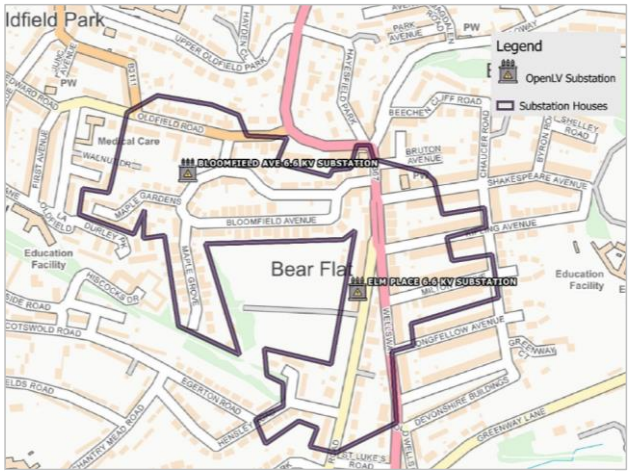


Figure 6: Bath & West OpenLV trial area

Bath & West Community Energy
Generating local energy

Bath & West Community Energy (BWCE) is one of the leading community energy groups in the UK.

They have installed over 20 MW of solar PV projects since their formation in 2010. They currently own 12.35 MW of their own PV capacity.

Over the next 3-4 years, BWCE aim to increase community renewables capacity, raise their local profile and develop innovative approaches to local energy markets, which has included launching a local energy supply tariff with Our Power.

The BWCE team consists of five non-executive directors, two executive directors, two co-opted directors, two employees, 16 volunteers and 650 members.

4.1.1 Summary of project

Bath & West are using OpenLV data as part of their Solar Streets project and were aiming to measure the impact of domestic PV and battery installations on the local substation and build a business case for further installations. They are running two demand reduction and shifting campaign months during the project, in June and October 2019. They first used OpenLV data and home energy monitors to engage residents and measure the impact of energy behaviour change on the local substation through the App and an online survey.

4.1.2 Progress since April 2019

PV and battery installations

The project has faced delays in the installations of PV and battery systems for houses in the substation area. Since April, four more PV systems have been installed meaning the community has nine PV installations in total as of July 2019, with four 4 kWh batteries installed. Unfortunately, one battery was faulty and had to be taken out. They aim to get this one replaced soon and still have 14 battery installations remaining.

Bath & West have reported that reasons for the continued setbacks with the installations include access to scaffolding, faulty inverters, faulty batteries and Moixa (the battery suppliers) being unable to respond quickly to issues.

Demand reduction month

Bath & West ran the first of their two demand reduction campaign months in June as part of their Solar Streets project, 'Turn Down the Juice in June'. The aim was to encourage residents

to either 'turn down' their electricity demand or shift it away from peak evening hours to off-peak times. The campaign involved distributing newsletters around the community to raise awareness, along with BWCE members door-knocking to get people involved and setting up an online energy behaviour survey, which got nine responses. They also hosted two drop-in sessions at the local pub to answer questions and provide home energy monitors to residents who wanted to participate. This had some uptake, but less than the group had anticipated.

In their newsletter for their demand reduction campaign month, Bath & West developed messaging around cost saving and climate change to encourage people to participate:

"Electricity demand at peak times is often met by ramping up the use of the most carbon intensive and expensive fuels. Therefore, shifting away from peak demand can:

• Help to combat climate change.

• Reduce costs. Currently consumers do not bear the peak costs but in future we are likely to see the increase in time-of-use tariffs which will charge you more for peak electricity.

In addition, there is the possibility that communities might benefit in future by helping the energy industry better manage supply and demand. But we need to prove this can work first."

The June campaign was a dry run for a larger demand reduction campaign Bath & West are planning to run in October.

However, with continuing delays in installations, Bath & West reported that motivation amongst local people has reduced, making it difficult to engage people in the behaviour change campaign. Their online survey had nine complete responses and while several of the more engaged residents took them up on the offer of home energy monitors, it was less than anticipated.

Learning:

As Bath & West's Solar Streets project continued to be impacted by delays outside of their control. They reported that motivation to get involved with their project amongst residents went down, which made it hard to engage people in the behaviour change campaign.

This shows that however active a community energy group is, having the equipment or information available to households in a timely manner is crucial in maintaining momentum.

4.1.3 Future plans

Bath & West's strategy is now focused on getting all PV and battery installations finalised and run the behaviour change campaign fully in October. The OpenLV app is also still being used in engagement activities.

The group plan to keep using the data until the end of the project to monitor the impact of new domestic PV and battery systems in the community and aim to build the business case for further installations.

4.1.4 Use of the App to date

Bath & West have been using the App for their behaviour change campaigns to engage their community in local energy issues and explain the benefits of demand shifting. They plan to measure substation activity prior to and after PV and battery installations using the App.

They now have one alert configured on the App and increased the number of graphs configured to 16 from 12 since April. However, the number of hits to the App has reduced significantly with only 34 hits in July 2019 compared to over 800 in March.

	December	January	February	March	April	May	June	July	Total Hits
App hits	25	2,702	2,929	807	63	366	144	34	**7,070**
Graphs configured		3			12			16	

Figure 7: Bath and West's monthly use of the CSE App and graphs

Figure 8 and Figure 9 show typical midweek days of energy use, pre-PV and battery installations and behaviour change campaigns.

Figure 11 shows a midweek day during the June demand reduction and shifting campaign, while Figure 12, shows a typical midweek day of energy use, taken from the OpenLV app.

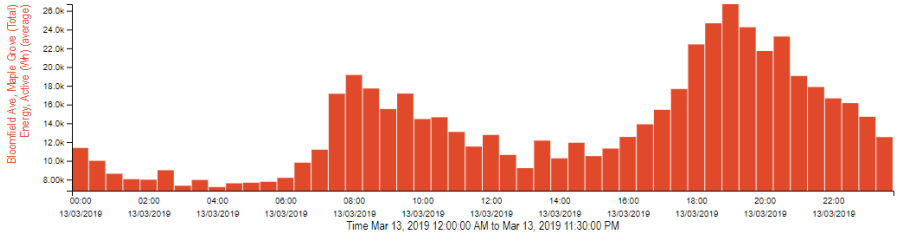


Figure 9: Energy use, Wednesday 13 March 2019

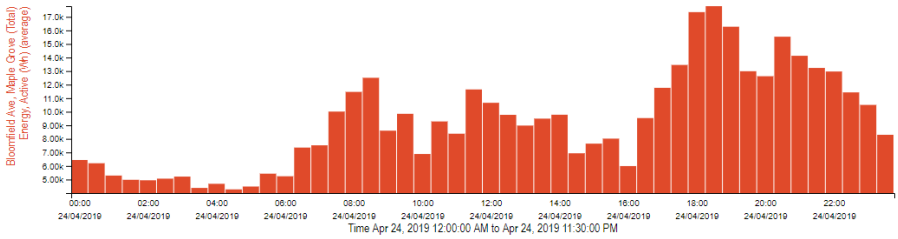


Figure 10: Energy use, Wednesday 24 April 2019

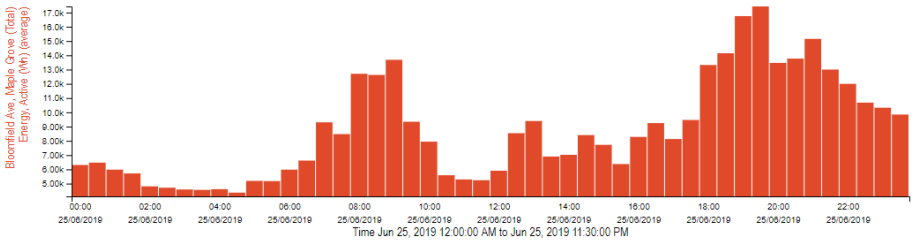


Figure 11: Energy use, Tuesday 25 June 2019

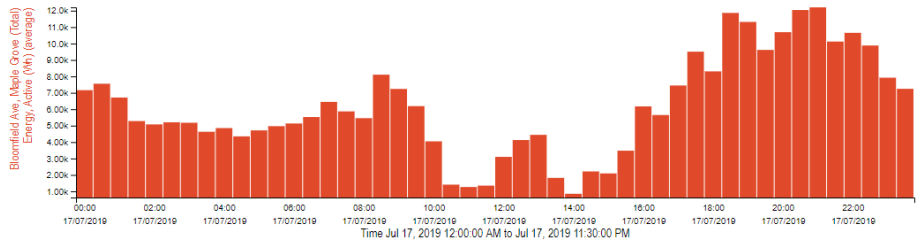


Figure 12: Energy use, Wednesday 17 July 2019

4.2 Tamar mid-trial interview and evaluation

Figure 13: Tamar's OpenLV trial area in Tavistock, Devon

Tamar Energy Community

The Power in Your Hands

Tamar Energy Community (TEC) is a community energy group based in Tavistock, Devon, formed in 2014. As a community-run social enterprise, they provide free and impartial energy advice and support to people in West Devon and South East Cornwall.

Their mission is to localise energy, keep the money spent on energy in their local economy and help vulnerable people in fuel poverty. As part of this mission, TEC installed 265 kW of solar PV on rooftops in their community in 2016, with their team of 13 active volunteers.

4.2.1 Summary of project

Tamar have been using OpenLV data as part of its 'The Power in Your Hands' project to engage their community in energy issues and influence local energy behaviour. This has been done through after school 'Eco Clubs' in the local junior school, St Peters, to teach school children about energy concepts such as carbon emissions and energy efficiency. Lessons have been supported by graphs showing local substation data, which have also been embedded into the Tamar Energy Community website. Eco Clubs ran once a week over the course of a term for groups of 7-10 year olds.

4.2.2 Progress since April 2019

Community engagement

Tamar had already completed their programme of Eco Clubs delivered to schoolchildren, so have been starting on the next phase of their community engagement.

They set up an online householders' survey to understand what messaging they can use and relate substation data to local households. Tamar's aim with 'The Power in Your Hands' project is to help people understand time-of-use tariffs, distributed energy resources and what they can do to impact the energy system.

Tamar have been door knocking in the community to raise awareness of the project and help people understand how the data was relevant to them, along with sending out e-newsletters and setting up an online householders' survey. They are also planning an 'engagement blitz' in August and September, targeting households who've shown an interest and want to learn more about the data.

Tamar reported that having knocked on every door in the area, only four or five were particularly hostile, lots were very keen, and people were much more open to the information than they expected.

Lessons for engagement

Tamar reported that doing the school eco clubs and going door-to-door created a 'brand identity', which means people are more open to talking. They concluded that consistent engagement is crucial in engaging the local population and having information available as early as possible helps this. They said that more resource and funding to do activities would help them to better achieve this. To help with consistent community engagement, they would advise communities starting a project like OpenLV to set up champion group at start, with early adopters, who could help keep momentum up.

App development

With the help of a software developer in their community, Tamar have continued working on developing a dedicated TEC web and smartphone app presenting the OpenLV data. They now have their app live on the TEC website, which shows energy demand from various feeders from the Elm Place substation in Tavistock. They are still trying to resolve gaps in the data they are getting from the OpenLV App, as shown in Figure 14. They reported that their software engineer has been busy with other engagements.

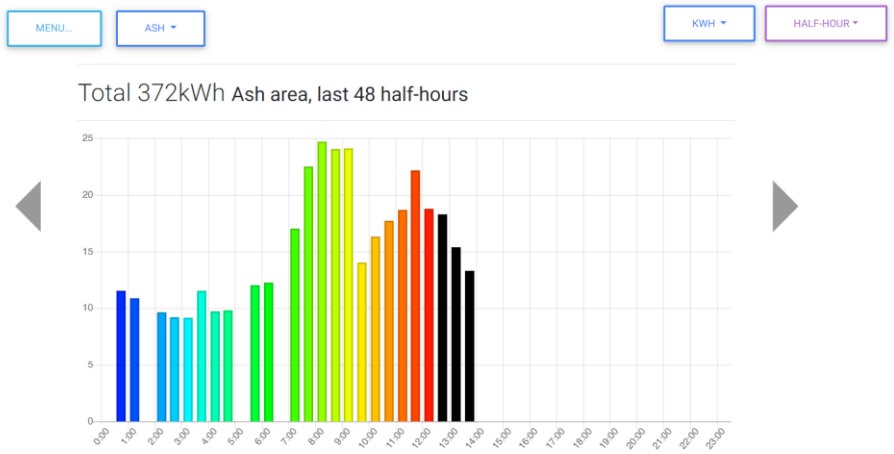


Figure 14: energy demand across a day from one of the substation feeders

4.2.3 Use of the App

The community uses the CSE App several times a week, while their software engineer logs into the App regularly when working on the project, to mine the data for the development of the TEC app. The OpenLV App has helped the community to better understand local energy challenges and concepts such as local flexibility, as well as being used by residents and schoolchildren to start conversations about energy issues.

Hits to the CSE App remained steady at over 300 in May and June but dropped to 144 in July. This drop has been due to their software engineer not being available to spend as much time mining data from the App to develop Tamar's own app.

Learning:

App usage by communities has been related to their volunteers time and capacity to use and analyse the information being provided. This has varied across communities with the better funded and supported organisations being able to spend more time on the project.

	December	January	February	March	April	May	June	July	Total Hits
App hits	54	342	470	557	203	325	305	144	**2,400**
Graphs configured		3			14			19	

Figure 15: Tamar's monthly use of the CSE App and graphs

Figure 16 and Figure 17 show typical midweek electricity during a spring day, while Figure 18 and 19 show typical substation energy consumption over a summer day. These demand profiles differ slightly to most residential areas, as the substation is connected to a primary school.

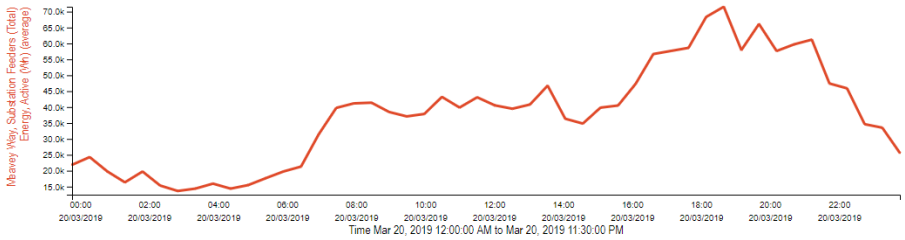


Figure 10: Energy use, Wednesday 20 March 2019

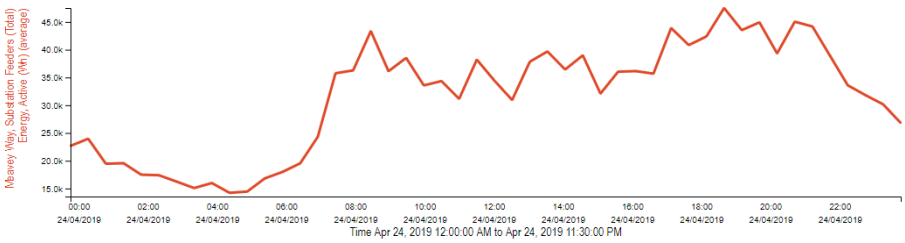


Figure 17: Energy use, Wednesday 24 April 2019

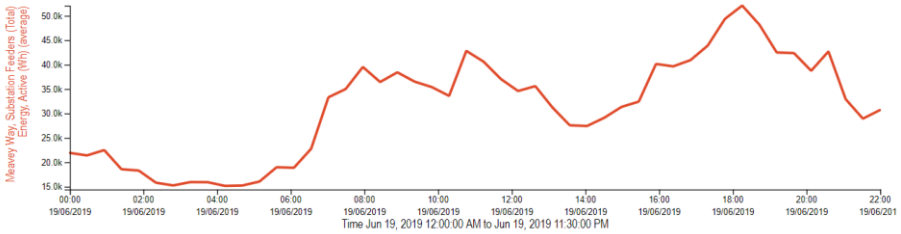


Figure 18: Energy use, Wednesday 19 June 2019

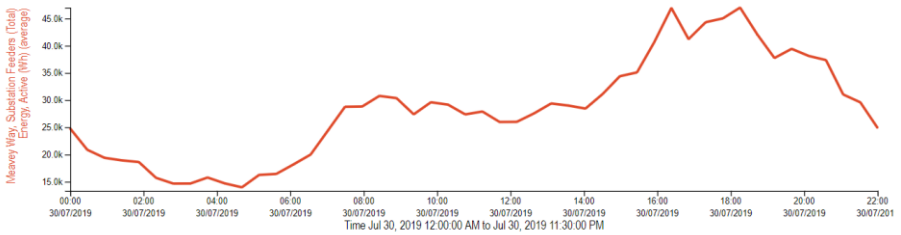


Figure 19: Energy use, Tuesday 30 July 2019

4.3 Exeter mid-trial interview and evaluation

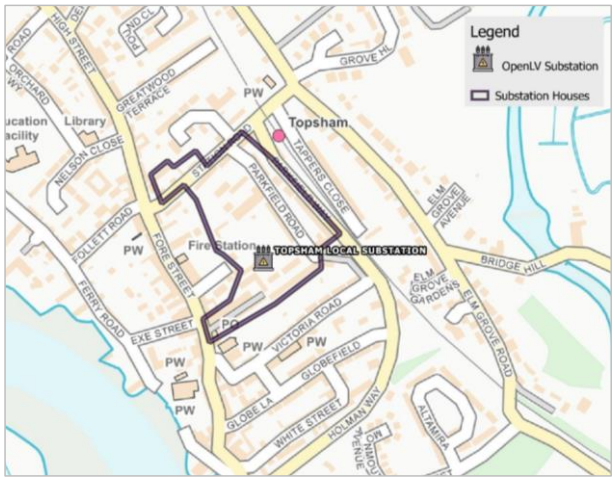


Figure 20: Exeter's OpenLV trial area in Topsham, Devon

Exeter Community Energy (ECOE) is a community energy group started in 2014 by a group of eight local people, springing from Transition Exeter.

Their main projects have included community solar, with 300 kW installed on rooftops across Exeter, and Healthy Homes for Wellbeing, helping local people to lower their energy bills and alleviate fuel poverty. ECOE are also currently exploring developing a hydro project at Trews Weir on the River Exe, and Solar PV 3, the next stage of their solar project.

4.3.1 Summary of project

The original outcomes for the Exeter project were to develop a smartphone mobile application with around £10,000 in-kind funding. It was planned that this smart phone application would provide information to users about energy use at the local substation, as well as data on local generation and National Grid carbon intensity.

However, the Exeter project has reduced significantly in scope from the initial project and evaluation plan. The details of this were outlined in the second mid-trial report but reduced scope was a result of both issues with timing and access to the desired substation data as well as a lack of available funding to further develop the smartphone application.

4.3.2 Progress since April 2019

There has been little activity since the original smartphone application idea was not taken forward. Since April 2019, efforts have nevertheless been made by CSE to encourage the community group to engage with the data through the CSE App.

CSE have sent through information about the App and user guidance and discussed with the group whether they might be able to start creating graphs and information that might be useful to the community group. There was also a discussion about whether it would be possible to include an iframe of App graphs on their existing Exeter Community Energy website. https://www.ecoe.org.uk/

Though the iframe has not yet been embedded, Exeter did include some information about the OpenLV data and held a discussion about the project at their annual general meeting in June 2019. CSE had helped with the preparation of information to send to other members of

the group's board. It was reported that there was an interesting discussion about uses of the information but no direct follow up.

The group have other priorities at the moment and as a voluntary organisation their resources are limited, therefore they are not prioritising using the data. In a brief discussion with Exeter, they also confirmed that they had no further plans to continue developing the smartphone app idea at present. They have also not yet gone ahead with the offer from Qbots to install monitoring equipment in an Exeter property.

4.3.3 Current use of the App

Despite the lack of progress towards project goals, Exeter have remained engaged with the CSE App, as seen in Figure 21, which shows the number of hits to the App. They have also increased the numbers of graphs configured to 11 from 6 in April.

	December	January	February	March	April	May	June	July	Total Hits
App hits	0	33	38	112	42	93	74	87	**479**
Graphs configured		2			6			11	

Figure 21: Exeter's monthly use of the CSE App and graphs

Figure 22 shows a typical summer day of energy use and carbon intensity at the Topsham substation. The demand profile does not show a typical evening usage peak as would be expected in a typical residential substation because it is connected to a retirement home which has more consistent energy demand across 24 hours.

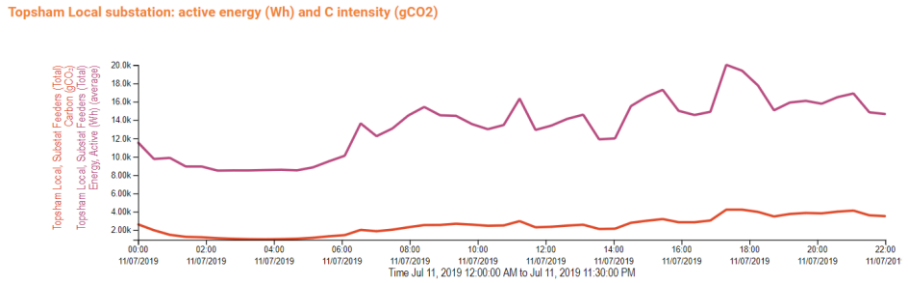


Figure 22: Energy use and carbon intensity at the Topsham substation, Thursday 11 July 2019

4.4 Owen Square Project Summary

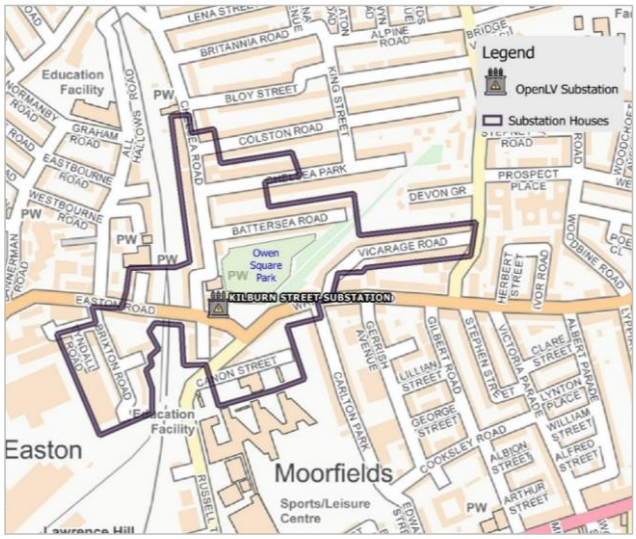


Figure 23: Owen Square's project in Easton, Bristol

Owen Square Community Energy is a co-operative local energy supply company ran by Easton Community Centre, Easton Energy Group, an urban community energy group in Bristol, and microgrid developer Clean Energy Prospector.

Their mission is to supply low carbon heat and electricity to homes and businesses in the Easton area of Bristol, promote the uptake of low carbon energy and support energy efficiency amongst their customers.

They are based around Owen Square Park in Easton, a densely populated and relatively deprived urban area.

4.4.1 Summary of project

Owen Square has been using OpenLV data to support funding bids for their community heat project in Easton, Bristol. They have used data to run financial modelling and built a business case for their heat decarbonisation projects, which involve either retrofitting air source heat pumps with thermal storage in 34 homes in their community, or extending the local heat network in the area as part of their 'community microgrid' approach.

4.4.2 Progress since April 2019

Supporting funding bids

Owen Square has been using the OpenLV data as part of their applications to secure funding to develop a community heat network and household heat pump retrofits, with the data demonstrating how this could work financially and what effect increased electrified heat would have on the local substation.

They have so far used OpenLV data in three unsuccessful funding bids, which have included applications for the Power to Change Next Generation Community Fund and the Energy Redress Scheme.

The community engagement part of the Owen Square project is dependent on securing funding as it relies on being able to go to local residents with a concrete offer for heat pump retrofit. OpenLV data would also be used in this part of the project to demonstrate the benefits of electrified heat and thermal storage for the substation and the household, through carbon and money savings.

The project lead at Owen Square, reported that OpenLV data has been useful in all their recent funding applications, however in some cases the funder is looking for a specific type of project to fund which may not necessarily make use of OpenLV data. Furthermore, the Owen Square project itself involves the challenging decarbonisation of heat in Victorian homes, so naturally carries more risk for potential funders.

Support for analysis

Over the past four years, Owen Square has recruited ten master's students from the University of Bath to support the community's projects with data analysis as part of their research dissertations. Several students have recently been analysing OpenLV data to run financial models and help build a business case for Owen Square's decarbonised heat projects. They will also be recruiting at least two more students in late 2019 to continue working with this data to support further funding applications.

4.4.3 Use of the App

Owen Square has not yet started a community engagement process with the App therefore the number of hits to the App is lower than most other projects. However, there were over 100 hits in July and the project has nine graphs and one alert configured.

Group	December	January	February	March	April	May	June	July	Total Hits
App hits	27	2	14	5	44	11	15	104	**222**
Graphs configured		2			6			9	

Figure 24: Owen Square's monthly use of the CSE App and graphs

Figure 25 and 26 show energy use by various feeders on spring days, while Figure 11 and Figure 12 show summer weekdays. The Kilburn Street substation's feeders show different demand profiles as the area includes residential streets, several commercial buildings, a mosque and a community centre.

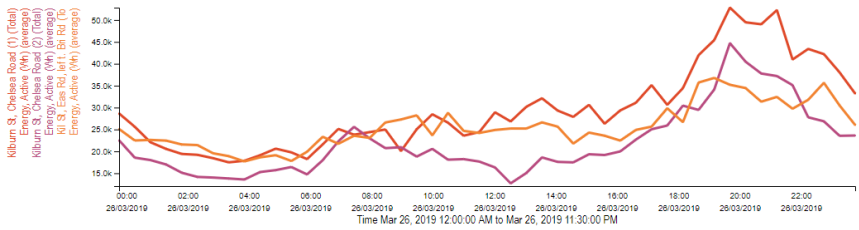


Figure 25: Energy use by feeder, Tuesday 26 March 2019

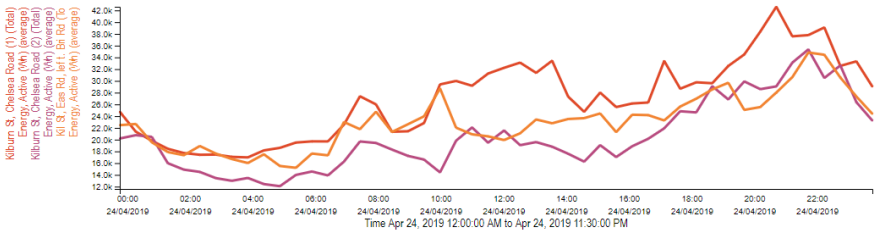


Figure 26: Energy use by feeder, Wednesday 24 April 2019

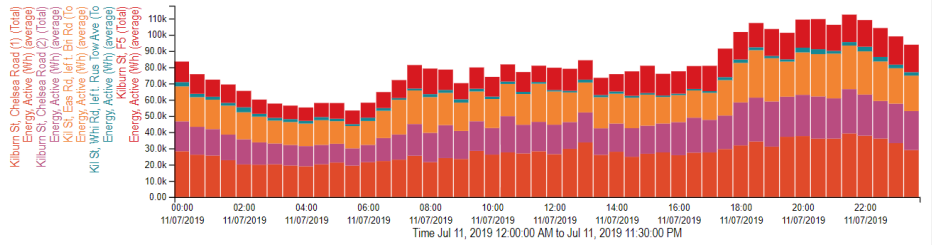


Figure 27: Energy use stacked by feeder, Thursday 11 July 2019

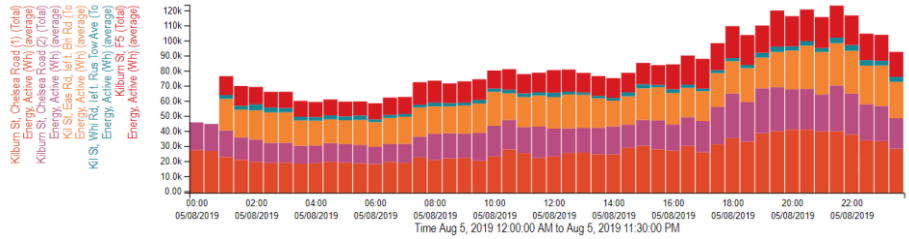


Figure 28: Energy use stacked by feeder, Monday 5 August

4.5 Marshfield Project Summary

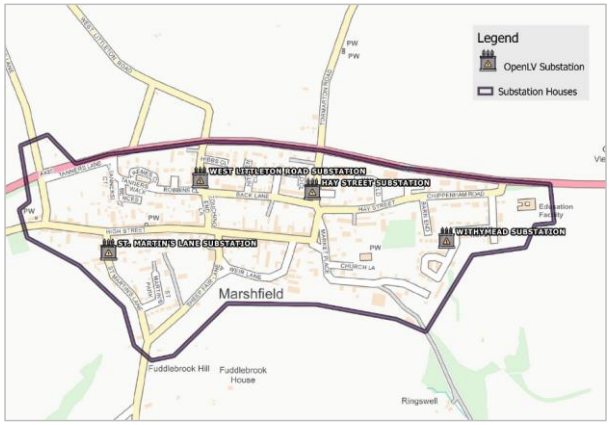


Figure 29: The OpenLV trial area covering the village of Marshfield

MARSHFIELD ENERGY GROUP

Marshfield Energy Group is volunteer led, with support from the Community Land Trust.

The local community has been active in installing renewable generation with the local primary school installing a 12 kW wind turbine and there are 30 domestic PV installations in the village ranging between 3-4 kW each.

The community group has undertaken research in the past looking at installing further renewable generation in the village. Exploring the potential for a solar farm, wind, and anaerobic digester.

4.5.1 Summary of project

A key objective for the Marshfield project is to use the data to understand the level of outages currently experienced in the village. A further objective for Marshfield is to use the data to provide an evidence base for the development of a village-wide energy strategy. With the area currently reaching maximum capacity for generation, they are unable to connect significant further generation without being asked to contribute towards further investment in the network to expand its capacity.

4.5.2 Progress since April 2019

Marshfield has been progressing with their project and working to understand the information being provided by the OpenLV App. Most of the original outcomes are in progress, including developing a better understanding of the outages and pressures on the energy network in the village. However, plans for showing the information to residents is not progressing beyond the development of a network map for the village, as they have been unable to find a compelling narrative that they feel would make the information engaging for the community.

Working with CSE to analyse data

Marshfield have been working together with CSE to plan how best to achieve their objectives around building a local energy strategy and understanding local network constraints. CSE have been exploring how they could provide data analysis and policy development support.

EA Technology have provided information about the capacities of the substations in order to understand how much demand and generation headroom there is for the community to exploit.

CSE and Marshfield met on 29 July 2019 to discuss ideas for how the group can help their village to decarbonise. Their aim is to now carry out data analysis in August on a full year of

data, as part of their village wide sustainability planning. CSE will provide a report including options and recommendations for 'decarbonising the village'. The group are still considering how best to make use of the recommendations. Ideas include a public meeting, a new Neighbourhood Plan, further work to develop new projects, and linking with a new 'Sustainable Marshfield' initiative.

Developing a village strategy

The plan is to use OpenLV data to answer questions that could form the basis of their village energy strategy. The community would like to look at the potential to:

- Increase renewable energy installations
- Install new battery storage
- Increase uptake of electric vehicles
- Trial new ways of energy purchasing
- Increase uptake of energy saving schemes

When the data analysis is complete, the group are hoping to present information and ideas back to the village at a public event.

4.5.3 Use of the App

The Marshfield project are relatively prolific users of the App with over 700 hits in July and 6,000 overall indicating their high engagement with the project. They have configured 16 graphs and two alerts.

	December	January	February	March	April	May	June	July	Total Hits
App hits	126	635	1,917	499	867	464	1,023	732	**6,263**
Graphs configured		3			37			16	

Figure 30: Marshfield's monthly use of the CSE App and graphs

Figure 31 and 32 show energy use on spring days on the West Littleton substation, showing a typical demand profile for a residential area, while Figure 33 shows a summer day, with a slightly lower demand and a flatter evening peak.

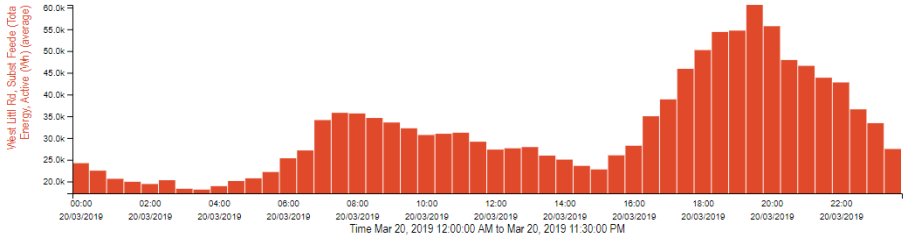


Figure 31: Energy use, West Littleton substation, Wednesday 20 March 2019

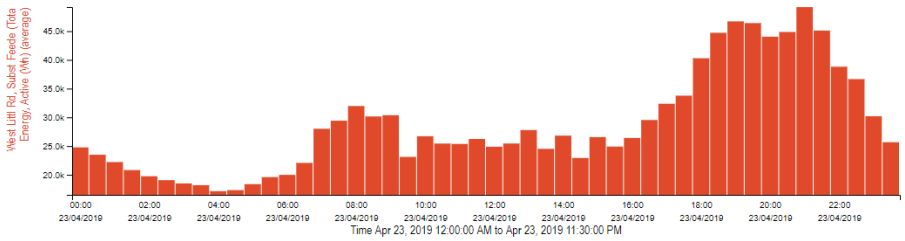


Figure 32: Energy use, West Littleton substation, Tuesday 23 April 2019

Active Energy

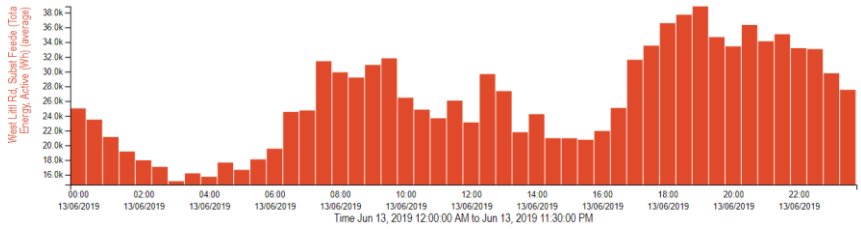


Figure 33: Energy use, West Littleton substation, Thursday 13 June 2019

4.6 Yealm Community Energy

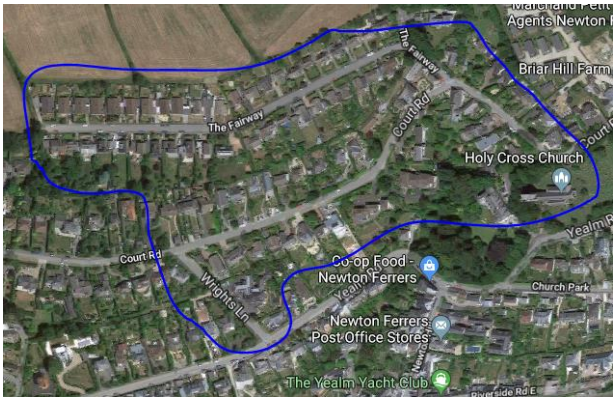


Figure 34: Map of the area connected to the Fairway substation in Newton Ferrers

Yealm Community Energy

Yealm Community Energy (YCE) is an established, member-owned community group serving the Yealm estuary area. The aim of the group is to bring local renewable energy installations such as solar farms into community ownership, then use the profits to fund local environmental projects.

YCE own an existing solar farm at Newton Downs which generates enough clean energy to power the equivalent of 2,000 average homes.

4.6.1 Project Summary

After working closely with Method 3 participants Engie, Yealm have joined Method 2 as a community participant, getting data from the Fairway substation in Newton Ferrers, Devon. As a late entry into the OpenLV project[4], Yealm has been starting to use OpenLV data to engage local people generally in local energy issues, through messaging on substation behaviour, local energy consumption, local generation and carbon intensity. They will put energy data loggers into the homes of residents who volunteer, to help people understand the link between their domestic electricity use, substation activity and local renewable generation.

Project outcomes

Their project aims to raise awareness of energy in the community, help people understand how the energy system is changing and how the OpenLV data might show these changes. Yealm also wants to use the App and their community engagement in Method 2 to build the image of the community energy group in the local area, ahead of a share offer they plan to launch in 2019 and 2020 for the Newton Downs solar farm. They plan to have OpenLV data displayed alongside generation data from Newton Downs in the App. They are also planning to install home energy loggers in the community to link generation, substation and domestic energy use data.

[4] Yealm were brought into the OpenLV method 2 trials in May 2019 to replace WHG who withdrew from the project following a personnel restructure in the housing association.

4.6.2 Progress so far

Yealm had a stand at the Yealmpton Agricultural Show, which had approximately 10,000 visitors. They showed printouts of graphs displaying the daily variation of the electricity flows at the substation and the daily average load curves for the substation.

They have identified householders who will accept data loggers in their homes, so they are on track to be installed in August and September. Yealm reported that it has taken longer than they expected to get corporate agreement to their procurement from Engie, but they are confident these will generate more granular data. The community and CSE have requested generation data owned by Solar Century/InAccess from the solar farm. However, they have had difficulty obtaining a data sharing agreement with the owners, so they are yet to obtain this data.

The group reported that, having joined the project at a late stage, they are mainly talking to people already interested in energy issues who want to know more about OpenLV. These include early adopters of technology, such as EV owners.

4.6.3 Use of the App

Yealm are using smiley faces to compare energy use between areas on the three different feeders connected to the Fairway substation in Newton Ferrers. Happier faces are associated with using less carbon intensive electricity, or reducing overall demand, which is designed to encourage energy saving amongst residents.

Commented [PM1]: Sorry - don't yet understand how the comparison is made or how it drives behaviour change

- does this mean people are using electricity at less Carbon intensive times of the day (based on the general grid carbon intensity)
Or
- or is there something about how they are sourcing the electricity to enable differentiation between the feeders?

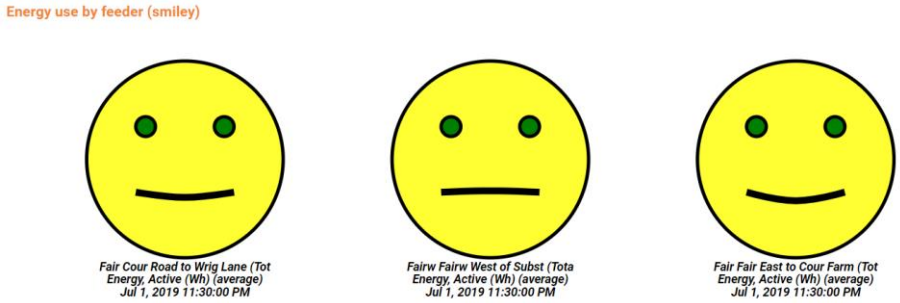


Figure 35: Yealm's 'smileys' graph on the App indicating comparative energy use

Since joining OpenLV in the May, Yealm have had relatively high engagement with their pages and graphs on the App. This peaked in June, with interest from the community in the new data they could get on their local substation.

	May	June	July	Total Hits
App hits	192	316	68	576
Graphs configured			10	

Figure 36: Yealm's monthly use of the CSE App and graphs

Graphs on the CSE App show electricity flows at the substation and carbon intensity of the substation, and the group want to supplement this data with home energy loggers to show the link between substation activity and home energy use. Figures 37 and 38 show summer weekdays of energy use at the Fairway substation, with morning and evening peaks typical of a residential area.

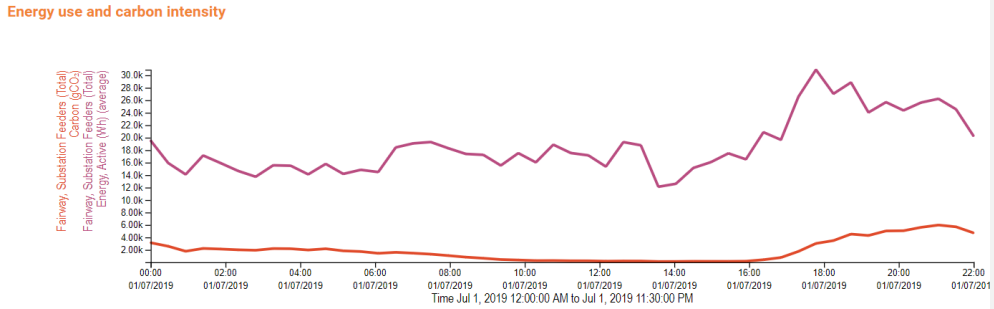


Figure 37: Energy use and carbon intensity at the Fairway substation, Monday 1 July 2019

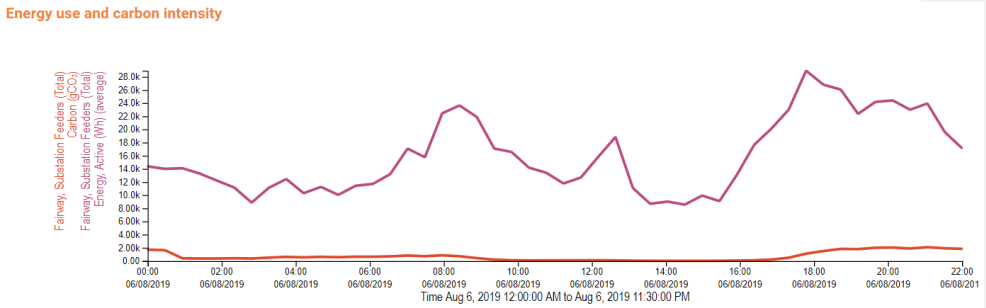
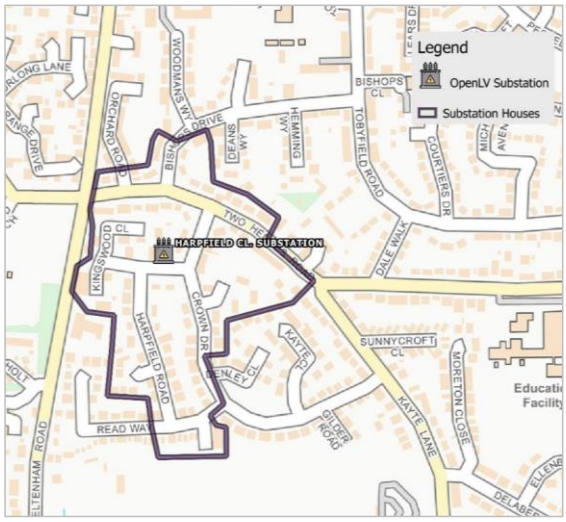


Figure 38: Energy use and carbon intensity at the Fairway substation, Tuesday 6 August 2019

4.7 Rooftop Housing



Rooftop Housing Group is a charitable housing association which focuses on provision of affordable housing for all household types and needs. Rooftop manage 6,000 properties and their main area of operation is in Worcestershire and Gloucestershire.

As a not-for-profit organisation, Rooftop reinvest surpluses back into the local community by building new homes, improving existing homes and supporting community initiatives.

Figure 39: Rooftop's trial area in Bishops Cleeve, Gloucestershire

4.7.1 Project Summary

Rooftop had originally planned to engage their residents in energy use and carbon emissions whilst using the OpenLV data. However, engagement was delayed from autumn 2018 in order to wait for the completion of the CSE App and then further delayed due to a change of project manager at Rooftop in early 2019. The continuation and approach to the project is still to be officially confirmed by the new project manager.

Given the time period remaining for the project, the understanding is that the project is unlikely to deliver significantly against their original outcomes on awareness raising of energy locally.

It is to be confirmed whether the secondary objective can still be achieved in providing useful information to the housing association to help with future decisions on improving housing stock. The project will now be evaluated with a structured interview with the Rooftop project manager, CSE and Regen.

4.7.2 Progress since April 2019

Since the engagement event held in Exeter in March 2019, there has been communication between CSE and Rooftop's project manager who had been spending time familiarising himself with the App.

Information and graphics from the App have now been displayed in the Rooftop office in Bishops Cleeve and shared with residents. The project manager also intends to produce material to share with the local school and CSE has been supporting this process.

During July 2019, CSE was unable to contact Rooftop for an update but did receive news that the neighbourhood officer who had been supporting the process has now left, meaning there are now fewer resources to deliver engagement.

4.7.3 Use of CSE App

Rooftop have had relatively low levels of engagement with the App which is demonstrated by the low total hits over the project period. They have 9 configured graphs.

	December	January	February	March	April	May	June	July	Total Hits by Group
App use	5	9	61	108	183	28	22	32	**448**
Graphs configured		1			3			9	

Figure 40: Rooftop's monthly use of the CSE App and graphs

Figures 41 and 42 show demand at the Harpfield Close substation in spring and summer weekdays respectively, which show a typical evening peak in a residential area.

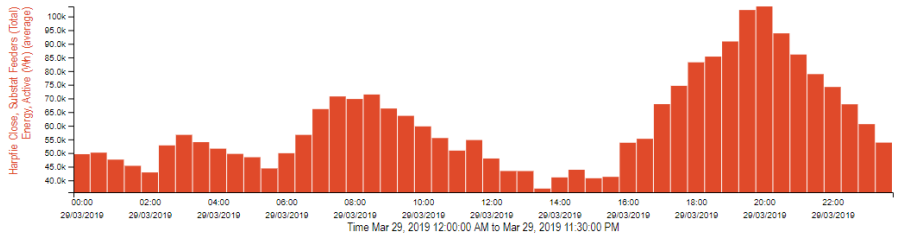


Figure 41: Energy demand at the Harpfield Close substation, Friday 29 March 2019

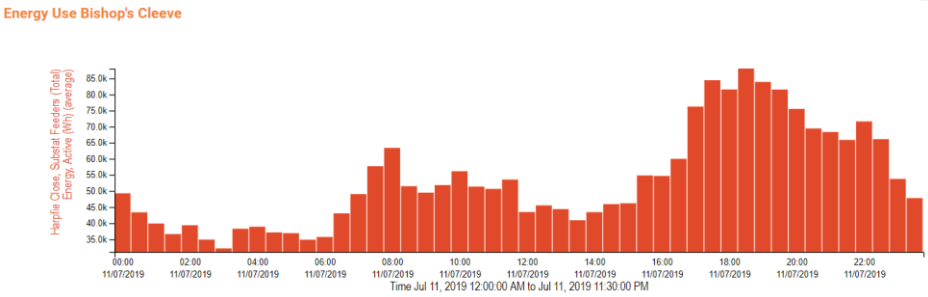


Figure 42: Energy use at Harpfield Close substation, Thursday 11 July 2019

Appendix A - summary of community App activity

Community	Graphs configured in January 2019	Graphs configured in April 2019	Graphs configured in July 2019	Alerts configured January 2019	Alerts configured April 2019	Alerts configured July 2019	I-frames embedded in external sites April 2019	I-frames embedded in external sites July 2019
Bath & West	3	12	16	0	0	1	0	0
Exeter	2	6	11	0	0	0	0	0
Marshfield	3	37	16	0	0	2	0	0
Owen Square	2	6	9	0	0	1	0	0
Rooftop	1	3	9	0	2	2	0	0
Tamar	3	14	19	2	0	2	3	3
WHG	3	9	8	0	0	0	0	0
Yealm	N/A	N/A	10	N/A	N/A	2	N/A	0

Figure 43: Usage of the App functionality by community Groups (31/07/2019)

Group	December	January	February	March	April	May	June	July	Total Hits by Group
Bath & West	25	2,702	2,929	807	63	366	144	34	**7,070**
Exeter	0	33	38	112	42	93	74	87	**479**
Marshfield	126	635	1,917	499	867	464	1,023	732	**6,263**
Owen Square	27	2	14	5	44	11	15	104	**222**
Rooftop	5	9	61	108	183	28	22	32	**448**
Tamar	54	342	470	557	203	325	305	144	**2,400**
WHG	20	17	14	24	49	13	38	21	**196**
Yealm						192	316	68	**576**
Total Monthly Hits	**257**	**3740**	**5443**	**2112**	**1,451**	**1,492**	**1,937**	**1,222**	**17,654**

Figure 44: Usage of the App functionality by community groups, arrows indicate relative use across different months for each group.