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OPENING UP THE SMART GRID

Community Learning Specialist:
Deliverable 8

Community guidebook

ea technology

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1 Executive summary

The OpenLV project trialled an open, flexible software platform developed by EA Technology that could be deployed in every low voltage (LV) substation in Great Britain. The project looked to demonstrate the platform's ability to provide benefits to the network, customers, commercial entities and research organisations.

This report is part of the 'Method 2 – Community Engagement' workstream, through which the project demonstrated the value of providing LV network data and an 'open platform' to communities. The project worked with seven community organisations (five community energy groups and two housing associations) who wanted to better understand their local electricity network.

This Community Guidebook is the final project deliverable for community learning specialist, Regen.

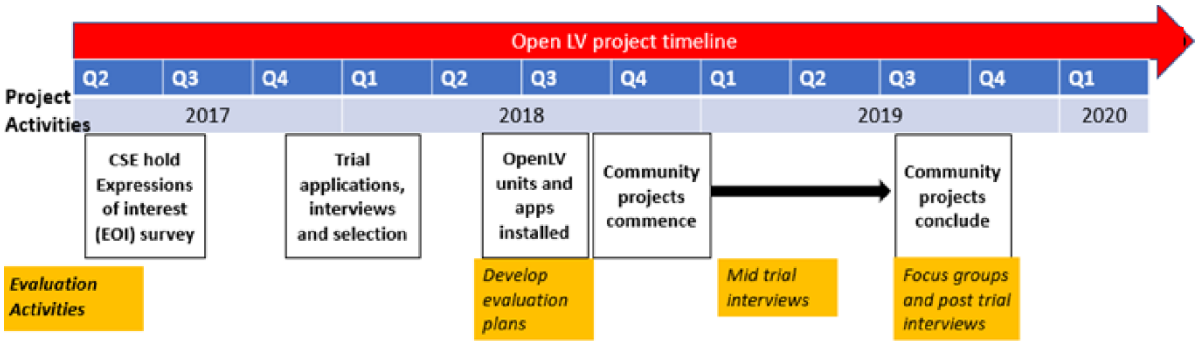


Figure 1: The OpenLV project timeline

The purpose of the guidebook is to summarise the learnings from the trials into a format that can be used by new communities or organisation who may wish to use a solution similar to OpenLV in the future.

The guidebook is written as a document for community organisations and non-expert audiences to show how having access to local electricity data can be used to support local energy projects, encourage behavioural change or help communities use more renewable electricity. Specifically, the guidebook explains how community organisations might use the substation data for three main use cases:

- to tell a story about their energy usage,
- to plan for the deployment of more low carbon technologies,
- and, whether communities could earn additional revenue from the provision of network services enabled by substation data.

The guidebook includes community case studies from the trial, as well as providing an overview of the use of the website application that processed and displayed OpenLV information. This application was developed for the trials by project supplier Centre for Sustainable Energy (CSE) to support the communities who participated in the trials.

2 OpenLV - understanding the low voltage electricity network

Low voltage electricity substations, like the ones monitored by OpenLV, make up a key part of the local distribution network which delivers electricity from the grid into UK homes, public building and businesses.

Low voltage substations typically serve tens to hundreds of consumer properties, although in rural areas especially, they may serve single farms or hamlets. Most substations also have several different 'feeders' coming from the substation which supply electricity to different sets of customers at a street level.

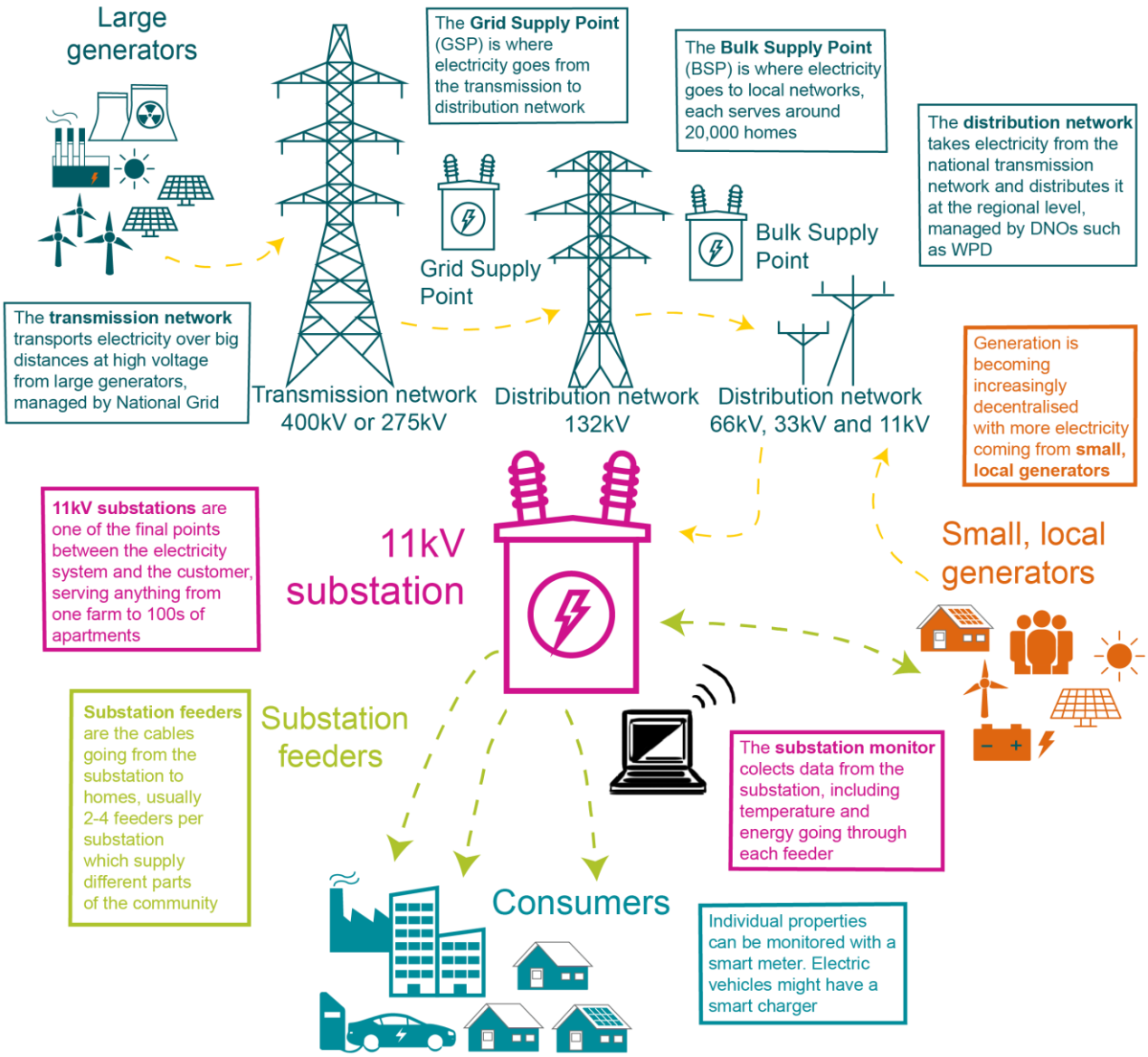


Figure 2: Illustration of the electricity supply network and substation monitoring

To understand the electricity flows at the local substation level, each substation that was selected for the trial was fitted with an OpenLV monitoring unit, with most of these substations transforming electricity from 33kV to 11kV. Each OpenLV unit has hardware and sensors that monitor energy flows and other related activity within the substation, and brings this information together onto a software platform that analyses and displays key data, such as electricity demand and transformer temperature (which is a measure of how hard the substation is working).

The key data obtained for use in the OpenLV community trials included electricity use (in kilowatt hours or megawatt hours), electricity generation, substation temperature and voltage level.

A website application, that was developed by the Centre for Sustainable Energy (CSE), processed and displayed the substation data in combination with other information such as data on the carbon intensity of electricity from the local network's Bulk Supply Point (a substation which transforms electricity from high voltage to a lower voltage, usually serving around 20,000 homes).

3 A Changing Energy System

Our energy system is changing rapidly as we work towards a net zero carbon future. Electricity generation is increasingly renewable and has become more decentralised. Over the coming decade we expect to see more low carbon technologies, such as electric vehicles and heat pumps, that will place new demands on local networks. This means that energy flows and balances, both for electricity supply and demand, need to be actively managed at a local level. Network operators, such as Western Power Distribution (WPD), are already developing the tools to more actively and intelligently manage the network to maintain resilient supply and to minimise energy costs.

As a network operator, WPD want to ensure that customers can access the data necessary to make smart decisions about their energy use. The provision of energy data is increasingly becoming an important service that network operators provide.

Consumers and communities can help to manage their local network with behavioural changes around their energy use and by taking advantage of local energy generation. This is where substation information becomes especially useful. By monitoring electricity flows at a local level, people can be informed to take action to change their energy consumption pattern to reduce peak demands on the network and to take advantage of more local generation or lower carbon electricity.

Energy data can also support wider community engagement and actions to address issues from climate change to fuel poverty. Providing local electricity data can help communicate abstract energy concepts by putting them in a local context - turning data, such as megawatts of energy consumption, into a more compelling message, about how much electricity your street is using at 5pm.

Equipped with this kind of information, communities and local organisations are ideally placed to speak to a wide-ranging audience about energy, with locally relevant messaging around how we can work alongside our neighbours as our energy system transitions to a zero carbon future.

4 Learning from the OpenLV community trials

Seven community organisations across WPD's licence areas were involved in the OpenLV trials, which ran from 2017 to 2019. Each community organisation used the data and sub-station information in several different ways. Some of the more established community energy organisations used the data to support the development of their renewable generation projects, while other groups used the data to inform local people on the impact of the shift to low carbon energy on their homes and the local network.

Most community organisations participating in the OpenLV project were receiving data from one or two substations, although one community participant received data from all four substations in their village. The electricity data they received was accessed online through a website application (webapp), built by the Centre for Sustainable Energy (CSE). The substation monitoring platform was designed to host apps created by anyone and, like a smartphone, it can host multiple applications built to respond to different needs. The uses each community had for the OpenLV data are summarised in section 4.2.

4.1 The community webapp

To support the OpenLV project, CSE developed a webapp to provide the trial communities with substation data as well as other sources of information as requested. The OpenLV webapp is on the website: https://openlv-cse.uk/

Each community in the OpenLV trial was given their own portal where it was possible to see 'real time' (updated to 30 minutes prior) data for their local substations as well as historical data across various time periods, in graphs or data tables. The webapp is also able to export data to be used in other software applications or uploaded into a host website.

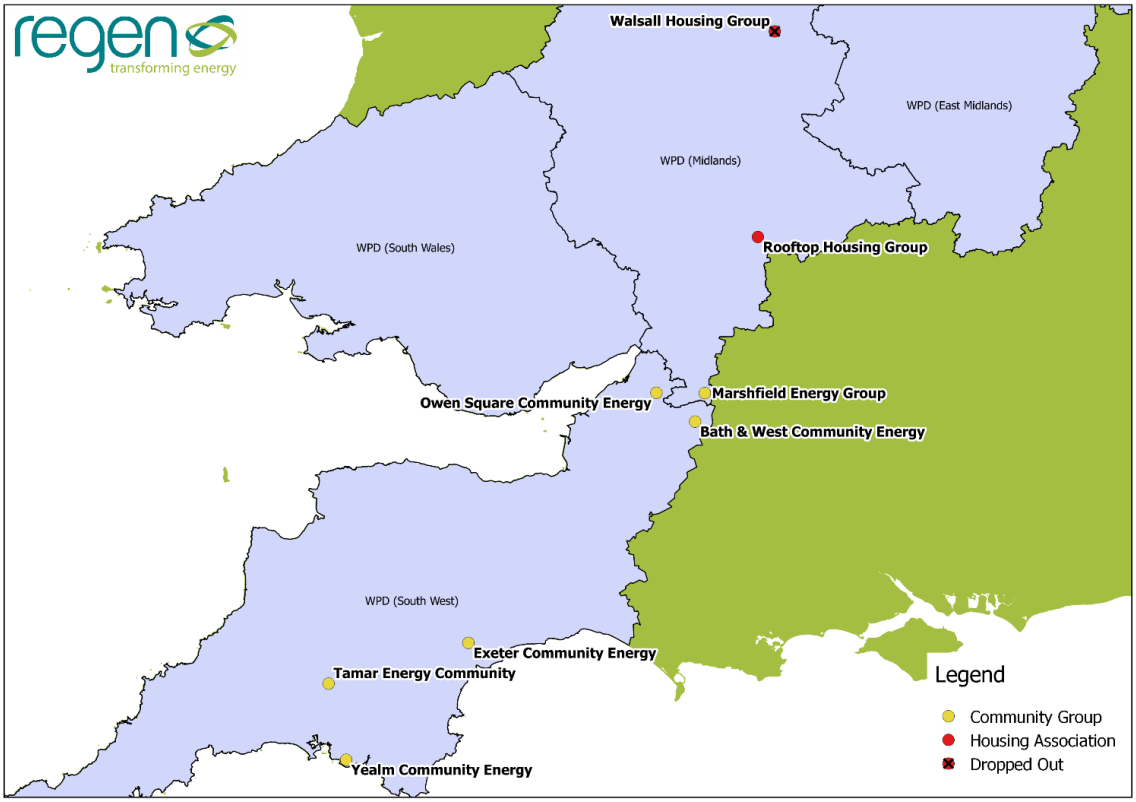


Figure 3: A map of the community organisations which participated in the OpenLV trial

4.2 Summary of the community trials and their use of data

Organisation	Project aims	Use of OpenLV data
Tamar Energy Community (TEC)	To engage their community and get them thinking about energy use and how it's changing	Used data from a substation in Tavistock as part of a local engagement programme, including Eco Clubs in the local school
Exeter Community Energy (ECOE)	To develop a mobile phone app for residents, integrating OpenLV data	Monitoring one substation in Topsham and planned to engage residents through a phone app to gamify local energy issues
Yealm Community Energy (YCE)	Joined midway through the project, wanted to practice local balancing of generation and demand	Integrate OpenLV data with generation data from their community solar farm and household energy data
Owen Square Community Energy (0SCE)	To use OpenLV data to develop a community renewable heat project using OpenLV data for modelling	Used substation data as part of funding applications to prove the impact of local heat pump and microgrid projects
Bath & West Community Energy (BWCE)	Run a solar and battery installation scheme and encourage shifting energy use to explore flexibility	Monitored two substations in Bath as part of a domestic PV and battery offer and engagement campaign
Marshfield Energy Group (Marshfield)	To engage their community and understand the causes of electricity blackouts in the village	Monitored four substations to understand energy issues faced by the whole village and how residents could respond
Rooftop Housing Group (Rooftop)	To engage residents in energy behaviour changes and help people struggling with energy bills	Used data from substations in Bishops Cleeve, Cheltenham to engage residents in energy behaviour
Walsall Housing Group (WHG)	To explore how smarter use of electric heat could help alleviate fuel poverty	Planned to focus on the impact of electric heat systems

Table 1: Summary of community trials

5 Using the substation data to tell a story about electricity

Most community organisations in the trials reported that the substation data was useful to help engage people in energy issues. The data and information showed how homes were connected on the network as part of an energy community, and how people share use of the local electricity network assets. Given the timescales of the OpenLV trial, this use case was the most common and immediate way community energy organisations used the substation data.

Community groups highlighted that, in contrast with much of the existing information about energy and carbon emissions which use national trends, or information that is limited to an individual households, local network data could provide village or street level information to start conversations with people who are more interested in their local community, but not specifically interested in energy.

In some communities, conversations centred on local profiles of usage (when peak demand might typically occur) and interesting facts about the community (who is connected to which substation and how this might reflect the historic building pattern of the neighbourhood).

For example, being able to illustrate local peaks in electricity usage helped people understand the advantage of time-of-use-tariffs, and therefore the need for smarter or off-peak charging for electric vehicles.

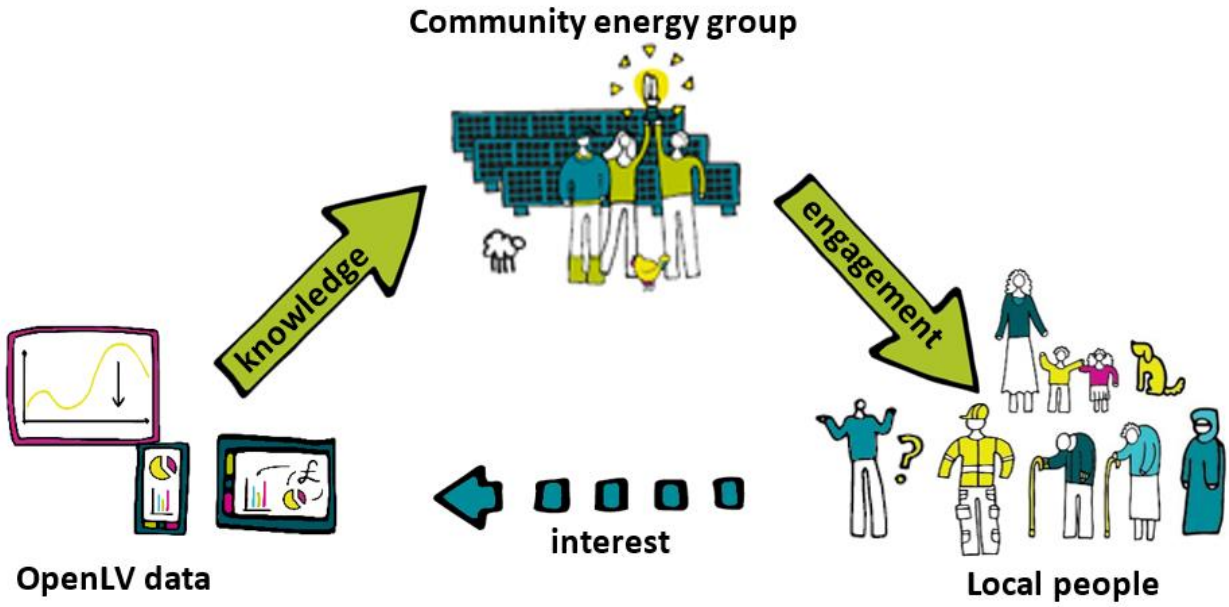


Figure 4: Community energy organisations using OpenLV as an engagement tool

The experience of the OpenLV trial showed that there are several key steps needed for a community organisation to go from gaining access to OpenLV data, to using it to tell a story about local electricity which people understand and engage with.

Figure 5 shows the steps necessary to develop a model around this engagement, once a community group has access to substation data and knows which parts of the community the data is coming from.

Using substation data to tell a story about electricity

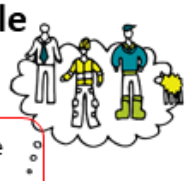
1 Community energy organisation accesses OpenLV data

- Work out which local substations you want to monitor
- Apply by getting in touch with WPD or visiting the CSE website
- Go to the OpenLV webapp to set up graphs for your community

2 Understand the existing knowledge and engagement with energy in the community

- Find out which homes are connected to substations being monitored
- Send out a householders' survey about energy to the local community
- Hold an engagement event to tell people about OpenLV and answer questions

3 Develop engagement objective – e.g. number of people using an app, households shifting energy use

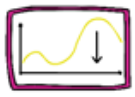


- Review current engagement in energy issues in the community
- Decide the story you want to tell about electricity to get people interested
- Decide how many people you want to engage and how you'll measure it

4 Develop an engagement strategy, including messaging to be used and how to spread the word

- Look at best practice for talking to people about energy, including OpenLV case studies
- Use a range of engagement techniques – online, by post and face-to-face events
- Reach as many people in the community as you can

5 Measure and evaluate to understand the impact of engagement – e.g. event feedback, app statistics



- Review OpenLV app statistics to see how many people are looking at the data or setting up alerts
- Gather feedback on your engagement at events and with online surveys

6 Review your engagement and potentially extend objectives

- Assess how many people engaged with the project and how successfully you told a story about electricity
- Decide on next steps – to advance with your community engagement or tell a different story around local energy

Figure 5: Steps to successfully engaging the community and telling a story around electricity using OpenLV

5.1 How the webapp supports this use case

The webapp collects and processes several useful bits of information for local communities that supports community engagement, including:

Data collected	Webapp usage
Active energy	Active energy (Wh) shows the net amount of electricity being used (demand minus generation), one of the most useful substation measurements used by trial participants.
Active power	Active power ("Power, Active") (W) is the power being used, or the *rate of energy transfer at a moment in time (Voltage x Current).* The website can display average power and the maximum power in a half hour period.
Electricity cost	The website multiplies active energy by a unit rate for electricity set by the user to show electricity cost (£). This gives a way to estimate spending on electricity at substation or feeder level, which can then be turned into an average household spend for a community.

Once a community has access to data from their substation, they can log in to the OpenLV webapp and set up graphs or download data.

Users can choose which data to display over what time period and for what feeder, depending on the story they want to tell. The graph configuration page is show in Figure 6.

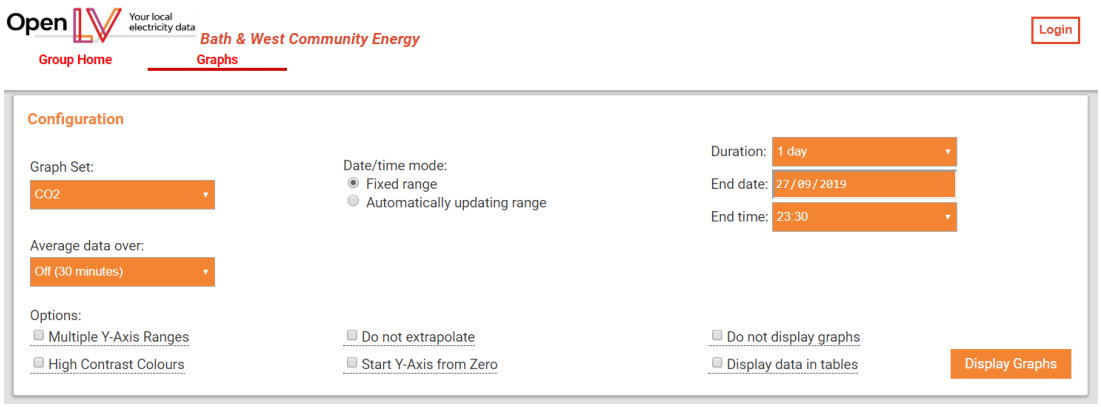


Figure 6: Configuring graphs in the OpenLV webapp

5.2 Presenting the information

Several community groups in the OpenLV trial aimed to use the substation data to encourage people to consider 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.

Examples of how communities used substation data for local engagement included:

- **Tamar Energy Community** (TEC) 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. TEC also used substation data when door-knocking in the community to start conversations around local generation, their energy bills and decarbonisation.
- **Rooftop Housing Group** spoke to housing association residents about energy use, lowering their energy bills and encouraged energy efficiency. They held a community event early in the project to raise awareness of local energy issues.
- **Exeter Community Energy** (ECOE) planned to develop a smart phone app for 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.

There were many ways to present information in the webapp. For example, Figure 7 shows energy use each day added together for the four different feeders to one substation in Bristol during 2019. This effectively shows the difference between summer and winter electricity usage. The lowest usage was during July and August and the highest usage in winter reached around 40% above the summer.

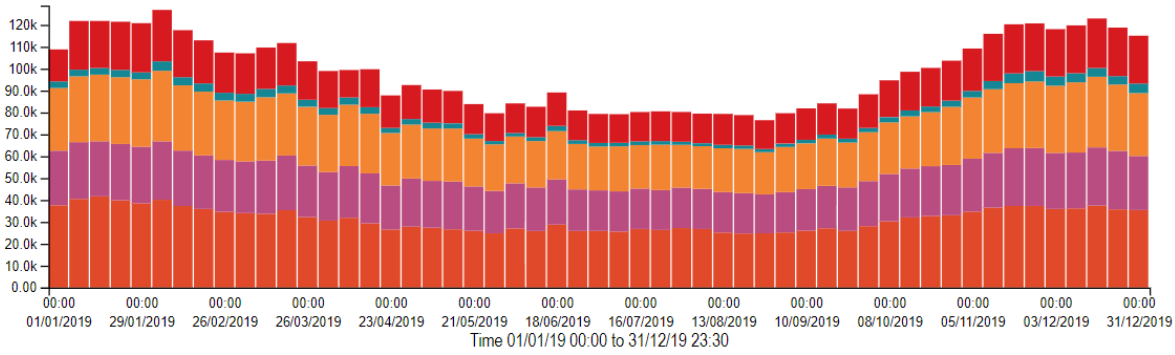


Figure 7: Energy use over a year in Bristol

5.2.1 Learning from trial communities

Each community developed their own messaging around the OpenLV project in order to make it most relevant to their organisation and local communities. However, all followed a similar theme about persuading individuals to act and modify their energy use to benefit:

- themselves (cost savings),
- their communities and the local economy (use local generation),
- and the climate (try to use electricity at the least carbon intense times).

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.

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. They reported the following key learnings:

- **It is useful to have or create a recognisable brand or presence in the community.** This was reported by groups such as BWCE, who identified their familiarity in the community as benefiting their engagement, and TEC 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. TEC 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. TEC 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.
- **Keeping up momentum is important.** BWCE's Solar Streets was impacted by delays outside of their control. They reported that motivation to get involved with their project amongst residents 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.** TEC used their school Eco Clubs to introduce children to 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 the trust and familiarity of the group in the local community.
- **Locally relevant information in the webapp makes energy more interesting to people and facilitates new conversations**. After presenting graphs at the Yealmpton Show, YCE 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.

5.3 Further reading

You can read more about how to engage communities in new energy issues and innovation in Regen's Rough Guide to Engaging Communities in Energy Network Innovation (2017) and Electricity Network Innovation Guide for Communities (2018).

CSE have a suite of resources for people looking to talk about local energy, particularly useful for schools and educators, which can be found here.

See more examples of what communities involved in the OpenLV trial did to tell a story about local electricity by visiting their project pages:

TEC's The Power in Your Hands project

BWCE's Solar Streets project

5.4 Case study 1: Tamar Energy Community

Tamar Energy Community (TEC) used OpenLV data as part of their 'The Power in Your Hands' project to engage their community in energy issues and influence their energy behaviour. To do this, TEC ran educational after-school 'Eco Clubs' in the local junior school to teach children about concepts such as carbon emissions, climate change and the importance of how we use energy. In their weekly Eco Clubs, TEC showed graphs and smileys of energy data to introduce schoolchildren to their projects, so they could go home and talk to their family about it.

TEC 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 TEC's project 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."*

After they had successfully run a series of Eco Clubs, TEC engaged the wider community, by going out door-knocking, sending out an online householders survey on energy use, embedding OpenLV graphs in their website and hosting drop-in sessions to introduce people to the project and answer any questions about local energy. TEC also worked towards developing their own app with the help of a software engineer in their community.

The OpenLV app 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. With this deeper understanding of their local electricity network, TEC were able to build a closer relationship with their Distribution Network Operator and develop new project ideas.

Figure 8: TEC promoting 'The Power in Your Hands' project at the local school

6 Using the data to plan for more low-carbon technology

The substation data gives communities an insight into the functioning and performance of the local electricity network. This could help organisations that are planning to develop new projects to see if there might be network issues – such as a lack of local network capacity – in their area.

While network operators already provide an overview "heat map" of local network constraints, such as the WPD Network Capacity Map, using OpenLV trial data allowed organisations to better appreciate what sort of additional low carbon technologies could be connected to the local network and where there might be potential to site, for example, electric vehicle chargers or additional rooftop PV.

The webapp was also able to provide additional information on local renewable generation and graphically show how local demand could be matched with community owned or local renewable generation, which could assist with the development of local energy supply models.

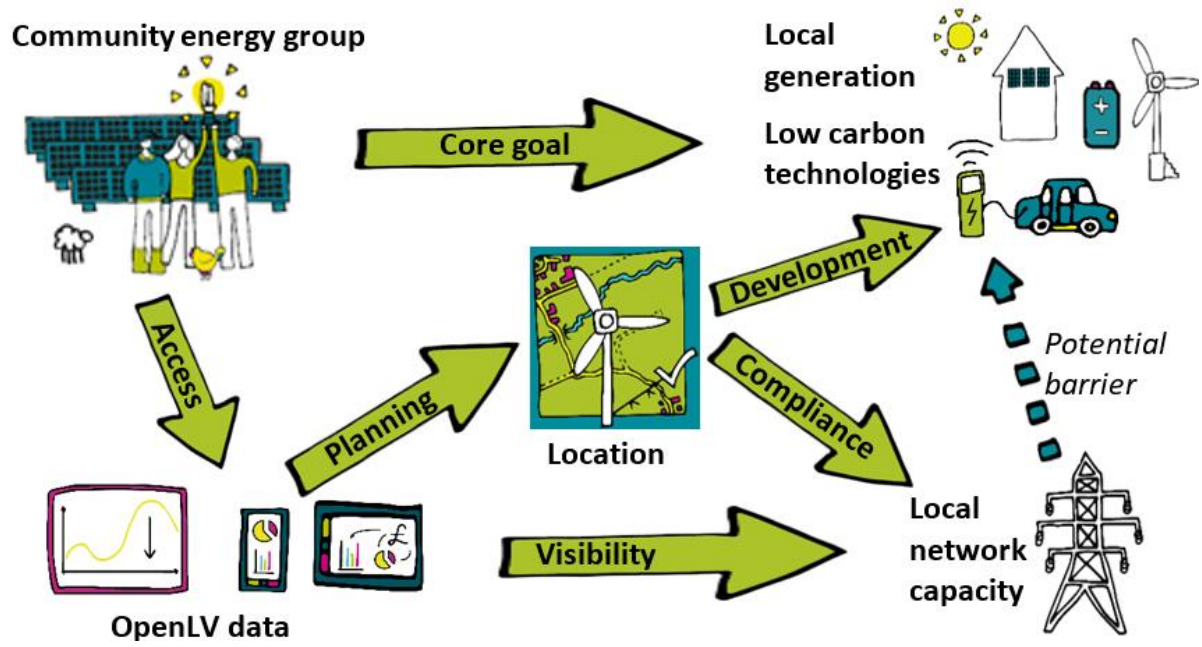


Figure 9: The value of substation data to plan projects

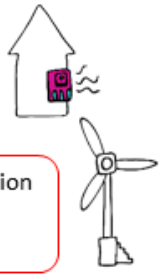
Many community energy organisations report struggling with grid constraints when looking to develop new generation projects or install new low carbon technologies in homes. Figure 10 shows the process of using OpenLV data to try and overcome these barriers.

Using substation data to plan new low carbon technologies

1 Community energy organisation accesses OpenLV data

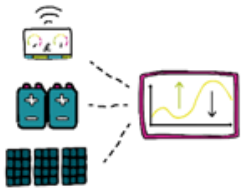
- Work out which local substations you want to monitor
- Apply by getting in touch with WPD or visiting the CSE website
- Go to the OpenLV webapp to set up graphs for your community

2 Collate information on local renewable generation and low carbon technologies in the community



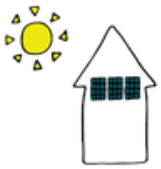
- Set up an online survey for people to tell you what household LCTs they have
- Get local generation data from WPD and Government statistics
- Cross check this information using tools like Google maps to see roofop solar

3 Add direct generation data feeds into the OpenLV app



- Contact generation owners and operators to access live and historic generation data
- Feed the live data into the OpenLV webapp through an API

4 Estimate solar rooftop capacity and set up OpenLV app



- Use the OpenLV data to see what headroom there is at the substation
- Use Google Maps, householder survey's and WPD's network capacity map to estimate the capacity for new generation

5 Compare community consumption and generation over time

- Get live and historic consumption data from the OpenLV webapp and home smart meters
- Set up graphs in the OpenLV webapp to directly compare local generation and consumption

6 Identify opportunities for more renewable generation based on local data

- Compare data on generation and consumption together with local network capacity
- Identify viable opportunities for new generation
- Contact WPD to develop a new project – read the Connecting Community Energy guide

Figure 10: Steps to using OpenLV to plan new low carbon technology schemes

6.1 Planning new low carbon technologies

Installing new low carbon technologies is a core goal of many community energy organisations, and some involved in the OpenLV trial used the data to plan and build a business case for new installations.

Owen Square Community Energy included 'current' and 'active energy' data in funding applications for a low carbon heat project. The community group used the data to show that there was capacity on the local network to take on more demand from electric heat (heat pumps), so they could be installed without incurring network reinforcement costs

Another example of a community group linking OpenLV data with local generation was Yealm Community Energy, who installed energy data loggers in people's homes and used OpenLV data to show the link between domestic energy use, substation activity and electricity generation at a local solar farm (Newton Ferrers).

6.2 How the CSE webapp supports this use case

The webapp collects and processes a number of useful bits of information for local communities that supports this use case, including:

Data collected	Webapp usage
Carbon intensity	Using the active energy data point, the website measures the carbon intensity (gCO_2) of energy being used from the grid at a given time, and shows for every Watt used, the estimated grams of CO_2 created. This data uses WPD's regional and national averages.
Renewable energy generation	Displaying local renewable energy generation data in the website was developed for four of the trial projects. Marshfield viewed electricity generation from PV on a community building, a wind turbine at the school, and estimated domestic PV generation on roofs in the village. Bath & West Community Energy had data from solar PV and battery installations, while Yealm Community Energy and Tamar Energy Community viewed output from large solar arrays close to the substations being monitored.

6.3 Presenting the information

The webapp allowed communities to compare regional carbon intensity with national data so they were able to identify whether their area had higher or lower carbon impact. Figure 11 shows this comparison for electricity use in Bath on 15 October 2019. This shows that local carbon intensity was lower and much more variable than national levels, illustrating the amount of renewable generation on that part of the distribution network.

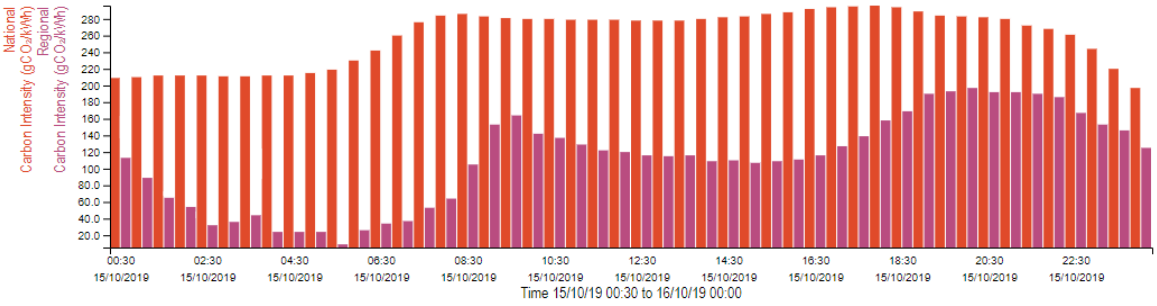


Figure 11: Regional carbon intensity vs. national for Bath & West Community Energy

6.4 Other applications from OpenLV trial

Energeo develop tools to analyse the built environment and the company was involved in the part of the OpenLV trial for businesses and academia. Energeo was given access to data from ten sites and used both historical and real-time data to show what is currently going on and to explain any anomalies or patterns and trends.

This data was used with the Energeo platform which can assess 1000 homes at a time to assess suitability for solar and how the trends might change.

The tool which Energo developed, when used with OpenLV data, allows local authorities to plan a decarbonisation strategy by helping identify suitable new sites for renewable generation. This functionality could also be used by a community energy organisation to identify sites for new low carbon technologies in their local area.

For more information see: https://openlv.net/studies/business-academia/

6.5 Further reading

Regen and WPD produced a community energy guide to getting a network connection for people developing community energy projects.

The document introduces the electricity network and an overview of the application process for different types of new energy generation relevant to community energy groups. There are details of and links to further sources of information such as on network engineering, innovation projects, local supply and alternative connection types, which can be used in conjunction with OpenLV data when planning new low carbon technologies.

https://www.regen.co.uk/publications/connecting-community-energy-a-guide-to-getting-a-network-connection-2/

6.6 Case study 2: Rooftop Housing Group

Rooftop Housing Group were an OpenLV trial participant and are a charitable housing association who provide affordable housing to all household types and needs.

As part of their work to regenerate one of their estates in Bishops Cleeve, they used local electricity data to start conversations around energy and help residents in fuel poverty. They held an open event at the start of the project where they explained to residents the OpenLV project and why they were participating in the trial.

Information and graphics from the app were displayed in the Rooftop office in Bishops Cleeve and shared with residents, who could drop in and talk about energy issues. Rooftop also produced materials to share with the local school, supported by CSE.

In addition, Rooftop were interested in exploring whether there was potential to install solar rooftop generation to help generate electricity for their residents and noted that the substation and local network information they received from the webapp would help them understand the potential to develop new homes in the area and what technologies they might be able to install in those homes, for example, solar PV, heat pumps or EV chargers.

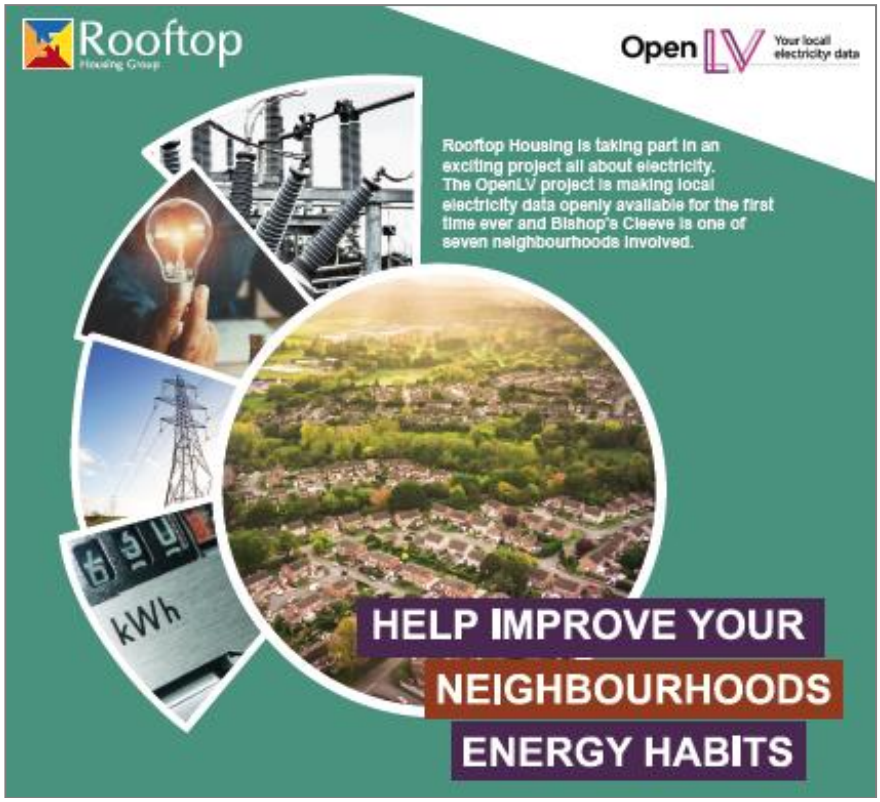


Figure 12: Rooftop's flyer to promote the project amongst residents

7 Exploring potential for revenue from network services

Some trial participants used the data to understand how they might be able to participate in providing flexibility services to the local network as an additional revenue stream. This use case was of interest to advanced community energy organisations and those who had more technical skills and generation capacity.

As more heat and transport becomes electric, householders and the community will be able to use flexible electricity demand to help manage the network and to take advantage of lower cost electricity at peak time. In parts of the network which are experiencing constraints, such as those identified by network operators as part of their network planning, flexibility can be sold as a service – turning up or down electricity demand or generation – to help avoid network overloading.

In the future, coordinating collective community impact at a substation might allow organisations or communities to change how and when they use electricity in order to respond to network need – and potentially be paid to provide those services to the local network. Having easy access to local substation data which shows exact electricity use will help to facilitate this.

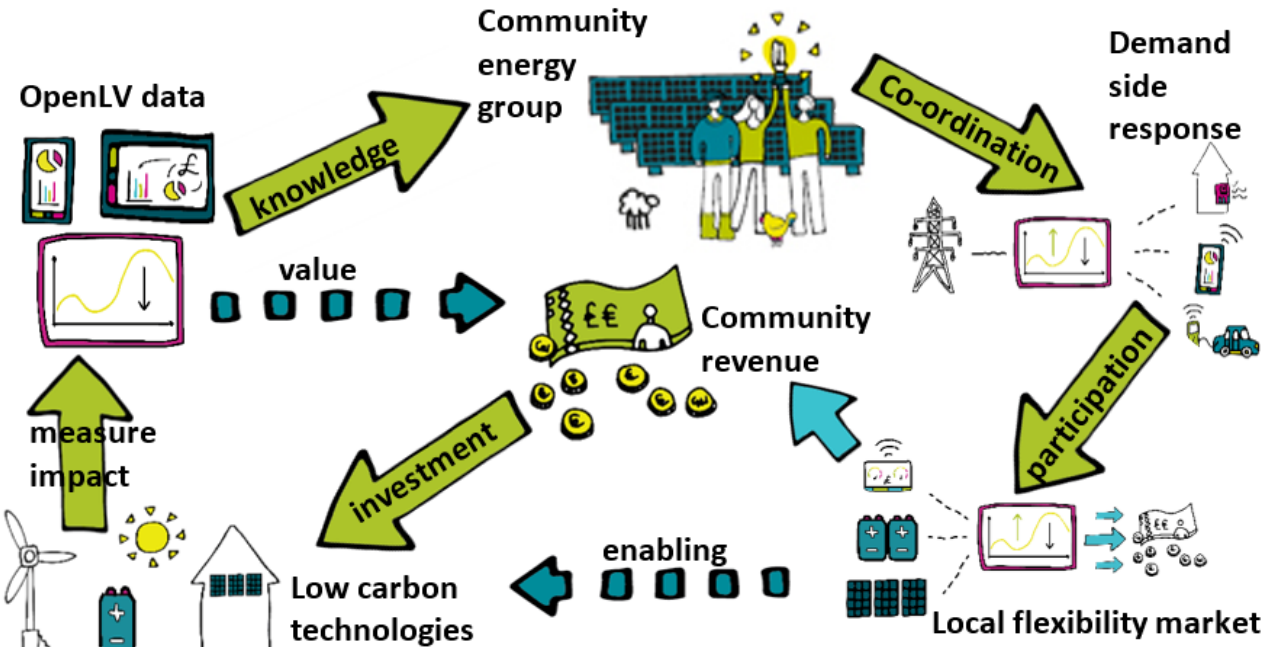


Figure 13: Flexibility value for local communities

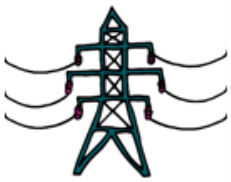
If situated in a constrained area of the network, the electricity load from a collection of households connected to the same substation could be aggregated to provide flexibility, with OpenLV data giving proof of demand side response (DSR) actions as part of a flexibility contract with a DNO. Figure 14 shows how this can be done by a community, after accessing OpenLV data then developing a relationship with their DNO.

Using substation data to explore network services

1 Community energy organisation accesses OpenLV data

- Work out which local substations you want to monitor
- Apply by getting in touch with WPD or visiting the CSE website
- Go to the OpenLV webapp to set up graphs for your community

2 Understand existing network conditions and local constraints by engaging with the DNO



- Use OpenLV data to assess local substation headroom
- Have a look at WPD's network capacity map to see generation and demand capacity in your area

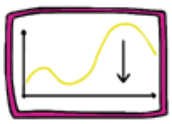
3 Set up a contact group and willing community participants to trial energy behaviour change

- Tell people in the community about the project and the logic of energy behaviour change
- Find volunteers willing to trial changing their energy habits, with the help of community champions

4 Model a time of use tariff or flexibility contract and send alerts to participants to encourage DSR

- Model TOUTs on the OpenLV webapp to tell people shifting energy use how much they could save on energy bills
- Set up alerts on the OpenLV webapp to tell people when they should use more or less energy, simulating a DNO call and response flexibility contract

5 Monitor responses and impact on the local network



- Assess the community response to DSR nudges – how much have people changed their energy behaviour?
- Look at OpenLV data to assess the impact community DSR has had on the local network

6 In the future: Engage with DSR aggregators or bid in to DNO flexibility tenders

- Visit WPD's Flexible Power website to see what local flexibility opportunities exist
- If you're in a part of the network where flexibility is needed, partner with an aggregator or look at an ECAS model

Figure 14: Steps to using OpenLV data to explore network service provision

7.1 Communities providing network services

Electricity demand can vary significantly during the day and be subject to considerable peaks and troughs in demand, both of which can cause the electricity system and network to come under stress. Figure 15 shows energy use at the Meavy Way substation in Tavistock on 13 November 2019, a typical 24-hour profile including a significant evening peak. As more transport and heating becomes electrified, this peak is likely to rise, causing issues for the network. In areas where this is an issue, network operators may offer payments for consumers to be flexible in their energy use and offset this peak.

Bath & West Community Energy (BWCE) used the data to support their demand reduction campaign months (June and October 2019) where they encouraged residents to be more energy efficient and 'turn down' their demand where possible, with the aim of measuring the impact on the substation. Other communities also expressed interest in developing this use case as an opportunity to harness future revenue stream.

This campaign gave BWCE a clear indication of how much flexibility could be called upon in their community if they were to provide network services, bid into a DNO flexibility tender, or sign up with an aggregator.

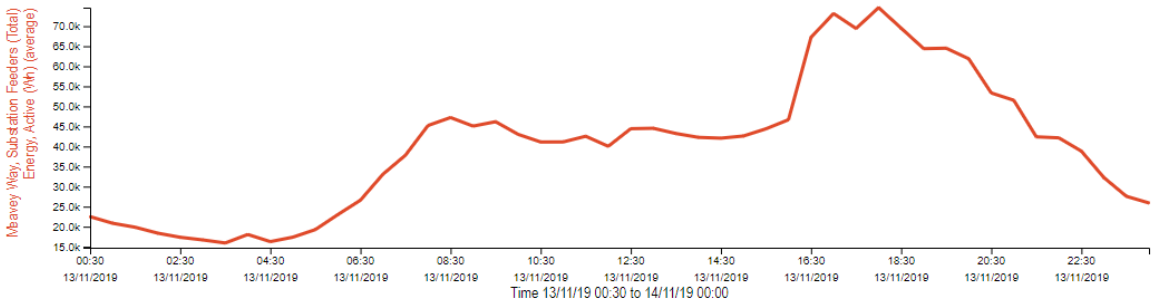
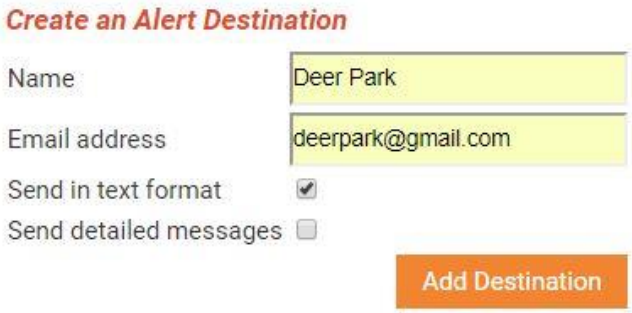


Figure 15: A typical day energy use at the Meavy Way substation in Tavistock

7.2 How the CSE webapp supports this use case

The OpenV webapp can be used to set up alerts to be sent out to members of a community when certain conditions (related to the substation) are met – simulating a call-and-response flexibility contract with a DNO, where the network operator would send out a call to the flexibility provider to modify their demand, generation or discharge for a financial reward.

To encourage flexibility and demand side response (DSR) as part of a behaviour change campaign, an alert can be set up to send a text to a group of residents when the combined energy used by households on a particular feeder goes above a certain amount, or when the temperature of the transformer on a substation exceeds a set temperature. This can make it easier for residents to engage in energy issues, as they don't need to go actively seeking data.



In addition, a 'Reverse Alert Count' has been set up in the webapp as a way for communities to record how many local people actively responded to alert messages generated in the web app. This can be used to measure how many people are engaging with the substation data.

Figure 16: setting up an alert through the webapp

Useful data streams for exploring flexibility and network services include:

Data collected	Webapp usage
Current	The average current (A) value for a substation shows the transformer load. When combined with a temperature graph, this is a useful indicator of whether substations are being overloaded - an important measure for some communities to determine whether the substation has capacity to take on extra load.
Substation temperature	Substation temperature (ºC) measurements are recorded by the LV-CAP sensors and are a rough indicator of when the substation is under pressure. Several communities looked at the records for the temperature of the oil inside and outside the transformer to see if there were any periods when the substation seemed to be under particular stress.

7.3 Further reading

WPD advertise their Constraint Managed Zones (CMZs) on their Flexible Power website, and you can see whether your community is eligible to provide flexibility services using their Postcode Checker.

Regen's Power to Participate report and Local Flexibility Markets guide are useful extra reading for community energy organisations looking to provide flexibility and other network services to their DNO and the National Grid.

7.4 Case Study 3: Bath & West Community Energy

Bath & West Community Energy (BWCE) used OpenLV data as part of their Solar Streets project. They wanted to measure the impact of domestic PV and battery installations they were doing in their community on the local substation and use the data to build a business case for further installations by understanding what services they could offer to the local network. BWCE also used the data to encourage behaviour change as part of two demand reduction and shifting campaign months during the project, (June and October 2019), along with other campaign days, advertised in their newsletter.

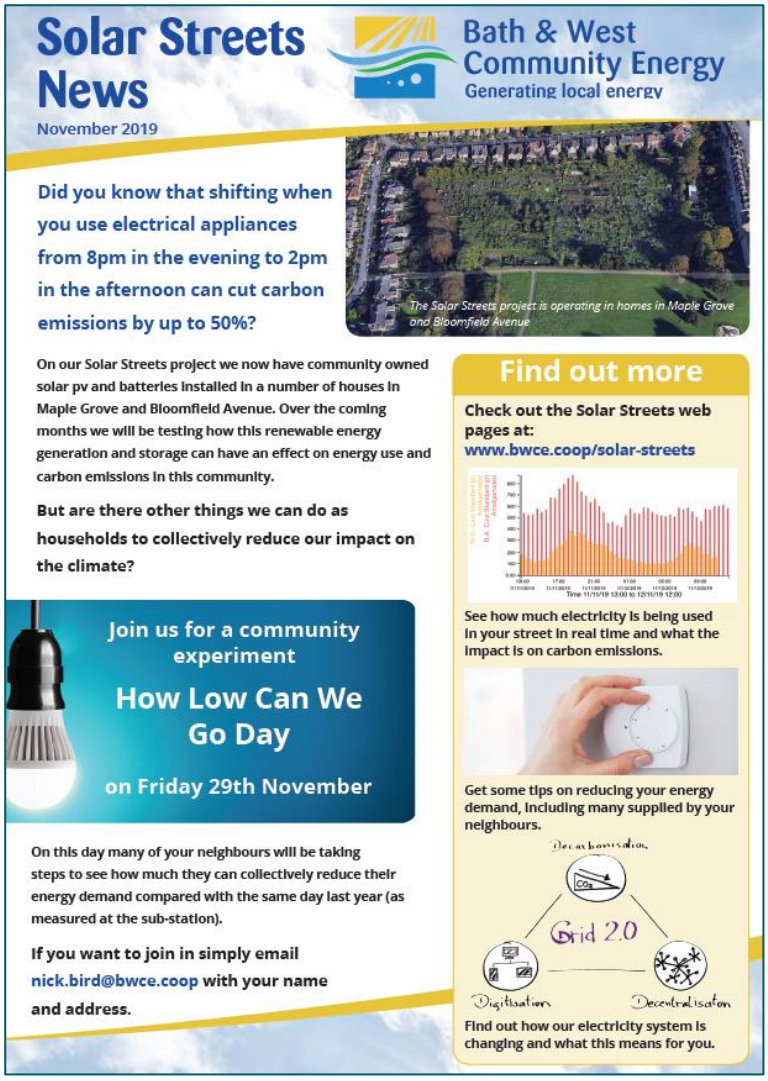


Figure 17: BWCE's newsletter to residents

As part of their community engagement, the substation data was used with home energy monitors offered to residents to measure the impact of energy behaviour change on the local substation, in terms of cost and carbon savings, through the app and an online survey.

BWCE ran drop-in sessions in the local pub, sent out newsletters and hosted community meetings as part of their project to engage local people in energy issues and help people better understand the energy system, helped by substation data.

8 Conclusions and next steps

The OpenLV project showed what benefits there are to be had for community energy organisations and housing associations from accessing local substation electricity data. Participating organisations found this data particularly useful for:

- Engaging community members and tenants in energy behaviour, getting people to think about their energy use and the role they have in the energy transition.
- Planning new projects involving low carbon technologies, and their impact on the local network.
- Exploring the potential to offer services to the network such as flexibility, and potential business models from this.
- Upskilling their own organisation by learning more about how their local electricity network operates.

There is now the opportunity for other organisations in WPD's licence areas, such as community energy groups, local authorities or housing associations, to access their own local electricity substation data.

To find out more about next steps and to register your interest, visit CSE's website: https://www.cse.org.uk/news/view/2421