WESTERN POWER DISTRIBUTION

INNOVATION

NEXT GENERATION NETWORKS

COMMUNITY ENERGY ACTION CLOSE-DOWN REPORT

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Glossary

Abbreviation	Term
WPD	Western Power Distribution
CEA	Community Energy Action
CSE	Centre for Sustainable Energy
MEA	Marches Energy Agency
ACE	Action in Caerau and Ely
NEF	National Energy Foundation
CEP	Community Energy Plus
GEM	Greenbank Energy Monitor
LCT	Low Carbon Technology

1 Executive Summary

The Community Energy Action project investigated the methodology and practicality of engaging with domestic communities for demand side response. WPD wanted to investigate whether engagement on a community level would be an alternative to conventional reinforcement and what was the most appropriate way to do this. Ten economically and geographically diverse communities were identified, falling under five energy charity remits. These communities were homes fed from a single distribution transformer rather than recognised community boundaries. The energy charities engaged with the communities to encourage both the reduction of peak demand but also energy usage in general. To monitor the change in the demand one minutely monitoring was installed at the distribution substation with GridKey units. This information was also uploaded in near real time to a publically available website.

Various techniques were used to initially engage with the communities and then to start to change their behaviours around energy. Techniques included coffee mornings, pop up stalls, home visits and a washing at 30 degrees campaign to name a few. Each of the engagement techniques had variable impact depending of the specific community.

The project set out to establish whether community level demand side response would be an effective way to influence demand for the DNO. This trial was designed to emulate how a DNO would roll out this sort of community demand side response. To ensure that the community was sufficiently incentivised, the reward was set intentionally high. However, learning from qualitative analysis has indicated that a financial community incentive is not a strong driver. The community demands had a significant amount of day to day variability, this was in turn made up by homes which also had a lot of variability making difficult to predict or guarantee the level of response.

Although the techniques tested did not lead to significant reduction in demand on the distribution substations, there were other softer benefits. The individuals within the communities who engaged increased their understanding of energy and in some cases their changed behaviour allowed them to manage their energy bills better. Some of the engagement techniques used would be good tools to engage with communities with vulnerable and fuel poor customers to increase their awareness around energy and help them manage it better.

WPD are testing different implementations of demand response through other innovation projects, such as: direct appliance control, tariff based and direct commercial arrangements with industrial and commercial customers. The lessons from this and other projects will be valuable to DNOs when deciding on demand side response policies for full deployment.

The main outcome of the project was: under this implementation trialled there was no statistically significant variations in demand due to the interventions carried out. This effectively suggests that community focused demand side response cannot be used by DNOs to circumvent asset overloads and that conventional reinforcement is a cost effective

and time efficient way of dealing with overloads. The project has proven that the cost of incentives and customer engagement significantly outweigh conventional reinforcement.

2 Project Background

The key task of this project was to determine if demand side response is effective for communities who have demand information and incentives available to them. WPD selected the Centre for Sustainable Energy as a partner as we have a worked together before and have a good working relationship with excellent resources in close proximity to WPD's head office. We worked with four other charitable organisations who specialise in energy spread across WPD's licence area that helped select 10 communities with different characteristics to be involved in the project. There was a particular emphasis on communities that have high low carbon technology adoption (such as heat pumps, electric vehicles and photovoltaics). This would increase WPD learning on understanding how low carbon technologies change demand profiles and affect the LV network. We collected community level electricity network and energy flow data and this was shared with the community via a website and specially designed energy monitor that could display the individual's demand and the overall community demand. They also received local energy efficiency advice from energy charities. We incentivised the communities to reduce demand at peak periods of the day to reduce potential overloading of the LV network. This was done in a way similar that a supplier or DNO in the future could use time of day tariffs. Once the demand profiles have been understood through interaction with the communities the findings could be reported to explain how effective the demand side response actually was.

3 Scope and objectives

The scope of this project was to work with 10 communities to gather demand data while implementing incentive tariffs. This was aided by community demand data being made available. In addition to this a community energy monitor will be developed to allow customers to see at a glance what their demand and the entire community demand was. The community monitor solution was generic and available for use in future. The benefit of this project was seeing if using demand side response could reduce the peak demand thus allowing us to defer or even negate conventional reinforcement which could reduce the cost demand driven reinforcement significantly. Additionally, due communities being selected with preference of low carbon technologies this allowed WPD to get indicative demand data for communities of the future.

4 Success criteria

The LCNF registration proforma stated:

- Understanding the effectiveness of demand side response at a community level.
- Understanding what effect do incentives provide.
- Communities are successfully engaged and that we receive positive feedback.

- Developing a community energy monitoring device
- Understanding the potential effects of low carbon technology on the LV network.
- Delivering the project on budget and on time.

5 Details of the work carried out

A significant amount of the work was carried out by CSE which is described in detail in their report, a link can be found in the references sections. This section is a combination of excerpts and paraphrasing from this report with elaborations around the aspects that WPD were directly involved in.

An outline project idea from the Centre for Sustainable Energy (CSE) was pitched to Western Power Distribution (WPD) in June 2012, describing the potential for a demand-side intervention project that used a network of five established energy charities[1] to stimulate and support behaviour change initiatives in communities attached to WPD's distribution network. The Centre for Sustainable Energy is the largest of these organisations and the only one with a dedicated research team that has the data analysis and programming skills to build the kind of web-based tools that would be needed for such a project. As such, it was proposed that CSE played a coordinating role in directing the research in addition to an on-the-ground role in engaging directly with two communities. The other charities were: National Energy Foundation (Milton Keynes), Marches Energy Agency (Shropshire), Community Energy Plus (Cornwall) and Severn Wye Energy Agency (Glos & S. Wales).

WPD submitted a registration to the LCNF Tier 1 funding stream based on the outline proposal from CSE having being adapted to be more ordinated around substation assets rather than communities in general. The major difference between the original proposition from CSE to WPD, and the registration was a neighbourhood being defined by its substation rather than any social definition. As such, the project registration was for monitoring at 10 individual substations, none of which related to a recognised community boundary. This proved to have a considerable impact on the delivery of the project but was essential to directly test network benefits.

5.1 Set-up phase

The set-up phase was originally planned to run from October 2012 to February 2013, and was to cover:

- The selection of participating communities
- The installation of the monitoring equipment at participating substations
- The establishment of a reward regime based on the deferred value of network reinforcement
- The development of mechanisms to record inputs, outputs and learning from each community in line with agreed protocols for project monitoring, evaluation and reporting

[1] The proposed charities were The Centre for Sustainable Energy (Bristol), National Energy Foundation (Milton Keynes), Marches Energy Agency (Shropshire), Community Energy Plus (Cornwall) and Severn Wye Energy Agency (Glos & S. Wales), all of whom participated in the final project.

- The development of a public, web-based interface that could present the consumption data in as near to real-time as possible

The set-up phase in reality was much longer, running until December 2013, which then necessitated an extension to the operational phase, which would otherwise have only had around 10 weeks to run. The selection on the communities took longer than anticipated requiring several iterations between the charity partners before the substation sites could be identified and surveyed to ensure they were appropriate for monitoring.

The monitoring equipment was also delayed, and then arrived over a couple of months leading to a long installation period. Due to the high resolution data being transferred over the mobile phone network at the limit of what is possible and a bespoke transfer system to send the data to CSE which required optimising, the system was unreliable for some weeks after installation. This also delayed the project timeline for the establishment of a baseline of data against which predictions of future consumption could be made. This needed to occur after the monitoring equipment had been installed, but before any interventions had been carried out. These issues combined to delay the start of the intervention period by around 11 months.

5.1.1 Identifying the communities

Identification of the 10 substations to be monitored was carried out between January 2013 and April 2013. The data analysis was carried out by CSE, using datasets provided by WPD. The five participating charities each defined the area across which their advice and engagement services were active, and this created the starting point for the search.

Basic parameters were established at the start:

- Substations should not have any large non-domestic users
- Substations should have a minimal number of small non-domestic users
- There should be at least 50 domestic addresses on any monitored substation

After further analysis, it was also concluded that:

- Off gas communities should be avoided
- Areas with high levels of installed PV and other micro-generation technologies should be avoided.
- Fewer than 25% of the addresses on the substation should be on an economy 7 tariff.

The last three parameters were added because it was felt that with only 10 substations in total, having these other variables would have made it too difficult to design interventions that we could learn from across a wider number of substations, and that the demand prediction model would become too complex. Also it would have increased the number of variables that needed to be considered when comparing the impact of the interventions between the communities. With hindsight, CSE believed that the avoidance of areas that were off the gas network or with high levels of Economy 7 customers was a missed opportunity. The decision to exclude them was taken for good operational reasons, as it was felt that their predominant peak demand, from storage heater use, lacked the controllability required to shift this demand. Also Economy 7 customers are the focus of another WPD

project. As the focus was on behaviour change, and without hardware upgrades to the heater or the controller being planned or budgeted for, this was excluded.

Finally, it was felt that the chosen 10 substations contained a mixture of communities in terms of socio-economic indicators, such as the Indices of Multiple Deprivation to give a wide indication of the impact that the interventions. Previous community projects had been focused in affluent semi-rural locations with an active and well-motivated community group. It was important to demonstrate how other types of communities would react.

By applying these filters, many thousands of candidate substations were narrowed down to 878 across the 5 charity areas. These were then further filtered by CSE to remove all those where the substation connections produced the most 'abnormal' community geography (e.g. where back to back houses, rather than houses that were facing each other were connected to the substation). This was a useful screening process, but could not address the fact that, even where substation geography followed natural community boundaries, there were no substations that mapped directly onto a recognised community, though the Tinker's Bridge area was a larger proportion of a recognised 'community' than most of the others. This created considerable difficulties during the operational phase.

A long-list of substations was presented to each of the charity partners for consideration, and they narrowed this down to 2 preferred communities each. In some cases, the long list, having selected for all the criteria shown above, resulted in a set of communities where the charity partner had no real presence other than it falling within their wider advice area, or where there were no local contacts or active and engaged groups with whom they could rely on a good working relationship. This meant that there was more 'starting from scratch' than had been anticipated at the start of the project, however made the project more representative and replicable.

Subsequent surveys for the appropriateness for monitoring equipment determined that some of the chosen substations were not suitable for installation of the equipment. Issues included concealed cable cruxes so the Regowski coils could not be fitted, not enough space to fit the monitor and not strong enough mobile signal to send the data. In these cases the next most suitable community had to be chosen instead. These surveys helped make the installation process smoother later down the line.

The final, selected substations are shown in Fig. 1 below:

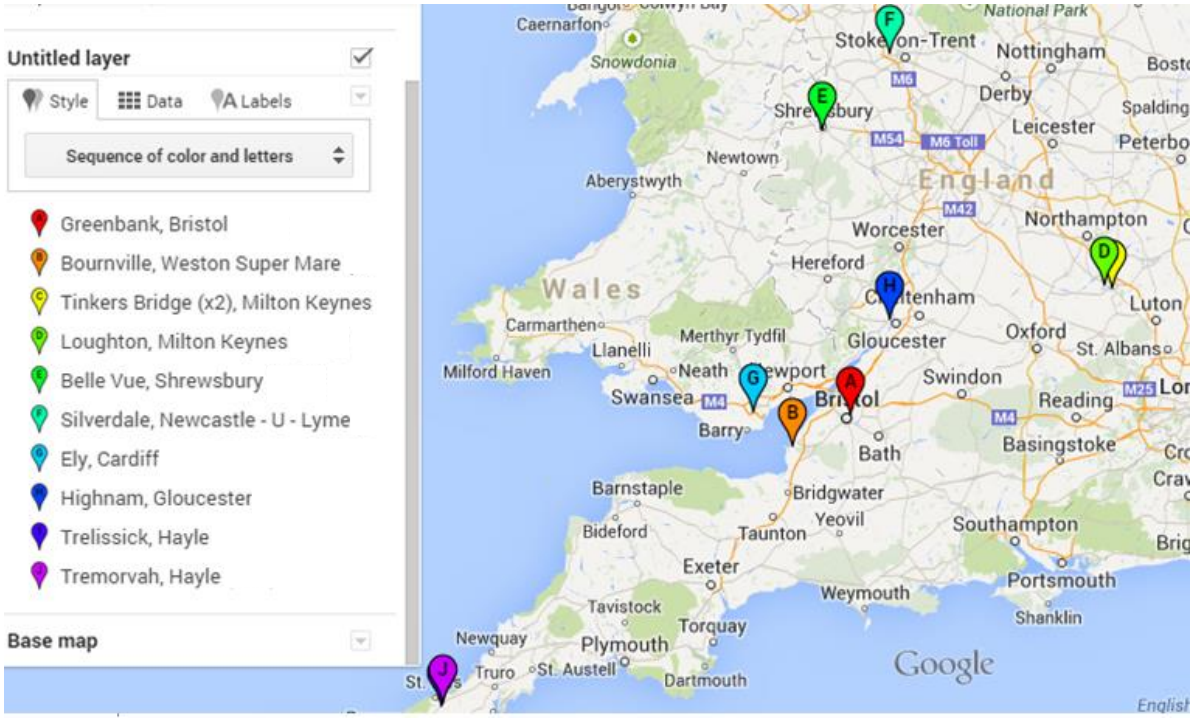

Fig 1: Location of all participating substations

The selected communities represented a reasonable cross-section of typical UK communities, with more lower income areas than affluent areas. Brief descriptions are given below:

Greenbank, Bristol (212 homes)

Greenbank falls within Easton ward in Bristol. Easton is an inner city area of the city of Bristol. It has a younger average age than that of England and Wales, and around 35% of the population is of Black or Asian origin. Easton is one of the most deprived areas in the south west of England. Despite this, it also has a bohemian aspect and is home to many of Bristol's younger creative people, looking for affordable housing and a sense of community – Greenbank is typical of this sector of Easton's wider population. Easton is a vibrant community with local community and pressure groups, local bands, political groups, housing and workers cooperatives and some anarchist communes. It also has three mosques, a synagogue, a Sikh temple and several churches of different denominations. Tenure is around 40% owner occupied.

Bournville, Weston Super Mare (93 homes)

Bournville is a residential area outside of the centre of the town of Weston-Super-Mare - a seaside town in the unitary authority of North Somerset. Bournville Estate is a housing estate built in the mid to late 20th century. Main Mosaic classifications include families in predominantly low rise social housing with high levels of benefit need, and older tenants on low rise housing estates where jobs are scarce. More than 2/3 of local housing is rented via the social landlord.

Tinkers Bridge, Milton Keynes (337 [195 + 142] homes)

Tinkers Bridge lies to the south of Milton Keynes, alongside the Grand Union Canal. It consists of a narrow housing grid square alongside the canal and was one of the first areas in the new city to be constructed. The main development is of two storey terraced houses built between 1972 and 1974. There is a local park, a general store and a meeting place. The area is mainly populated by young people renting flats in high density social housing, and older childless tenants in flats. There were two substations monitored in this area, though to all intents and purposes the area was treated as one. The second substation in this area was situated in a section of housing dominated by young families in low-rise social housing, and young parents with significant need for state support. Tenure is predominantly social renting.

Loughton, Milton Keynes (203 homes)

Loughton is an ancient village, modern district and civil parish in Milton Keynes, Buckinghamshire. The original village has now been incorporated into the modern 'grid square' of Loughton. However much of the character of the old village remains with the Church and a cluster of several sixteenth century buildings. Today Loughton is a mainly residential area but is also home to a large Equestrian Centre. The population locally is a mix of couples with young children in comfortable modern homes and early middle aged parents. Incomes are relatively high and most residents own their own homes.

Belle Vue, Shrewsbury (168 homes)

Belle Vue is a suburb of the town of Shrewsbury, Shropshire. It is located about a mile south of the town centre. "Belle Vue Road" runs through the middle of the area, which has many public houses. It also has a selection of small shops, though many have become houses in recent decades. Main Mosaic descriptions for the area are residents with sufficient incomes for right to buy social housing and often indebted families on low rise estates. Tenure is predominantly owner-occupied, but with about 25% social renting.

Silverdale, Newcastle-under-lyme (235 homes)

Silverdale is a suburban village and civil parish in Staffordshire, west of Newcastle-under-Lyme. The last colliery, Silverdale, closed in 1998. Mosaic classifications summarise the area as being a mixture of families in low-rise social housing with high levels of benefit need, or vulnerable young parents needing substantial state support. It is a mixed tenure area with higher than average privately rented figures.

Ely, Cardiff (346 homes)

Ely is a community primarily dominated by council housing in western Cardiff, Wales. The predominant groups are families in low rise social housing with high levels of benefit need, and older tenants in social housing with high unemployment rates. Tenure is predominantly social renting.

Highnam, Gloucester (126 homes)

Highnam is a village and civil parish on the outskirts (3 miles NW) of the city of Gloucester. As a village, Highnam is fairly small, containing a few social amenities, including: the Church of the Holy Innocents, a school, a village hall, a day nursery, a village shop and a doctor's surgery. Most homes are owner occupied, with more than half owned outright with no mortgage.

Trelissick, Hayle (160 homes)

Hayle is a small town, civil parish and cargo port in west Cornwall. It is situated at the mouth of the Hayle River and is approximately seven miles northeast of Penzance. This substation falls in an area characterised by couples and young singles in small, modern starter homes. Tenure is predominantly owner-occupied, and there are more young children than in Tremorvah.

Tremorvah, Hayle (202 homes)

This area of Hayle is characterized by residents with sufficient incomes in right-to-buy social housing, and low income older people on long established former council estates. Tenure is a mix of social renting and owner occupied.

5.1.2 Installing the monitoring equipment

To monitor the substation demands an accurate and remotely accessible monitor was required which needed to be interrogated in near real time. This was to act as an engagement tool but also allow the charities and WPD to assess the impact of the interventions. The GridKey monitor was selected as it had the required functionality and it had been previously successfully used in other WPD LCNF projects.

Installation of the monitoring equipment was scheduled to begin in April 2013. However, major delays at the manufacturer in the Far East resulted in a delayed shipment that put this timetable back into June. Further delays then ensued due to other demands for the units, meaning that the full complement of 11 monitoring systems available between June and August 2013.

Once all equipment had been installed, there was a subsequent period of persistent loss of data from various substations. In some cases, this was caused by failures in the cellular communications system that was transmitting the data, and required replacement or upgrading of the antennas. However, other teething problems also occurred, including:

- The Loughton substation monitoring equipment was installed but the equipment needed to be transitioned from WiMAX to GPRS.
- All the equipment was shut down for a planned maintenance programme that was not communicated in advance, losing several days' data.
- WPD technicians needed to carry out maintenance work at the Silverdale substation shortly after the equipment was installed. The design of that substation was open tar-filled LV board, which meant that the Rogowski coil current sensors for the GridKey unit had to be attached to the fuse carriers themselves. When the Rogowski

coils from the monitoring equipment were removed for the maintenance work, they were unfortunately replaced the wrong way round. This created false readings of apparently negative consumption in the data which, although subsequently corrected, was not rectified for several weeks. This was picked up on and the local team were informed to take note of the direction arrows in the future to avoid it happening again.

- There were consumption spikes from faulty monitors that affected CSE's abilities to analyse peak and overall consumption estimates and took time to resolve.
- For some substations there was loss of data for up to a week, or issues with data falling behind and then cutting off. This was especially prevalent at Tinkers Bridge, where the unit had to be replaced once and then still failed a few more times due to poor signal strength.

Due to the millions of lines of data being received, it took time for the server to recover from these delays and cutouts every time, sometimes meaning that the graphs for that area were several days out of date.

5.1.3 Building the website

In order represent the data feeds from the substation in a way that was meaningful to the layperson, CSE's research team developed a simple website comprised of three basic widgets for each community. It was agreed that the project name submitted to Ofgem (Community Energy Action) was far too generic, and it created a problem in that there was no available URL that could be purchased as the domain name. Thus a new project name was developed, around which a web identity could be built, and the project became known, for publicity purposes, as 'Less is More.' This was principally to move away from the very generic sounding project names containing the words 'community' and 'energy' and to convey the message that the less electricity was consumed, the more financial reward the communities could earn.

In the main, this new brand name was considered helpful and appropriate by most partners. However, there were some concerns from the charity partner working in Ely that it was developed without a community consultation and had no 'local' feel to it, and the charity partner working in the Midlands decided to rename the project 'Parksite Energy Challenge' in one of their substation areas for the same reasons, and 'Love your substation' in their other area. Given the incredibly short timetable for the operational period it is doubtful that a useful community consultation on the project name could have been carried out, and the qualitative evaluation in the remaining 8 communities does not suggest that a 'local' name is a key driver for engagement. However, the 'Love your substation' name did generate some positive discussion about the nature of responsibility for the LV network when the qualitative evaluation was carried out, which is certainly worth investigating further.

The website home page was very sparse in design and was principally designed to give basic information about the partners and the funders of the project, before guiding the user directly to the home page for their particular community as shown in Fig. 2 (note that the explanatory text has now been updated to refer to all activities in the past tense, since the

project is no longer live). The qualitative analysis showed that most people would have preferred a more interactive and visually appealing site. In addition, although there was no attempt to encourage competition or co-operation between (rather than within) the substation communities, the qualitative analysis also showed that residents were interested in the fact that their community was one of many across the country taking part and would have liked the opportunity to share experiences via a forum.

On clicking through to any of the individual substation pages, the user can see information on current energy consumption against demand for their own substation (see Fig 3, below) and the proportion of the community reward earned to date. These widgets were designed to be as simple as possible, so that charity partners could encourage local residents with simple messages such as 'we are aiming to keep peak energy use below the blue line'. However, a great deal of complex work behind the scenes went into developing the widgets and driving their content, which is described in more detail in the next section.

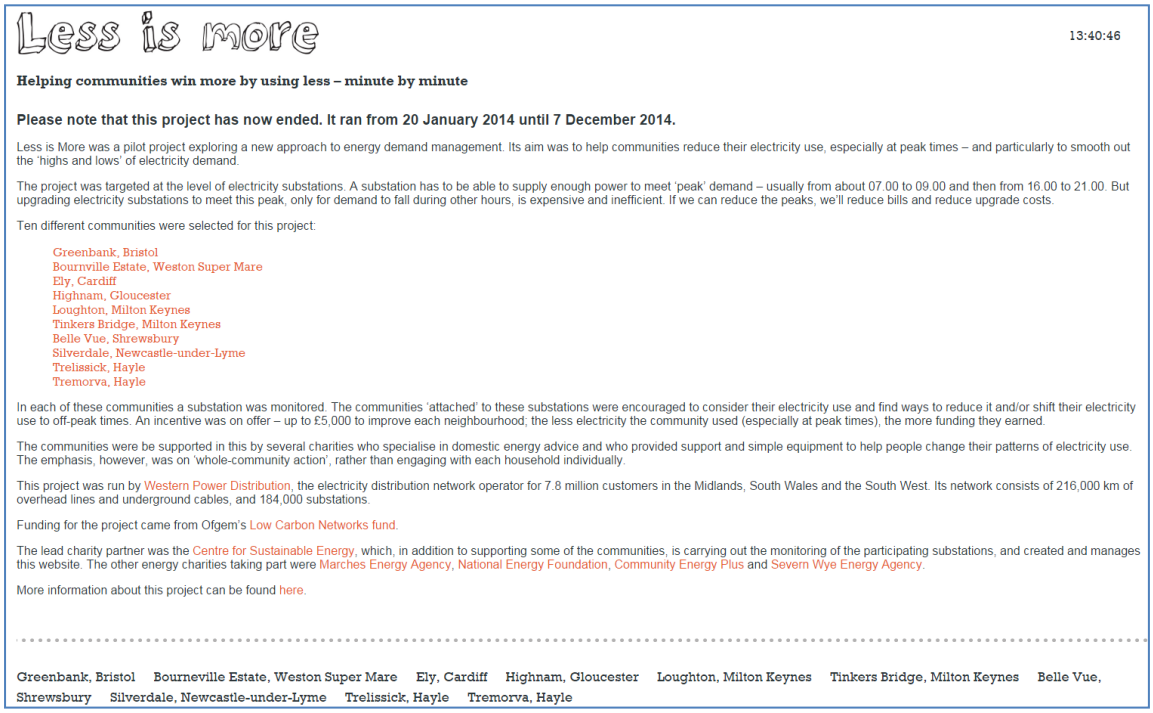

Fig 2: Screenshot of home page of www.lessismore.org.uk

Predicting future energy consumption

Step 1: Collecting baseline data

Consumption data from each electricity substation began to be collected when the first units were fitted and commissioned in early July 2013. All units were operational from late August and data was collected until the end of November 2013.

This baseline data was used to predict future consumption during the Operational Phase when interventions in each community were being carried out. Raw substation data was received as a database entry every minute from each of the 11 substation GridKey monitors

and stored automatically on CSE's web server using a Java application. Over the course of the project, this resulted in more than a trillion data points being received and processed.

Substation data records containing the energy values were calculated from the raw substation data each minute. The consumption Watt-hour (Wh) values were calculated as the sum of all feeder active energy values from raw substation data. New records were processed by the system using a trigger function that checked for the most recent preceding record and estimated the time elapsed since the previous sample. This elapsed time was used to calculate the "consumption Wh per minute" value, which was used in the baseline and reward calculations, and also handled issues caused by delayed records from the substations containing consumption values aggregated over several minutes at a time, making it unsuitable for use in the project.

Substation data was then validated by filtering for records that were not above/below +/- 10000 Wh per min, non-zero, not -1 and most importantly, had "timeSincePrevious = 1". This ensured that they were definitely minutely records. It should be noted that only measurements that were received within one minute of a preceding measurement were used in the baseline consumption data set. This was intended to prevent the adverse effects of measurement errors resulting from delayed transmissions due to monitoring equipment failure.

Consumption Wh were then aggregated to half hourly (HH) and scaled to account for missing samples, assuming average uniform consumption during missing samples within the same HH.

A moving average was then calculated using the baseline half hourly values to create a smooth curve for each substation and feeder.

The baseline data was used to create a profile curve for each day of the week for each substation. This is combined with the estimated consumption to project a relatively smooth estimated consumption curve for the user in the web-based visualisation shown in Widget 1 where the green 'estimated consumption' plot shown in Fig 3, below.

Step 2: Estimating and adding PV generation

Though substations had been selected where WPD records suggested the number of PV installations was low, it was not possible to avoid this completely. Since households with PV are able consume electricity which they generate themselves (and which therefore does not come through the substation) a method was devised to factor this in to the baseline data. Without addressing this, it would have appeared that a particular community had reduced its electricity consumption when in fact it had simply been a sunny day in an area with lots of installed PV (for example, Highnam).

- To do this, the electricity generated by PV installations during the data collection period (July to November 2013) was estimated using an online tool[2] and added to the baseline figures to give a total electricity consumption estimate.

[22] http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php

- Since solar electricity is not generated evenly across a 24 hour period, it was then assigned proportionally (and minute by minute) to appropriate times of the day.
- Using the same online tool, future electricity generation was forecast over the length of the project and incorporated into the overall results.

Step 3: Collecting weather data at substations
Another variable that needed to be factored in was the weather. Weather, and particularly temperature, has a significant effect on how much electricity people consume, and thus it was important to understand both what the weather was like at the various substations when the baseline data was collected and also whether this was warmer or colder than average. This was to ensure that, if the baseline data was collected during a particularly warm period, the community would not be penalised if the weather was much colder during the operational phase.

Weather data was collected in the neighbourhood of each substation during the baseline time period, including the temperature at noon on each day. This was then compared to the average for every individual day during the past ten years.

Estimates for future electricity consumption were then based on an assumption that the weather would be similar to the average weather over the last ten years. Real time weather correction during the operational phase was not possible, because this would have required retrospective alterations to the data which would have then affected the calculation of daily rewards (i.e. it could have resulted in a reward being earned and then taken away again once the weather correction had been carried out).

Step 4: Estimating annual consumption for each community
Using a proprietary model for energy consumption, the weather-corrected baseline data was used to estimate the total annual consumption of electricity for each community over the operational phase, an approach similar to that taken by retail energy companies when estimating household electricity consumption for future bills using only past meter readings.

The estimated annual electricity consumption was then allocated minute by minute over the length of the project and weighted according to the day of the week.

The measured and historical weather data (from step 2) were used to calculate the weather correction factor for a given substation at a given half-hour. The weather correction factor was equal to the load profile estimate (kW) under average weather conditions divided by the load profile estimate under the observed weather conditions. The aim was to create a scaling factor that would correct the consumption value back towards what we would have expected to see under normal weather conditions.

A Load Profiles function was used to calculate the total kW estimate for a substation for a given half hour as a weighted sum of estimates for different profile classes. Each estimate was weighted by the proportion of the substation customers assigned to that class. From this, a load profile estimate was produced for a given half hour, taking into account Noon Effective Temperature (NET), sunset time & profile class. The load profile estimate was

evaluated using a proprietary regression model for electricity consumption which depends on those variables and a set of coefficients.

This resulted in what appeared to be a good forecast of how much electricity each community was likely to consume, based on their previous usage and adjusted for weather, season, and power generated by solar panels (the accuracy of the predicted consumption curves is discussed in section 3.2 Quantitative Analysis).

Step 5: Estimating peak consumption for each community
Estimating the peak consumption required a similar approach to that of general consumption. First, there was a requirement to isolate the daily peaks, before applying the same model to adjust for PV generation, correct for weather effects and finally estimate the future peak consumption for the project.

Plots of both estimated overall consumption and estimated peak consumption were then displayed on the website: see pale green and pale blue plots in Fig 3, below in kWh per minute. This was then overlaid with 'real –time'[3] data from the substations, represented by the pink line.

The standard display covered a 72 hour period, as can be seen in Fig 3 below, but it was possible by using a url generator tool provided to all the charity partners, to display the graphs for any period of time throughout the project.

[3] In reality this was not absolute real-time data because a 10-minute rolling average was applied in order to reduce the chances of communities losing all of their reward for going above the target peak for a very short period. Rationale for this is further described in the next section.

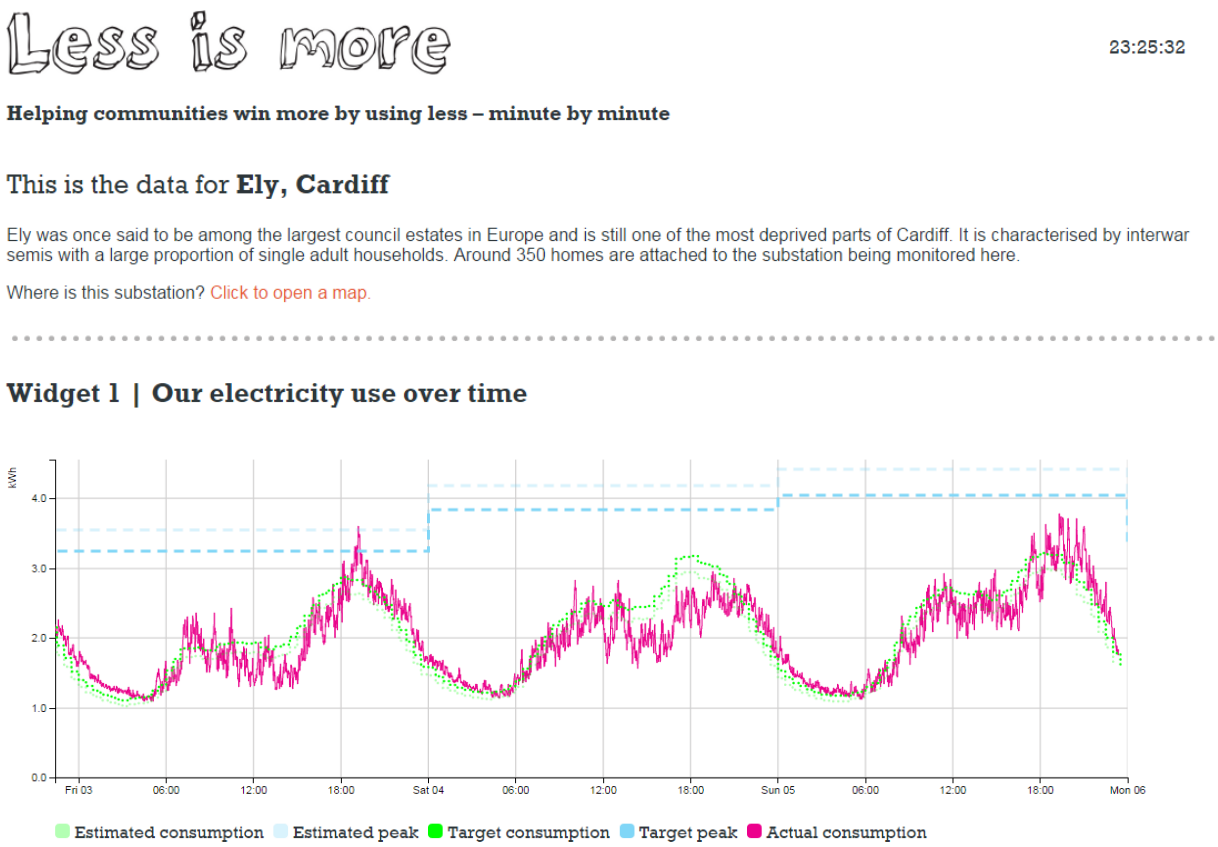

Fig 3: Screenshot of widget 1 from the Ely community page, www.lessismore.org.uk

5.1.4 Setting the reward targets

Establishing a reward total

The intention was that the project was designed around the concept of rewarding communities with a sum of money that was broadly equivalent to the value of the deferment of reinforcement works at the substation. The community was being encouraged to reduce their demand to ensure that their peak demand did not go over the rating of the transformer, avoiding it needing replacement. Effectively communities would be accepting some level of responsibility for this element of the local distribution infrastructure and then benefiting from their attempts to protect it from overload by being rewarded with the same sum of money that the DNO would otherwise have to outlay in order to carry out the reinforcement that would result.

However, once the project had launched and the typical cost of reinforcement was quantified taking account of the amortisation of costs, it appeared that the reward total per substation was as low as £750. This was not considered an adequate sum to offer as a reward for participation, particularly was this was for the entire year for the whole substation. Short term factor model to justify a higher incentive were considered, however it was not possible to quantify the perceived benefits accurately enough to result in a significantly increased reward figure because of the specific nature of short term faults.

Ultimately, a business decision was taken to base the reward structure on calculations from some initial calculations made in the FALCON project that looked at deferred reinforcement of the 11kV and 33kV network of around 30p per kWh. Linking this cost to the potential peak weeks across a year and aiming for a significant peak reduction, this resulted in the reward pot being set at £5,000 per community. This reward also did not consider the significant engagement costs that where incurred by the charities themselves.

Apportioning the rewards across the operational phase

The substation households participating in Less is More effectively had two goals; to reduce electricity use at peak times and to reduce total consumption. The £5,000 pot was allocated across these two aims; £3,000 for the peak target and £2,000 for the overall consumption reductions target in each community. For example, a peak-reduction target could be set that challenged a particular community to keep their actual peak electricity consumption in any day/week/month to 10% below the predicted peak (based on the predicted consumption curves developed using the methodology outlined above).

Both totals (£3,000 and £2,000) were divided by the number of days in the intervention period to give a total daily maximum reward that could have been earned by each community (£9.32 for meeting the peak reduction target and £6.21 for the overall consumption target). This was considered the most manageable method for dealing with apportioning rewards. It created an advantage in being able to ensure that the total prize pot could not be exceeded over the course of the project. On the downside, it meant that exceptionally good performance by any community on any given day could not earn extra reward (though in reality this was never really an issue).

The evaluation time period for both targets ran from 00.00 on 20 January 2014 through to 23.59 on 7 December 2014. The participating communities could view their total reward pot and rewards earned from both the peak and overall consumption targets, as well as the total earned, by visiting their community page on the Less is More website (see Fig. 4, below). In at least two communities, a local resident took it upon themselves to communicate this information to others on a wider basis, either through a self-produced newsletter or using social media such as Facebook.

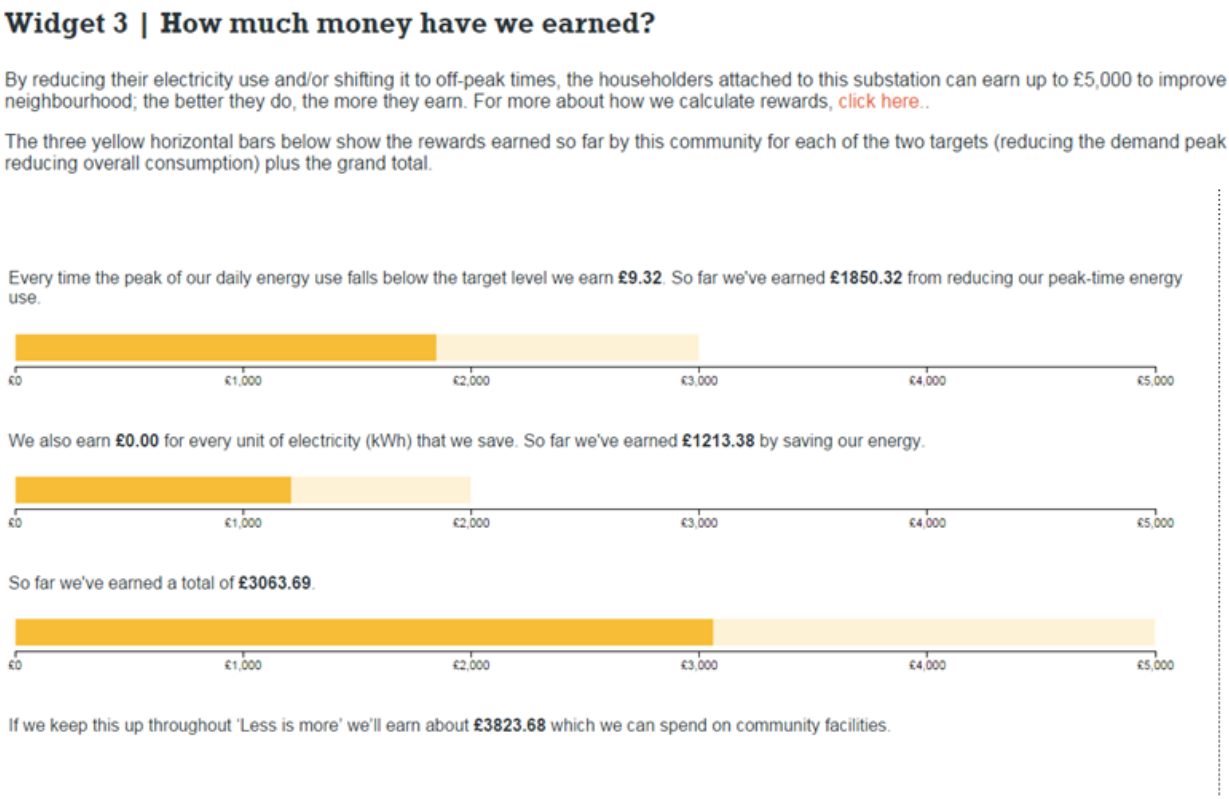

Fig 4: screenshot of widget 3 from the Ely homepage (this widget updated daily to show cumulative earnings)

It was recognised at the outset that any targets set at the beginning of the project would most likely need to be adjusted to take into account additional or improved data, or differences between the communities. In particular, there were concerns that the less affluent communities would already have a tendency to be more frugal with their electricity use before the project started and would therefore find it harder to make continual reductions in use as the project continued.

Each community could have earned up £5,000 if they had met their targets for both peak and overall reductions in electricity demand from day one. In reality of course, each community was unable to earn the full £5,000 because from day one of the Operational Phase they were losing small amounts of money each day. This was exacerbated by the lack of a 'warm-up' period in the project. Effectively, the charity partners were prevented from engaging with the communities at all while the baseline data was being collected between August and December 2013 (because engagement ran the risk of affecting behaviour and therefore skewing the baseline). But this left only around 3 weeks from the end of the baseline collection period to the beginning of the operational phase, which was completely inadequate for raising awareness of the project. In effect, most of the households connected to the substations were unaware of the project when it launched. For this reason, the target during January 2014 was set at 100% (i.e. the communities were only expected to perform as predicted), and did not drop below 90% until the end of April 2014.

Between…	…and	Proportion of estimated usage required to earn 100% of reward was…
01/01/2014	31/01/2014	100%
01/02/2014	28/02/2014	95%
01/03/2014	31/03/2014	90%
01/04/2014	30/04/2014	90%
01/05/2014	31/05/2014	90%
01/06/2014	30/06/2014	75%
01/07/2014	31/07/2014	70%
01/08/2014	31/08/2014	70%
01/09/2014	30/09/2014	70%
01/10/2014	31/10/2014	70%
01/11/2014	30/11/2014	70%
01/12/2014	31/12/2014	70%

Table 1: Original reward target thresholds

In addition, though the targets set were quite ambitious (especially after April), the rewards were earned on a sliding scale of "reward bands", so that where a community missed the target on a particular day, by getting close they would still earn some of the available reward.

For example, if a target was to cut total consumption for that day by 30%, the group would get all the reward if that target was hit, but would still earn some of it if they could only cut their consumption by 10%.

Table 2 below shows the proportion of reward given for varying percentages of target achieved:

% estimated consumption	% of target achieved	% of reward earned
70%	100%	100%
80%	66%	75%
90%	33%	50%
100%	0%	25%
110%	-33%	0%

Table 2: Proportion of reward earned against proportion of target achieved

This table shows that if, at the end of the day, a community had reduced its total electricity consumption to 70% of the predicted consumption, it would receive 100% of the reward. A sliding scale was at work, which meant, for example, that a reduction to between 80% and 90% of predicted consumption would earn half to three-quarters of the reward, depending on if that community was closer to 80% than 90%.

It also shows that some of the reward (25%) would be paid even when no apparent saving had been made. This was because a degree of tolerance was built in to reflect the fact that the predicted consumption could only ever be a ‘best estimate’ – rewarding communities for not exceeding the predicted maximum was effectively giving them the benefit of the doubt.

The same sliding-scale reward mechanism applied to the peak reduction target as well: with the reward earned reflecting the percentage reduction of peak consumption compared to the estimate.

There were two methods used to account for any missing data; if the data gap is short then linear interpolation is used between the points immediately either side of the gap, for longer gaps a manual correction was used. If the data gap was large enough that it would significantly impact the reward earned for that day (or multiple days) then an average of the reward earned for the preceding three days was applied to the affected days.

The community rewards were not calculated using the raw measured data, instead a 10 minute moving average was used. The reason for this was because a very short spike in energy use could result in a community losing all of their reward for the day. By using a moving average very short term variations are smoothed out. It is also feasible that community members could use the data to modify their consumption and stay under the target, using the moving average gave more scope to do this. The last point was particularly desirable for use with the GEM intervention (in Greenbank) which focused on making changes over a small time frame each day.

5.2 Operational phase

The operational phase of the project began on the 20th of January 2014 and ended on the 7th of December 2014. During that time, all charity partners and where possible the local voluntary and statutory organisations who they were working with were engaged in a range of interventions to affect the electricity consumption behaviour of the residents attached to the monitored substation in their respective area.

As described in further in below in the quantities analysis section, it became clear after the first 10-12 weeks of the project that for the charities to apply an 'Action Research' approach was significantly undermined by the fact that it would not be possible to match changes in the consumption data to any of the activity on the ground. As a result, the design of interventions relied more on anecdotal feedback from the engaged residents, and the pooled experience of the charity partners. At the monthly partner meetings, interventions over the past month and their perceived effectiveness were discussed. Where appropriate, partners copied activities that had been trialled first in other areas. Good examples of this learning were in the use of slow cookers (trialled first in Loughton and rolled out in Bournville, Hayle and Easton), and the Wash at 30 degrees campaign (trialled first in Ely and rolled out across most of the other areas).

Some of the more unusual interventions were born out of necessity in areas where community engagement remained stubbornly low. An example of this was the coffee mornings approach used in Belle Vue, which was specific to that area and which the qualitative evaluation demonstrated was a successful technique in an otherwise difficult area, albeit one that would have needed a much longer operational period to bear fruit.

A summary of the types of interventions in each community is outlined in Table 3, below:

Table 3 – summary of the interventions used in the operational phase

Community & charity partner	Making contact with stakeholders	Making contact with individual householders	Targeted interventions	Piggybacking	Press and PR
Silverdale, Newcastle-under-Lyme (MEA)	Meeting and correspondence with Aspire; meeting and correspondence with parish council; meeting with Beating the Cold outreach worker; meeting with ward councillor; meeting with local councillor; meeting with local Parksite shop owners	Oct 2013 intro meeting with 10x householders (hh), meeting with 1x hh from previous project, leaflet drop to 235x homes and door knocking 40x homes; Jan 2014 kick off meeting; Feb 2014 newsletter; March 2014 MEA outreach trailer; March door knocking; June 2014 door knocking and newsletter distribution; July 2014 door knocking and newsletter distribution; Oct 2014 newsletter, 2x hh LED fit outs, consultation on community pot (suggestion box in shop), pop up stall for consultation on community pot; Nov 2014 home visits and OWL meter fitting and door knocking	Door knocking, OWL energy monitors, LED giveaway/makeover, newsletters; coffee mornings	Stall at summer fair; stall at Christmas fair	Ongoing publicity in local shop with prize draws.
Belle Vue, Shrewsbury (MEA)	Oct 2013 met with church reps; met with 2x social housing provider reps; extensive correspondence with 2x local councillors throughout project	Jan 2014 initial door knocking and leaflet drop to inform hh of project, project launch event; Feb 2014 newsletter, visit to 2x hh to inform on project/LED; June 2014 coffee morning, stall at arts festival; July 2014 newsletter, coffee morning; Sep 2014 newsletter; Nov 2014 coffee morning, door knocking on community pot spending opinions	Door knocking, OWL energy monitors, LED giveaway, newsletters, 3x coffee mornings, wash at 30 packs	Stall at arts festival	March 2014 article in ward newsletter
Loughton, Milton Keynes (NEF)	Meeting with chair of residents association; attendance of parish council meeting;	Jan 2014 72x leaflet drop, launch event; Feb 2014 email introduction to 7 hh, OWL monitor drop off, thermal imaging event, delivery of LiM packs to all hh; April 2014 pop up stall; May 2014 MP visit to 1x hh; July & August delivery of washing packs; August & October delivery of requested OWL monitors; fortnightly progress bulletins on noticeboards and website	Thermal imaging event, delivery of LiM packs to all hh, delivery of OWL monitors, delivery of 120x washing packs, intended October slow cooker event (cancelled)	Stall at Easter Fair, promoting 'energy egg' and OWL monitors	Feb 2014 print and online article in MK News; April 2014 article on parish council website; Aug 2014 article in parish council newsletter; fortnightly bulletins on Parish Council noticeboards.

Community & charity partner	Making contact with stakeholders	Making contact with individual householders	Targeted interventions	Piggybacking	Press and PR
		throughout.			
Tinkers Bridge, Milton Keynes (NEF)	Feb 2013 email contact and meeting with Community Action MK; Aug 2013 meeting with Woughton Community Council; Jan 2014 meeting with CAMK and WCC	Jan 2014 leaflet drop at TB Meeting Place; Feb 2014 launch event; April 2014 slow cooker event, Facebook update, prize draw; May 2014 leaflet; 8x 7 minutes at 7; Oct 2014 leafleting for event; Nov 2014 community energy event; Dec 2014 leafleting for Christmas event, Christmas celebration event; Jan 2015 questionnaire delivery	Leaflet drop, launch event, 7 minutes at 7, prize draw, slow cooker event		Feb 2014 print and online article in MK News;
Ely, Cardiff (SWEA)	Nov 2013 meeting with Futurespace; Dec 2013 meeting with ACE and volunteers	Jan 2014 pop up stall and leafleting and lightbulb giveaway, more leafleting, 2x launch event (11x attendees); Feb 2014 2x pop up stall; Mar 2014 2x pop up stall, LiM newsletter distribution; April 2014 2x door knocking with survey, pop up stall, newsletter distribution; May 2014 meeting with residents and volunteers, pop up stall, newsletter distribution, door knocking, resident focus group; June 2014 litter pick, newsletter, energy saving event, pop up stall; July 2014 334x wash at 30 packs delivery; Aug 2014 door knocking, 3x home visits, newsletter, energy saving session; Sept 2014 pop up stall, energy advice session, newsletter; Oct 2014 3x home visits, energy advice session, newsletter, litter pick; Nov 2014 slow cooker promotion event, energy advice session in primary school; Dec 2014 slow cooker promotion event, newsletter	Launch event, door knocking, leaflet drop, Wash at 30 degrees packs, LED lightbulb giveaway	Open day for Community Hub	MP event, story on ITV news http://www.itv.com/news/wales/2015-02-23/these-families-are-being-paid-4-000-for-saving-energy-heres-how-they-did-it/

Community & charity partner	Making contact with stakeholders	Making contact with individual householders	Targeted interventions	Piggybacking	Press and PR
Lassington, Highnam (SWEA)	June 2013 meeting with parish council; March 2014 meeting with active community member to discuss engagement	July 2013 information evening; Jan 2014 leaflet drop, information event; Feb 2014 email update; Mar 2014 flyer delivery with progress update, meeting with community members; April 2014 newsletter, email on reward spend, meeting; May 2014 newsletter, door knocking; July 2014 wash at 30 packs & newsletter delivered; Aug 2014 newsletter delivered; Oct 2014 newsletter, publicity for LED & slow cooker event, lightbulb demo event, 2x home visits; Nov 2014 newsletter	Wash at 30 degrees packs, newsletters, leaflet drop, slow cooker & LED demo event, home visits	June 2014 stand at village fun day	July 2013 article in Highnam village magazine; May 2014 article in Highnam village magazine
Tremorva & Trelissick, Hayle (CEP)	Informed local business park about project (although didn't manifest into partnership working because of lack of time on their part); informed the local town council; ineffective engagement with the residents association; used other local organisations to promote the project.	Leafleting Jan-March 2014; door knocking of whole area to achieve baseline behaviour survey Apr-Jun 2014; energy advice given to individuals Jan & March 2014; door knocking June 201; home visits July-Sep 2014; .	Energy efficiency advice survey March 2014; slow cooker event Sep & Nov 2014.	Hayle fun day August 2014.	Newsletter March 2014; established social media presence March 2014; article in local paper March 2014; press release in The Cornishman April 2014; article in Hayle Pump July 2014.
Bourneville Estate, Weston-Super-Mare (CSE)	Partnership with Alliance Homes from the beginning. Ran advice stands, attending residents association meetings, slow cooker event and door knocking with Alliance. Held drop-in event with Alliance and other support agencies.	Press release and news story in Feb 2014; leaflet drop in March 2014; door knocking and survey in April 2014; surveys and information with prize draw run regularly via community hub building; further door knocking in July & August 2014; stall at family fun day in July 2014.	door-knocking and installation of rotary washing lines May 2015; Giveaway goodie bag and advice on school run July 2014; slow cooker event July 2014; delivery of wash at 30 packs in August 2014; home visits August-October 2014. Monthly newsletters from June.	Drop in event with support agencies Feb 2014; Prepayment meter consultation event March 2014; Stall at family fun day July 2014.	News story on community online noticeboard; press release picked up by online news site 24dash.
Greenbank, Bristol	Partnership from the beginning with Easton Energy	Leafleting, door knocking (+survey) a week later in Feb 2014; promotion of	Greenbank Gathering (community event with a dozen	Greenbank Gathering stall, April	Feature in print and email versions of 'Up Our Street' (community

Community & charity partner	Making contact with stakeholders	Making contact with individual householders	Targeted interventions	Piggybacking	Press and PR
(CSE)	Group.	GEM July 2014; further door knocking and signing householder up to GEM July 2014. Doorknocking Sep-nov re: GEM recruitment and home visits, Pop-up stand for a week in July near school	community groups working in area) April 2014; distributed 'goodie bags' during school run; slow cooker event with evening hosted by Stephen Williams MP August 2014; wash at 30 packs Sep 2014; GEMS to householders Oct 2014; home visits Oct- Nov 2014. Monthly newsletters from July. Trained Easton Energy Group in home visit techniques and personal safety, Nov 2014 (legacy)	2014.	newsletter) Feb 2014; started production and distribution of monthly newsletter August 2014.

5.2.1 Making contact with stakeholders

As described in above, all of the charity partners were in a difficult position in terms of 'warming up' their areas before the official launch of the operational phase, because of the need to collect an unadulterated baseline of consumption data. Some of the partners had begun engaging with statutory and other stakeholders as early as January 2013, but wider communications in the participating areas were put on hold until the end of December 2013. During that period, light touch engagement with key stakeholders took place where the charity partners could feel confident that details of the scheme would not leak out to the wider community.

The main stakeholder groups that were engaged with were:

Local politicians and local government – parish and town councils in Loughton, Highnam, and Hayle, as well as local councillors in Belle Vue and Silverdale being briefed on the project.

Housing providers – social housing providers and associated residents committees were engaged at Bournville, Hayle, Tinkers Bridge and Ely. Alliance Homes in Bournville were greatly supportive of the project and this made it possible to deliver all of the activity co-branded with them when the project launched. This was greatly beneficial as they are a trusted brand for the estate.

Local community groups – Greenbank was unique in being part of a wider ward (Easton) where there was already an active community group specifically focused on energy (Easton Energy Group). It was agreed with them that they would be the face of the community project (in that their logo would appear on all materials and CSE staff would frame their work on the ground as being 'part of Easton Energy Group'). Ely was also favoured in being the largest substation (so representing an area that felt more aligned to the boundaries of a real community), and having a very active community association (ACE – Action in Caerau and Ely) with paid staff, existing funded programmes, and a range of volunteer activities already underway. Discussions were held with them and it was agreed that the programme, as in Easton, would be delivered with ACE as the main brand. On a lesser scale, similar community engagement work was already being carried out by the Woughton Community Council (covering Tinkers Bridge), who agreed to support the programme through the use of their existing community mobilisers.

For some of the participating areas, it simply was not possible to create partnerships with genuinely community led activity that was already happening on the ground. This proved particularly problematic in Highnam, an affluent but rather 'closed' community. The substation area here contained no useful community building, organisation or other activity on which to pin the project. Similar problems were encountered in Belle Vue and Silverdale, where (in Silverdale particularly) wider socio-economic problems compounded this issue.

It became apparent even at the early stages of making contact with stakeholder groups that the design of the project could create problems in terms of wider community engagement. Since individual substations were being monitored, and their geography did not map on to the wider community geography, it was difficult to explain to stakeholders why the

boundaries of the project's activities seemed to be rather arbitrarily excluding some parts of their communities. This was raised as a key concern in Bournville by Alliance Homes. The estate is reasonably homogenous, being comprised of around 2,000 homes built at the same time, and with a broadly similar socio-economic demographic across the area. As such, it was likely that any community reward earned would be allocated to 'The Bournville Estate' as a whole. However, only 93 of the homes were on the monitored substation. It was agreed that the exact location of the monitored homes should not be communicated widely or represented on maps as this might create pressure on that very limited number of householders to perform well in order to earn the reward for the estate as a whole. Similar concerns were raised in other areas, and the approach of not directly identifying the participating homes was followed in several areas.

5.2.2 Making contact with individual householders

This could not begin until January 2014 since contacting householders before the baseline had been collected could have affected their behaviour.

Newsletters, leaflets and surveys

All partners began the project with the delivery of newsletters and leaflets advertising the scheme, the support available to change energy use behaviours, and the potential to earn a significant reward of up to £5,000 per community.

In many of the communities, a regular newsletter became a feature of the project, and the qualitative evaluation showed that persisting with this and using a consistent brand and layout was a useful way of gradually getting householders to look at the information being sent round rather than putting it straight into the recycling. Most of the newsletters were delivered to homes (using valuable local volunteer labour in Ely, Greenbank and Tinkers Bridge). Attempts were made (via Alliance Homes) to recruit local volunteers in Bournville, but to no avail. In all other areas, newsletters were dropped by the staff from the charity partners themselves.

Examples of the types of newsletters distributed are shown in Appendix 5 of the CSE report. What is clear from the evaluation is that, since residents can ignore or dispose of newsletters and leaflets for several months without even looking at them before the point where they finally becoming interested, it is important to repeat information, rather than assuming that something in a previous newsletter is now widely understood.

A technique employed in Ely and Highnam was to concentrate on a theme of the month – e.g. 'saving energy in the kitchen', and to base helpful tips in the newsletter around that theme.

A householder survey was produced by CSE as a way of collecting some basic information on how people in each community were using electricity (this is not the same as understanding *how much* electricity was being consumed, information which was already known from the consumption baseline collection period). The householder surveys were designed to find out which appliances and household behaviour patterns were prevalent so that interventions could be better targeted. It was not possible to collect a statistically significant number of surveys in any community, but the limited information was useful in

helping to shape interventions; for example, in Easton there had been an intention to carry out a campaign on getting residents to dry laundry outdoors, but a large proportion of the surveys collected showed that there was very little tumble dryer use already in the streets attached to the substation so this idea was not implemented. An example of the survey used in Ely is in Appendix 5 of the CSE report; questions were broadly the same in all communities.

Surveys were distributed through almost all intervention methods – with newsletters, as part of prize draws, at pop-up stalls and events and when doorknocking.

Launch events

In some of the communities there was an official launch event of some description:

- Bournville – Launch at the quarterly meeting of the Bournville Estate Residents Association (27/01/14)
- Tinkers Bridge – Launch event with Woughton Community Council (20/02/14)
- Loughton – Evening event with the Parish Council (27/01/14)
- Ely – Launch event with ACE (27/01/14)
- Highnam – Launch event – no partners (25/01/15)
- Hayle – Launch event with town council 20/01/14)

These events were promoted for 2-3 weeks before hand via leaflet drops and use of available noticeboards (for example in Loughton, Ely, Bournville and Tinkers Bridge).

Most of the charity partners also managed at least one article in the local press in January 2014, helping to raise awareness of these forthcoming events.

Door-to-door engagement

Door to door work was used throughout the project in all communities, with varying levels of success. The launch event in Highnam attracted a small number of attendees, but attempting to build on this with door to door work was initially met with an almost hostile response. Similarly, door to door engagement in Bournville and Tinkers Bridge also met with little success initially. In all of these areas, there was a feeling from the charity partner involved that these householders were at saturation point in terms of patience for answering the door to strangers. In the case of Highnam, door-to-door charity fundraising and 'hard-sell' solar PV schemes had resulted in a tendency to not want to speak with yet another person talking about saving energy, saving the planet, or cutting down bills. The situation was resolved within a few months by the charity partner engaging with the Neighbourhood Watch scheme, a useful piece of learning for future interventions in similar areas. Neighbourhood Watch ran a piece about Less is More in their monthly newsletter, to put local residents' minds at ease that the scheme was neither selling anything nor collecting money and was a bona fide operation.

In Bournville and Tinkers' Bridge, anecdotal evidence suggested that there was a sense of 'intervention fatigue'. They are both low income areas with high levels of social need. There is some confusion about the range of agencies operating locally offering help and support services, and the Less is More project added to this list. It also became apparent from those who would engage with the door to door work that householders in those

communities (along with Ely and Silverdale) felt that they were already being as frugal as they could be with their energy consumption, for economic reasons, and it is important to be sure that messaging about why they should reduce their electricity consumption reassures householders that the participating agencies/organisations are authentically trying to improve the householders lives, rather than serving a corporate need of the DNO (to reduce pressure on the substation). While it was clear that many people did not have good levels of 'energy literacy' (in that they did not really understand which behaviour changes would have the most impact on their electricity consumption), a great deal of trust needed to be built up before they would be willing to accept this information from an unknown person on the doorstep. Only by consistent and regular door to door work by the same individuals did these barriers ultimately begin to be broken down, and this of course lends itself to projects with a lengthy operational phase. This was most apparent in some of the more difficult communities, where the qualitative evaluation showed that a particular individual had become the 'face' of the project, e.g. Phil Newcombe from Marches Energy Agency in Silverdale and Belle Vue, Heather Crane from CSE in Bournville, and Rebecca Brown (a local 'community mobiliser' working with NEF in Tinkers Bridge).

Pop-up stalls

Street-based pop-up stalls were used in Ely, Bournville and in Easton as a way of stopping people on their day to day business. Regular and persistent attendance was required to make this a successful intervention, along with the availability of 'freebies' and useful information that passersby will attach a value to. The pop-up stalls in Ely were used at the very start of the project as a way of raising awareness, and since the weather was cold, the availability of hot tea/soup was a real draw which also encouraged people to stay long enough to complete baseline surveys of their energy using behaviour (see Appendix 5 for an example).

The pop-up stalls in Easton and Bournville were done in early July. They were located near to, but not on the school grounds and were timed twice a day to catch parents heading to and from the school run. The technique worked well because the stalls were in the same place, every day for several consecutive days, which meant it required a great deal of dedication on the part of passersby to consistently ignore them! The stalls contained educational energy quizzes for children as well as information on the project, offers for home visits, and small freebies such as LED nightlights and thermometer cards. Children could enter a prize draw to win a slow cooker for their parents by taking home a home energy quiz looking for ways that energy is wasted in their home and returning it in a freepost envelope to CSE.

Pop-up stalls were also used by some other partners as part of bigger community events.

5.2.3 Targeted interventions

Each charity partner attempted a range of interventions in their area that were more specific than the ongoing door-to-door and newsletter work. These included:

- LED home lighting makeovers – Belle Vue, Silverdale, Highnam
- Slow cooking promotion – Loughton, Bournville, Hayle, Greenbank

- Distribution of OWL energy monitors – Loughton, Belle Vue, Silverdale, Highnam, Tinkers Bridge (as part of prize draws), Ely, Greenbank and Bournville (at home visits)
- Wash at 30 degrees campaign – Ely, Highnam, Belle Vue, Bournville, Greenbank, Loughton
- Home visits – Greenbank, Bournville, Silverdale, Belle Vue, Ely, Highnam, Hayle
- Dry outdoors campaign – Bournville
- Coffee mornings – Belle Vue
- The Greenbank Energy Monitor – Greenbank.

5.2.4 Interventions Carried Out In More Than One Community

LED home lighting makeovers

These were offered in Belle Vue, Silverdale and Highnam. In all cases, despite the fact that each home could qualify for £100 or more in value of LED lights, take-up was very low. This may have been related to the fact that in all areas they were promoted very early in the project, when understanding of the scheme and trust in the charity partners was at its lowest.

For the few households that did take up the offer, the process was really rather transformational. All became actively interested in the scheme, either through clearly monitoring and managing their wider electricity use better, or by participating in other activities (such as hosting coffee mornings). Many of the recipients took part in either interviews or focus groups for the qualitative evaluation process, and in the Belle Vue community, local residents voted to spend the reward money on further LED makeovers by investing it in a bulk purchase of the lightbulbs which local volunteers (who have become active as a result of the Less is More project) will help to fit in other people's homes.

Slow Cooking Promotions

The idea of promoting slow cooking came out in a brainstorming session and was first tested in Loughton. The idea is to encourage residents to move from cooking their meal in a conventional or microwave oven over a short period of time each evening (peak time), to using a much lower powered device that runs all day. In all the communities where this was used as an intervention it took much the same format – a demonstration early in the day with local residents returning some hours later to sample the food and enter a prize draw to win slow cookers – this allowed for more collection of survey details and contact details for local residents. In Bournville, the smallest substation (93 homes), the number of slow cookers given out at the event was a high enough proportion of the monitored homes that it was theoretically possible to see a change in consumption data if they were all used on the same day. Indeed, there was a reduced evening peak on the Saturday after the event, when the recipients of the slow cookers were texted to ask them to use them to prepare the evening meal that day. However, it was not possible to prove that it was a statistically significant drop in consumption.

Slow cooker promotions worked far better in lower-income areas, where the promotional work was around not only reducing the energy costs of cooking (and moving people away from peak time), but about wider household economy issues such as feeding families for

less and eating healthily – these combined messages tend to sound more authentic than something that serves only the needs of the DNO. In Greenbank the promotion was not a success, but in Hayle, Bournville and Loughton it definitely represented good PR for the project. Slow cookers, when purchased in bulk via a wholesaler, are reasonably low cost (from around £12 to £18 each). However, their perceived value to householders is much greater, so having the opportunity to win one of a large number that were on offer seemed to alter perceptions of the scheme as a whole in some cases. This was especially true in Trelissick, Tremorvah and Bournville, where the partner reports show that this intervention represented a turning point in acceptance of other advice and information on offer. At subsequent events and when leafleting and door-knocking locally, the CSE project coordinator for the Bournville estate (Heather Crane) was better recognised and reported a much better reception from local people.

Distribution of household energy monitors

In some communities, this was done as an end in itself, and in other places the OWL monitors were made freely available as a way of incentivising people to come to an event or complete a survey. In Tinkers Bridge and in Highnam these were given out as part of doorstep engagement work, and in Highnam this led to a swap scheme where neighbours used the monitor for a few works and then passed it on to somebody else in the scheme.

There is already a significant body of academic evidence to show that an interested householder will both engage with and learn from a household energy monitor, and that they will alter their behaviour (and see reduced consumption) as a result. This is reflected in the qualitative evaluation from this project. Residents who had received the monitors as part of a targeted intervention, home survey for LED lighting or wider home energy advice visit were using them and in many cases were also encouraging other family members (particularly children) to take note of the display. This project was not long enough to assess whether the initial interest in the home energy monitor would significantly diminish over time, though several recent major studies have shown that the energy saving behaviour from the use of feedback monitors is persistent over time, and that this persistence is strengthened where social norming and group-based mechanisms are at play[4]. Therefore the recipients' understanding that they were being given the monitors as part of a bigger community project in their area is likely to strengthen their impact.

The effectiveness of home energy monitors is less evident where there is no wider support associated with them; though they are designed to be a DIY installation, a reasonable level of technical competence is required to fit and initiate them. Distributing them as freebies, as was done in some communities, is less likely to have resulted in the householder actually using them.

Domestic energy monitors were avoided in Bournville, because the Alliance Homes community support officer advised that they would be an inappropriately complex intervention in that area. They were also avoided in Greenbank, because it was felt that they would confuse the householders when it came to the distribution of the Greenbank Energy Monitor (the GEM – a community-scale feedback mechanism). However,

[4] http://web.stanford.edu/group/peec/cgi-bin/docs/behavior/research/Ehrhardt-Martinez%202011%20-%20Feedback%20and%20Persistence%20Paper.pdf

preliminary qualitative evaluation with GEM households suggests that they would have welcomed them.

Wash at 30 degrees campaign

This intervention was tested first in Ely. As the only Welsh community in the project, the project coordinator in Ely had access to some extra funding that none of the English partners could access. This was used to work with environmental charity 'Global Action Plan'[5] to carry out surveys to understand what would make householders move to washing at 30 degrees. The conclusions were that, while messages about the environment and energy bills were important, the single most important message and driver was that washing at 30 degrees makes clothes last longer. GAP worked with the charity partner in Ely to develop a householder pack about the benefits of washing laundry at 30 degrees, based on this research. They also tested a variety of approaches to distributing the packs, and determined that while delivery on the doorstep by a local volunteer is very effective, it is also time consuming and expensive to coordinate. By contrast, simply posting the packs 'anonymously' resulted in lower takeup, but when a letter from a local resident was included, with messages about why they had decided to move to washing at 30 degrees, the takeup was at similarly high rates to the volunteer-delivered packs. It was also important that the pack was 'a pack' and contained things that had a perceived value to the householder (washing tablets etc). A simple letter would have ended up in the recycling.

Fig 5: Wash at 30 degrees pack

After the trial and research in Ely, this intervention was also deployed in most of the other substations, with letters from local householders and area-specific themes included.

Since householders choose to do their laundry at a wide range of times, this intervention was unlikely to affect peak energy demand, but it would be more likely to have an impact on reducing overall demand. The campaign was mentioned several times in the qualitative interviews carried out, with residents saying they had altered their washing habits as a result. However, the diffuse nature of this intervention (in that there is no guarantee that somebody receiving the pack will do their laundry within a certain amount of time

[5] http://www.globalactionplan.org.uk/

thereafter) means that the chance of seeing an impact of this intervention in the data in a way that could be categorically linked to the activity would have been vanishingly small.

Home visits and Thermal Imaging

Home visits were offered in most of the communities. Uptake tended to be low in the more affluent communities. In fact, in Highnam there was not a single household who took up the offer. Uptake in Greenbank was also very low, with the few that were being carried out tended to result in the advisor confirming that the householder was already doing much that they could be doing, particularly given the limitations of the housing stock in that area (pre-1920, solid walled, single glazed). Thermal imaging was more popular in more affluent areas, and was a successful awareness raiser in Loughton. However it needs to be used with caution to correctly calibrate and interpret the resulting imagery, and is limited in when it can be carried out, since a differential between internal and external temperatures of 10 ^{o}C+ is needed. In Highnam, thermal imaging on a 'street walkabout' was used, and while it seemed to genuinely pique the interest of householders, it did not translate into any requests for more detailed home visits.

In the less affluent areas, home visits were received more enthusiastically, and resulted in more genuine help being given to householders who in many cases had not put in place some of the simplest measures they could have, or who had considerable misunderstandings about how their heating systems worked. In Bournville, 15 residents of the 93 monitored homes signed up for the home visit (though in the end only seven were carried out due to various householders dropping out). Home visits were also taken up in Trelissick, Tremorvah, Ely, Silverdale and Belle Vue. All recipients benefitted from advice including reducing their bills through schemes like the Warm Homes Discount and through switching tariffs, advice on using their heating controls effectively, tips on reducing condensation and free gifts to help them to save energy such as washing lines, powerdown plugs, light bulbs and draught proofing devices. In Trelissick and Tremorvah, CEP were also able to refer householders to have Smart Meters fitted. Some were referred to the housing provider for more detailed support, such as help with sorting out issues with their heating system or upgrading their loft insulation. The residents visited were sent a short report giving them further advice and including relevant factsheets to help them to change their behaviour and reduce their consumption in the long run.

This kind of intervention was also provided in other areas and is highly regarded by all charity partners as a way of having meaningful, impactful conversations with householders. However, it is a high-intensity and very labour intensive process that could perhaps be made more affordable to provide over a long period by skilling-up existing agency staff where possible. Indeed, CSE has provided guidance to Alliance Homes staff on carrying out similar visits, and has trained a number of volunteers from the Easton Energy Group that operates in the Greenbank area, in the hope that this activity can continue.

A key conclusion from home visits work is that while most of the supported households will see overall reductions in household energy consumption, the biggest savings will be in their heating and hot water area, which means from a DNO point of view, effects on the substation are negligible, even if the householder is genuinely better off and using less energy overall at the end of the process. It is simply not possible to promote an offer of home energy advice that only looks at electricity use in isolation, since this immediately

raises suspicion that the benefit is mostly for the DNO rather than the householder. This suggests that joint working with the gas distributors to offer support and funding for a programme of home visits and simple upgrades may be a useful approach.

Messaging about the purpose of the home visit is also important. In less affluent areas, the home visits were offered as a service that was principally about reducing bills, and this acted as a strong recruitment offer. Given the experiences in Greenbank and Highnam, it is tempting to suggest that home visit services in more affluent areas with higher numbers of professionals should be pitched with messages that relate more strongly to home improvement, increasing the value of the home, or checking that technologies and approaches already being used are the most up to date or 'state of the art'.

5.2.5 Interventions Carried Out In Single Communities

Dry outdoors campaign

This was only used in Bournville. The idea emerged because the small number of surveys collected suggested that local people did use tumble dryers, and also because the community support worker from Alliance Homes had reported that a lack of communal washing lines was an issue for some local residents in flats.

This intervention was partly to test the idea of 'barrier-busting' – advising a householder to change an energy-using behaviour should not lead to a 'to-do' list for that individual. If it does, they are less likely to implement the change. So advising householders to dry their clothes outdoors when they do not own or cannot install a washing line is unlikely to result in change. As part of the door to door work offering home energy advice visits, residents in Bournville were given the opportunity to ask for the tools that would allow them to dry their washing outdoors – lines, pegs and baskets. These were then provided and fitted for them, and the qualitative evaluation showed that they did alter their laundry-drying behaviours as a result. The principle of barrier-busting is an important one that could be applied across a range of other interventions.

Coffee mornings

This intervention emerged rather out of desperation; Belle Vue proved to be among the most difficult community areas to engage. The substation area did not include anything that could act as a community hub (school, pub, community centre, shop), and did not map onto the wider, recognised community in any meaningful way.

After a surprisingly low uptake of the LED lighting makeover offer, the idea emerged that those few households who had benefitted from the offer could themselves act as an information point and recruiting point for other residents locally. The project coordinator for Marches Energy Agency persuaded a few of them to host coffee mornings that were broadly themed around chatting about saving energy, but which were rather free-form events that were as much about community cohesion as about the Less is More project itself. The invitations were delivered to all 168 homes on the substation, with the hope/expectation that only very low numbers would attend, given the venue. Small numbers did attend, but this has formed the hub of a nascent resident energy group and they will be the individuals most engaged with distributing the LED bulbs that have been purchased with the community reward in this area. The qualitative analysis also showed

that the participants really valued these events as both opportunities to talk about energy but also to build community links.

There was of course no chance that the immediate impact of the coffee mornings could be seen in the data, but the long term impacts of social norming of conversations around energy use, as well as the 'see-learn-do' processes that emerge from seeing community peers taking up new or innovative technologies could be significant. This is a technique that could have been pursued and analysed further in a longer, more widespread project, and is also something that would lead on well from a home visits programme – the next step up from individual home visits is to encourage local residents to then come together to discuss what they have changed and why – the coffee mornings approach was a fledgling attempt to do this that clearly resonated in a lasting way with those who took part.

7 minutes @7

This intervention was only deployed in Tinkers Bridge. The idea was to initiate a mini-version of the annual WWF 'Earth Hour' initiative (where householders are encouraged to turn off all electrical appliances for an hour on a particular evening). Notwithstanding the negative effects of the switch-on-again moment at the end of 'Earth Hour' each year, NEF decided that a smaller version of this, asking people to switch as much as they could off at 7pm, every Monday night during August and September, would be a good way of trying to show how much a drop in consumption could be driven by this intervention. The idea was that people would cut back their consumption of electricity as severely as they could for 7 minutes, and that this would generate a signal in the data that could then be used as part of the engagement process – getting people to link their own behaviour to a significant signal in the data and then using that to prompt further discussion and debate about what other levels of switch off, and over what time periods, could bring down their energy use and/or flatten their peak consumption on a more consistent basis.

In order for the intervention to work, NEF intended to collect mobile phone numbers for local householders, and then send them a text in advance of the 7pm switch-off each Monday, along with a follow-up text after 7 minutes telling them that it was over.

The intervention was not a success. In part, this was because NEF's engagement on the Tinkers Bridge estate relied very heavily on the use of local volunteer community mobilisers. While this was absolutely the right approach and was overall very beneficial, an unfortunate clash of holiday and sickness meant the availability of volunteers was very low during the recruitment process for this campaign. In addition, a major barrier seemed to be householders' reluctance to give out their mobile phone numbers.

Again, had the operational period been longer, this intervention could have been re-designed and tried again at a later time. In the limited time available, it had no impact at all.

The GEM (Greenbank Energy Monitor)

Design

This intervention was designed specifically to address one of the stated objectives of the LCNF proposal – to develop a community-scale feedback monitor linked to consumption data.

Early in the operational period, a member of the volunteer group in Easton had raised awareness of a device developed by his engineering consultancy [6] which was being used in an EU-funded solar project in another part of Bristol. This device effectively relied on short-range radio communications between the export meter of a domestic solar system, and a small receiver with a red LED light that was kept somewhere visible within the home. At times when the solar system was exporting a high proportion of the electricity generated, the receiver would flash red, alerting the householder that this would be a good time to use the electricity in the home, for example by running the washing machine at that time. The developer posited that perhaps a similar device could be developed that would alert a householder to the fact that the local substation was 'under pressure' (i.e. during peak times), and householders could then react to this in the opposite way; rather than seeing a red light and looking for something to turn on to use up 'spare' electricity generation (as in the case with the solar systems), the householder would see a red light and look for opportunities to turn off (or delay using) electricity consuming devices in the home.

As a result of this initial idea, WPD contracted directly with Clean Energy Prospector to develop a device, working closely with CSE so that the data feeds that were driving the consumption visualisations on the website could also be used to instruct the devices as to when the substation was under the most pressure. 50 units were to be developed, for deployment in April 2014, with a battery life of around 6 months.

A series of meetings between WPD, CSE and Clean Energy Prospector were held to try to establish the operating parameters of the device, and to determine what information should be displayed to householders, how the device would send and receive signals, and how it could be used to engender a sense of 'collective endeavour' for reducing electricity consumption within a certain group of homes. In this sense, it represented the best example of an intervention that was truly community-scale, rather than working with a range of individual householders.

An iterative process resulted in the development of a unit about the size of a large smartphone, with one of two displays visible most of the time (see figures 6 & 7 below). Most of the time, the display showing was the 'default mode' illustrated in Fig 6 below. This displayed three pieces of information:

- The time that the next challenge period would begin (challenges are explained in the next section)
- The number of householders with a GEM who joined in at the previous challenge
- The total amount of reward earned so far (note, this updated after midnight each day and also included the general reward earned via other performance across the whole Greenbank substation).

Challenge periods were set every day, during which time householders were meant to do two things:

- Indicate their ability/intention to take part in the challenge by pressing the button on the unit.

[6] http://www.cleanenergyprospector.com/

- Turn off any electricity using appliance that they were not really using at that time, and deferring any tasks that they felt they could (such as running the washing machine) until after the challenge period had ended.

When the GEMs were distributed, it was made clear to householders that this was not an intervention like 'Earth Hour', and that it was absolutely not the case that they were expected to turn everything off and put life on hold for 45 minutes: the messaging was that they should continue to live their lives normally, but to try to pay attention to where they were wasting electricity at that time in particular, or whether there was anything they could put off for a while.

Each GEM received the information about the start time of the next challenge from the central server at CSE. The challenge periods were pre-programmed for the entire period of the intervention (based on the predicted time of the peak on that day), but could also be manually altered to occur at any other time. It was agreed that challenge periods longer than one hour would be offputting, and so 30-45 minutes was chosen as the challenge period length.

Fig 6: GEM 'default display'

Once a challenge period started, the display changed to the challenge screen (see Fig 7 below).

Fig 7: GEM 'challenge display'.

The challenge screen displayed how many minutes remained in the current challenge period, the number of homes currently participating, and an extremely simple bar-graph showing total consumption on the substation at that time, along with a line showing the consumption level that the community was trying not to exceed. The display refreshed at one-minute intervals, thus the number of households participating updated every minute, based on signals received at the central server from button presses made in the last minute, which were then relayed back to all units.

LED lights were inserted in a thin strip below the display screen. A red light flashed slowly as the time of the next challenge approached. On pressing the button to join in, a blue light flashed once to indicate that this household was now participating. The red lights flashed more quickly when the black area in the graph approached the 'peak limit' line, to try to give a sense of urgency that the substation was under most pressure at that time.

Deployment

The initial contractual arrangements for the GEMs had planned for there to be 50 devices distributed across one of the two feeders of the Greenbank substation (given that each feeder had around 100 homes attached to it, this level of deployment was felt to be a minimum requirement to see statistically significant changes in consumption data). There were considerable barriers to deploying this number of devices, but interestingly, lack of community interest was not one of them. The main barriers were:

- A number of technical problems encountered by Clean Energy Prospector meant that the GEMs were not available until October. This was several months after the original April deadline, and even a major delay from the renegotiated deadline in July. This meant that the deployment period was reduced from six months to around one month.
- The radio network that Clean Energy Prospector established to send and receive messages between the server and the GEMs was not strong enough to reach the area originally planned. As a result, although 50 units were produced, only 23 were ever deployed.
- Even after deployment, some of the devices were unreliable for a number of weeks.

- The battery life of the units was reduced to a matter of days, rather than the 6 months originally planned. This meant that they needed to be re-charged, which resulted in a design change to incorporate a USB charger, and also a major risk that once a GEM had run flat, the householder would be unlikely to recharge it, at least immediately.

5.2.6 Piggybacking

Where possible, charity partners carried out information and awareness raising as part of other events that were happening locally. The reasonably short timetable meant that there were only a handful of occasions in each community where this could have been done, and there was varying success.

In Highnam, Bournville, Hayle and Silverdale, information stands were held at high-profile local events such as summer fetes, estate fun days and school fetes. These had a limited impact because such events are characterised by lots of 'fun' activities. To compete with the other displays is quite a challenge.

Piggybacking on other, tangentially related events was more successful. In Bournville, CSE's project coordinator was able to attend pre-payment meter switching workshops to promote both the Less is More scheme and the advice that was on offer through it. Since concerns about the cost of energy bills were the main focus of these pre-payment meter events, this made for a receptive audience (though again, the limited area covered by the monitored substation meant that the advice and support was principally given to householders whose homes were not being monitored, and thus no changes in data would be visible).

The local volunteer group in Greenbank (Easton Energy Group) were one of several embedded local community organisations who came together to promote community activity in general at an event called 'The Greenbank Gathering'. They promoted the Less is More project at this event and it resulted in around 15 local households of the 212 connected to the substation filling out surveys on energy use and signing up for the email newsletter.

In Ely, the close association of the project with the Action in Caerau and Ely group (ACE) presented multiple opportunities to promote the project through trusted and recognised local volunteers. This included having local volunteers involved in a regular litterpicking round handing out flyers and information leaflets, distributing Wash at 30 degrees packs, using the ACE local hub to run several residents' energy advice surgeries, and having a presence at the community open day at the hub.

5.2.7 Adjusting the targets and rewards during the operational phase

Reducing the severity of the targets to allow higher earnings

The success of the Less is More project depended heavily on the local communities being aware of the project and 'buying into it'. It was expected that it would take some time for the communities to become aware of the project. For this reason the initial targets were set to be attainable even if the communities continued to use electricity in exactly the same manner as predicted. For example in the first month of the project the target for both peak and overall daily consumption was set as 100% of the estimated usage. The targets for

subsequent months were programmed into the website at the beginning of the project, getting progressively more challenging in later months (as shown earlier in table 1). It was difficult to predict quite what level of reduction in consumption would be reasonable, and as such it was recognised that these targets would probably need to be altered. As a result, they were not widely communicated to the participating communities, and communication centred around less quantifiable messaging, for example merely that the project aimed to help them reduce their electricity consumption.

For the months of January, February and March all communities were earning a reasonable amount of the available reward However, in April the amount of reward earned dropped significantly, a comparison of reward earned by month is given in Appendix 10 in the CSE report.

This was initially confusing, since April's target was not significantly different to the target set for March, and raised suspicions among the project team that the performance of the communities in January-March had been somewhat accidental. In effect, it was suspected that the high level of reward earned to date was more linked to 'performance within the error'[7] than to any coordinated effort to reduce electricity consumption at any of the substations (though it was clear that certain households had bought into the project by this point, and some fledgling local activity - such as the establishment of local Facebook pages – had begun to emerge).

At the late-April 2014 meeting of the charity partner organisations, it was concluded that not enough people in the participating communities were fully aware of the project at this point and that in order to engage the maximum number of people in the communities, the project must remain attractive. By having increasingly challenging targets before communities were sufficiently aware of the project the maximum available reward would significantly decrease, which would make further community engagement ever more challenging.

Thus, an interim target-setting methodology was developed that was designed to find a target level which enabled to communities to earn a reasonable level of reward whilst also encouraging them to reduce their energy usage. Here, a 'reasonable amount' of the reward was taken to mean sufficient to make the project appealing without unjustly rewarding them. The aim was to use this interim method until such a point as a reasonable reward pot had been earned in each of the communities, which could then in itself be used as part of the engagement communications, for example, "we have already earned £1,500 to spend on local facilities, let's see how much more we can add to this".

The original rewards calculation involved five points where a set proportion of the estimate corresponded to a set proportion of reward with linear interpolation between these points. This is illustrated in figure 13, below.

[7] See section 3 (Quantitative analysis) for further discussion about systematic errors within the modelling.

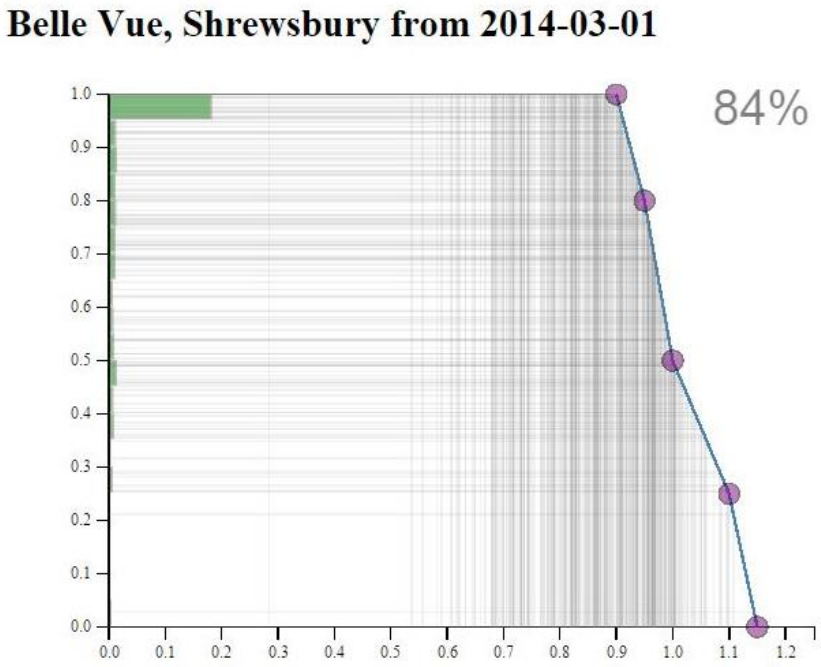

Fig 13: Original 5-point reward curve

The values chosen for these points were set before the project began and it was always envisioned that they would be modified based on the progress of the project. Thus the starting point was to attempt to modify these existing thresholds to get the desired outcome. At first a single target was sought that would result in all communities earning a reasonable level of reward. This proved impossible due to the differences between the communities.

It was ultimately decided that the best way to ensure a reasonable level of reward was to set a desired level of earned reward and use this to solve for the ideal reward threshold (thus generating an individual reward curve for each community). To keep things as simple as possible the number of set points was reduced from five to three as shown in figure 14 below. This made the optimisation simpler and the proportion or reward earned more intuitive.

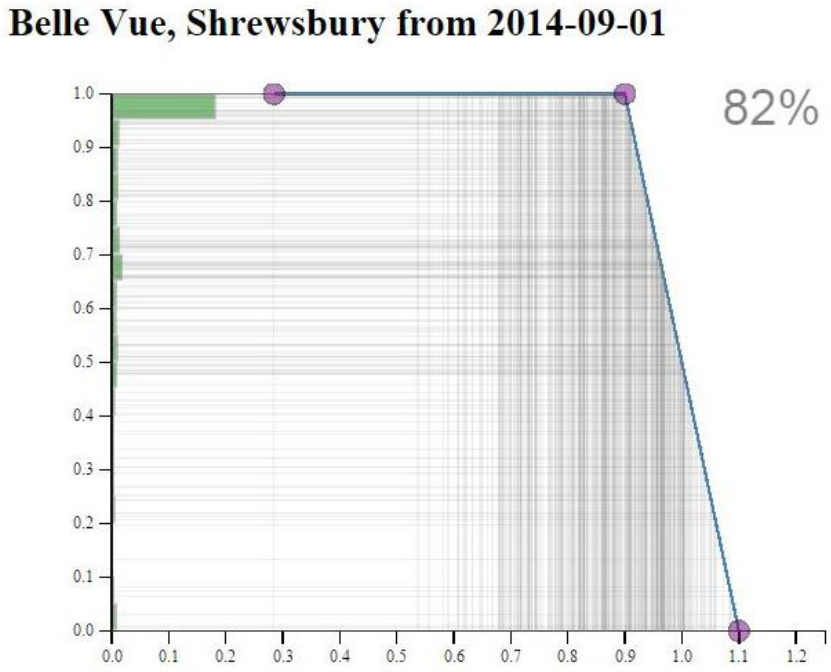

Fig 14: Simplified reward curve

To begin with it was decided that the target amount of reward for communities to receive would be set at 90%. This value was chosen as sufficiently high so that any error in the method should not preclude the communities from earning a reasonable reward. The point at which no reward could be earned remained at 110% of the estimated usage, to give a 20% range over which the rewards could be determined by linear interpolation.

This was done by using data only from January to March (i.e. the start of the operational phase) to model future reward earnings if the behaviour observed to date was maintained. A function was then created which optimised the reward thresholds for the amount of reward earned. This accounted for factors such as the differing consumption profile of the communities and the variance of consumption profile within each community over time. Thus this produced target curves tailored to the individual communities, which differed to the original conception of setting all of the rewards based on the same proportional reductions in peak and overall consumption.

An interface was developed that allowed the project team to look at the likely future performance of the communities against the rewards, based on their past behaviour during the operational phase (see fig 15 below). Each cell showed how a substation would have done in that month under a given reward target, based on past performance - a right skewed histogram would indicate likelihood of higher rewards earned, a left-skewed histogram would indicate limited reward earned. For each substation, an overall histogram was displayed in the leftmost cell showing the distribution of that substation's past performance. It is clear from the section detailed in Fig 15 (below) that after only a few months there were already sizeable differences between the communities, which underlined the need create more tailored targets from here on.

Assessing the individual months for each community, it was clear that the proportion of available reward earned in April was far less than in March, which was less than the first two months. Once the optimisation was applied for the month of May (signifying the proportion of reward the community is expected to earn) the skew of the resulting histogram strongly resembled that of January and February. This approach was consistently reviewed during May, June and July. The aim was to monitor reward earned against increased awareness and participation in the project, in order to begin weaning the communities off this approach for the last 5 months of the intervention period, and back onto a genuinely earned reward target. This was not wholly successful, the reasons for which are discussed further in the Quantitative Evaluation.

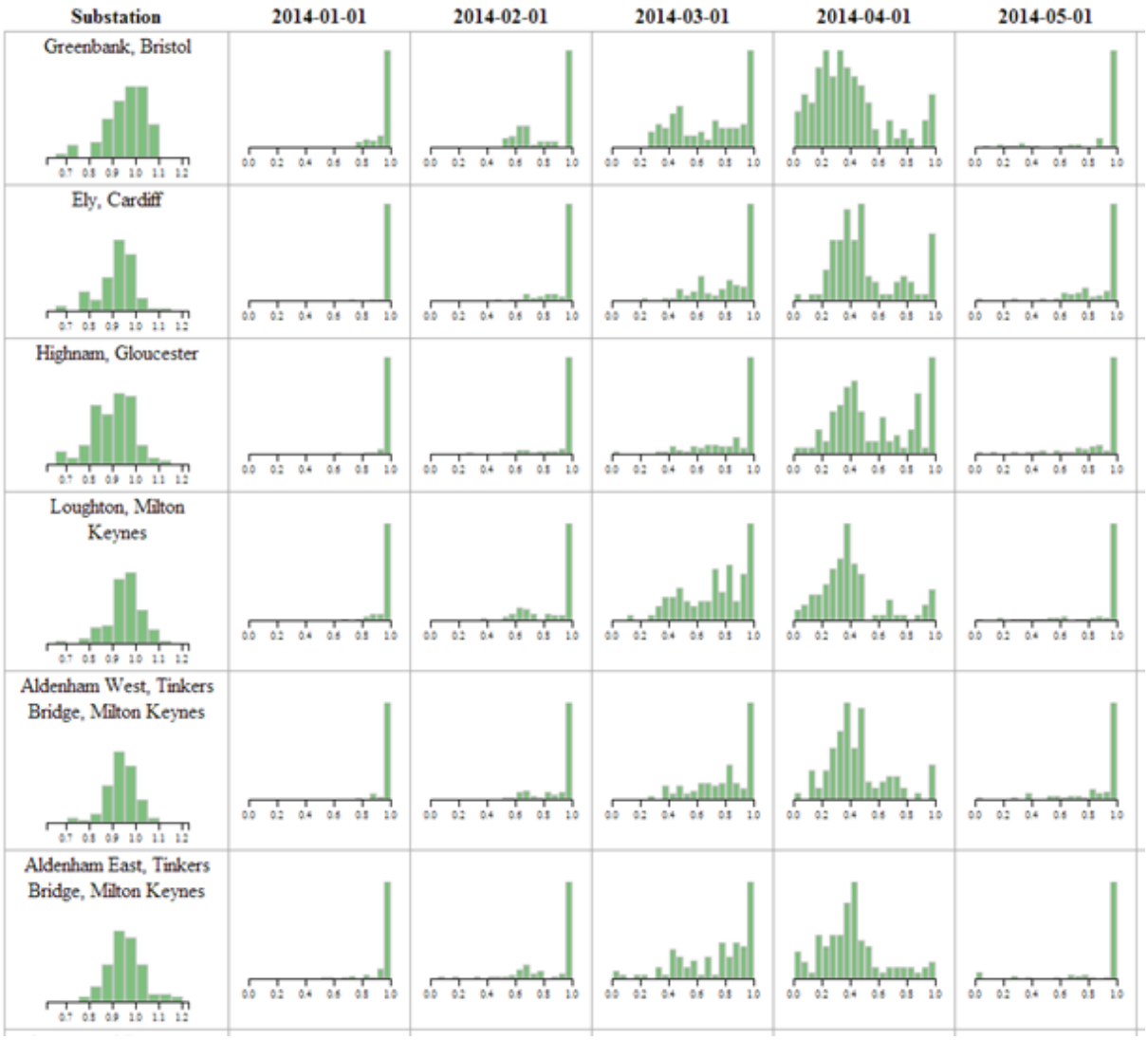

Fig 15: Jan-May section from target setting interface

Moving the communities back onto more challenging targets

While it was clear that overall, the model was giving a sufficiently accurate prediction of the measured behaviour, the small sample sets caused by only monitoring individual substations meant that some communities were better described by the model than others, and thus more likely to earn a higher proportion of their reward. Some examples of the

differences between the substations that made a setting a uniform consumption target impossible included:

- Some communities had a relatively consistent daily consumption, other communities had significant daily variation
- Some communities had a regular consumption profile with a consistent peak range, other communities had fluctuating profiles with some peaks being sharp with a high peak and others being flatter with a lower peak
- Some communities had a low daytime consumption culminating in a sharp evening peak whereas others had a flatter peak with a greater proportion of consumption being spread across the day

To illustrate the difficulty of a uniform set of targets consider two communities with an average consumption of 90% of the estimate. For a given month the daily consumption target is 85% of the estimate. Community 1 uses exactly 90% of the reward each day and community 2 alternates between using 100% and 80%. If they had been allocated the same targets then community 1 would have earned earn a higher proportion of the available reward, since community 2 would earn no additional reward for being under well under the target, but would lose reward on the days where their consumption was higher.

As described above, a decision had been made to allow the communities to build up a reward pot by reducing the severity of their targets. Thus, for May, June and the first two weeks of July, all communities were able to earn a high proportion of their reward allocation because they had been effectively taken off the real target setting approach that was originally envisaged when the project started. In order to re-introduce some more challenging targets once this aim had been achieved, but to set targets in a way that more fairly reflected the differences between the communities, some further analysis of their behaviour was carried out.

As a starting point, the ratio of measured usage to estimated usage was found for all communities for the length of the project to date. This revealed three clear outliers, Aldenham West, Aldenham East (both Tinkers Bridge substations) and Ely. Each of these substations had on average higher consumption than the estimates over the course of the project to that point, while all other communities were lower than the estimates[8.] Based on this a scaling factor was calculated that could be applied to the existing estimates and that

8 Further investigation showed that for the three outliers, their base load consumption was relatively high compared to other communities and as such the seasonal effects that caused such large changes in consumption for the other communities seemed to be more muted in these three. The reasons for this were not determined, but could relate to the high numbers of local residents who are at home much of the time, which would tally with higher than average unemployment rates in those communities. However, had this been the sole reason then it would be expected that other communities with similar social profiles would have shown similar patterns of consumption (notably Bournville and Silverdale), but these patterns were not apparent there. Some other factor must also have been at play, which was not possible to determine from the data or the known information about lifestyles in Tinkers Bridge and Ely, and underlines a need for future projects to ensure that the baseline data collection gathering period includes social as well as technical data. While socio-economic data was collected for all of the communities (e.g. Census, IMD and Mosaic classifications) this could not give the detail of how local residents live their lives, for example their patterns of appliance use, and when and for how long they were at home on different days of the week.

accounted for the additional data gathered since the start of the project. The targets set for all communities except for these three outliers were set to be equal to the estimates multiplied by the scaling factor. For the three outliers, which had seasonal variability, an average over the spring and summer season was used.

The effect of the target adjustments made midway through July were re-examined at the end of the month to help set the targets going forwards. This revealed that for the Peak Reductions target, the percentage of available reward earned ranged from 76% to 97%. When these results were examined more closely it became apparent that there was a flaw with how the targets were set. It is possible that this accounts for the relatively wide spread of results.

The issue was that the targets had been set using the maximum daily half hourly peak rather than the absolute peak. This lead to the value of actual peak as a percentage of the estimated peak estimate (which was used to set the targets) being too low. This error was corrected for and the ratio of actual peak and estimated peak was used as the scaling factor. The reward varies linearly from this threshold down to 0% of the reward at 110% of the estimate.

Following this adjustment, the percentage of the consumption target earned varied from 81% to 95%. This seemed a reasonable range given the typical daily variation in consumption over the length of the project. For this reason these target levels were maintained going forward. However, following a further review in October, several communities had their targets shifted to exclude winter measurements in the same way as the original three outlier communities had had their peak target altered.

Beyond this targets were set using the scaling factor to modify the preset estimates. This method seemed the best way to set targets that had some basis on the measured data and was providing enough of an incentive for communities to engage without them being earned for excessive consumption.

5.3 Total rewards Earned

By the end of the project the following amounts had been earned by each of the communities. A full breakdown of rewards earned per substation, per month, can be found in Appendix 10 of the CSE report.

Community	Total Reward	Beneficiary
Greenbank	£3,912.53	Easton Community Centre
Bournville	£3,972.13	Split between – new CCTV camera for the youth centre, a donation to the allotments society for the estate, and a donation to the childrens' school holiday lunch club.
Ely	£3,989.75	Energy saving devices to be distributed to local householders
Highnam	£4,242.77	A 'Resusci Annie' and resurfacing a local cycle path
Loughton	£3,936.33	TBC
Tinkers Bridge	£3,841.30	TBC – but ideas emerging are around facilities/lighting/benches etc for the estate
Belle Vue	£4,017.00	LED lightbulbs, to be distributed to local householders by volunteers who benefitted from these during the project
Silverdale	£4,035.13	Upgrading the childrens' play park
Trelissick	£3,994.04	These two communities are pooling their rewards, and will put the money towards heating or covering the local open air pool.
Tremorva	£4,315.65	

Local surveys or events were used to come up with ideas for how the reward money could be allocated locally. While energy related projects did come up in some of the communities, there was also a wide range of other social issues that people wanted to use the money to address.

6 The outcomes of the Project

The outcomes of the project section has been split into three sections: Quantitate Analysis, Qualitative Analysis and DNO Implementation. The first two sections are adapted versions of the CSE report focusing on the community engagement while the third section looks at WPD's perspective of the project more broadly.

6.1 Quantitative evaluation

6.1.1 Determining causal relationships between activity and consumption patterns

Although a great deal of time was spent analysing the data from the 11 monitored substations, it became increasingly apparent after the first 2-3 months of the intervention period, that detailed quantitative analysis of the data feeds from the substation would be largely fruitless. For the initial few months, the lack of a discernible change in the data was initially thought to be the result of the time taken to embed the activities in the local area. The reader will recall that any intervention or awareness raising in the period prior to the official launch was not possible, because of the risk that this introduced in terms of affecting the baseline data collection period. Thus, when the project officially launched, there was a period of no awareness at all in each community, as activity slowly ramped up, meetings were held and information was distributed.

However, after the end of April (the 3rd full month after the public launch) assessments of the data suggested that it was highly improbable that any observable changes in electricity consumption that could be confidently attributed to intervention activity would occur.

In order to confidently link any given intervention with a change in the data three things needed to be true:

1. There needed to be confidence that the estimated data against which measured data was compared is valid.
2. The change in the data must be sufficient that it could not have been a random fluctuation.
3. There needed to be a convincing temporal link between an intervention and any apparently associated change in the data.

With reference to point one, analysis shows that it was indeed the case that the estimates provided a very good projection of the substations' energy use over the length of the project. Summed over the whole year both the estimated daily peaks and daily consumption aligned closely with what was the measured data. In most areas the ratio of measured to estimated values was within 5% of 1:1. This is shown in tables 5 and 6. The mean ratio falls within one standard deviation of the unity in all but one case, suggesting that the estimates are a valid approximation of the actual consumption over the course of the year.

	Substation	Mean measured to estimate ratio	Standard deviation of measured to estimate ratio
1	Aldenham East, Tinkers Bridge, Milton Keynes	0.96	0.12
2	Aldenham West, Tinkers Bridge, Milton Keynes	1.04	0.14
3	Belle Vue, Shrewsbury	0.99	0.09
4	Bournville Estate, Weston Super Mare	0.99	0.05
5	Ely, Cardiff	1.01	0.12
6	Greenbank, Bristol	1.00	0.07
7	Highnam, Gloucester	0.91	0.06
8	Loughton, Milton Keynes	0.99	0.10
9	Silverdale, Newcastle-under-Lyme	0.95	0.07
10	Trelissick, Hayle	0.99	0.08
11	Tremorva, Hayle	0.95	0.07

Table 5: Ratio of measured consumption to estimated consumption

	Substation	Mean measured to estimate ratio	Standard deviation of measured to estimate ratio
1	Aldenham East, Tinkers Bridge, Milton Keynes	0.96	0.11
2	Aldenham West, Tinkers Bridge, Milton Keynes	1.01	0.11
3	Belle Vue, Shrewsbury	0.96	0.08
4	Bournville Estate, Weston Super Mare	1.00	0.08
5	Ely, Cardiff	0.97	0.08
6	Greenbank, Bristol	1.00	0.08
7	Highnam, Gloucester	0.95	0.06
8	Loughton, Milton Keynes	0.96	0.10
9	Silverdale, Newcastle-under-Lyme	0.93	0.07
10	Trelissick, Hayle	0.94	0.06
11	Tremorva, Hayle	0.93	0.07

Table 6: Ratio of measured peak to estimated peak

However, despite the fact that the estimates appear accurate over the course of the project, crucially, this was not the case over shorter time spans. Figure 15 shows a residual plot of the daily variation in the estimate to the measured daily consumption ratio for the Greenbank substation (with variations typical to all of them). It is clear that there is significant daily variation in the ratio as well as hints of a seasonal systematic error.

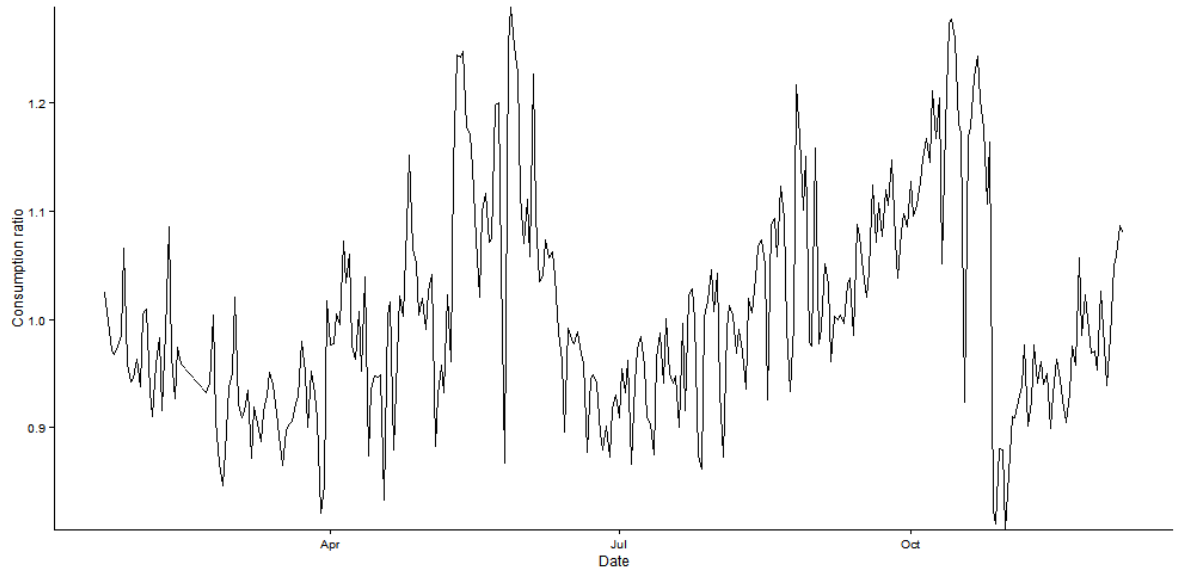

Fig 15: Residual of measured to estimated consumption for Greenbank

Analysis suggests it is likely that this daily variation is caused by the small sample size in the project (with the largest number of homes being 346 and the lowest 93). Because of the small number of homes per substation, it does not take many people using more or less energy than is expected to have an effect on the data. On a national level, with millions of homes, any atypical behaviours would tend cancel each other out, but with fewer homes it is more likely that variations will be observed, as with these individually monitored substations.

In addition, the non random pattern in the residual plot in figure 15 suggests a systematic error in the model. This can be seen for all substations in figure 16. Although there is some variation in the shape of residuals across the substations there are some common trends. For example the residuals are mostly negative for a period at the beginning and end of the project and positive in the middle. Analysis suggests this is due to the way seasons have been modelled and suggests a limitation of the model. Figure 17 shows the residual plots of the daily variation in the estimate to measured daily peak ratio. It is clear that in most cases the peak has been overestimated and in certain substations the same seasonal effect is observed as for the consumption.

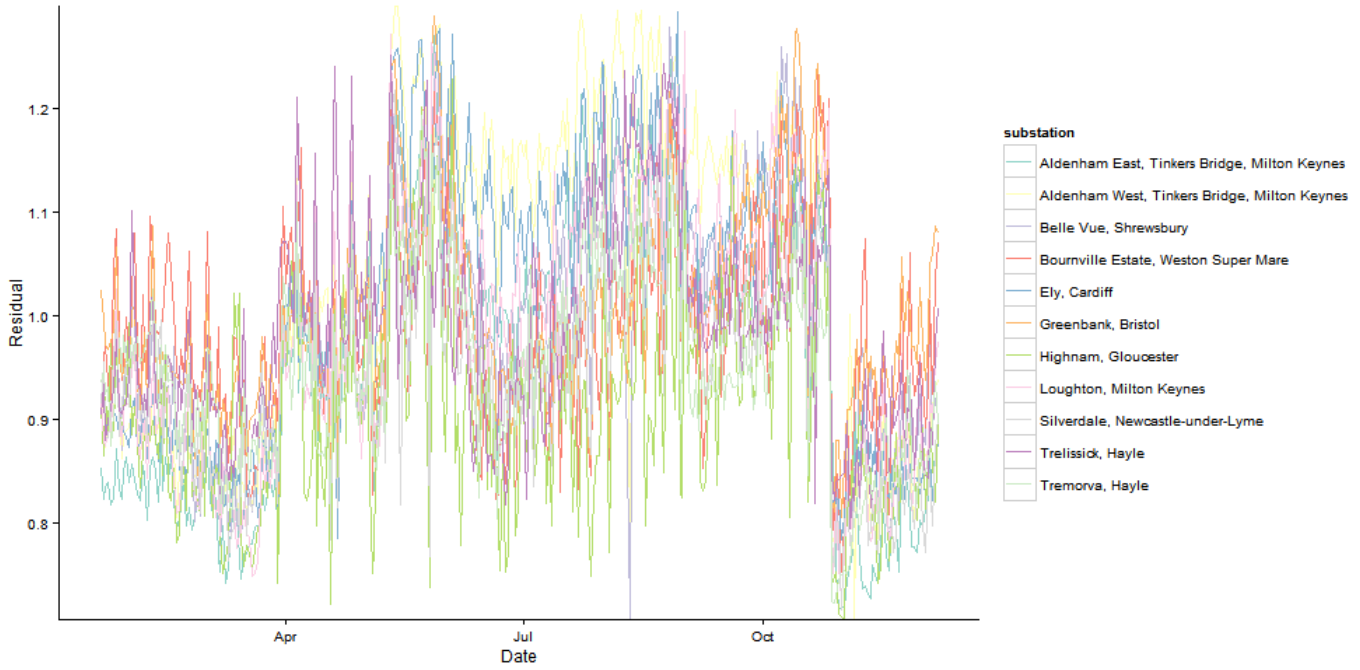

Fig 16: Residuals for measured to estimated consumption for all substations

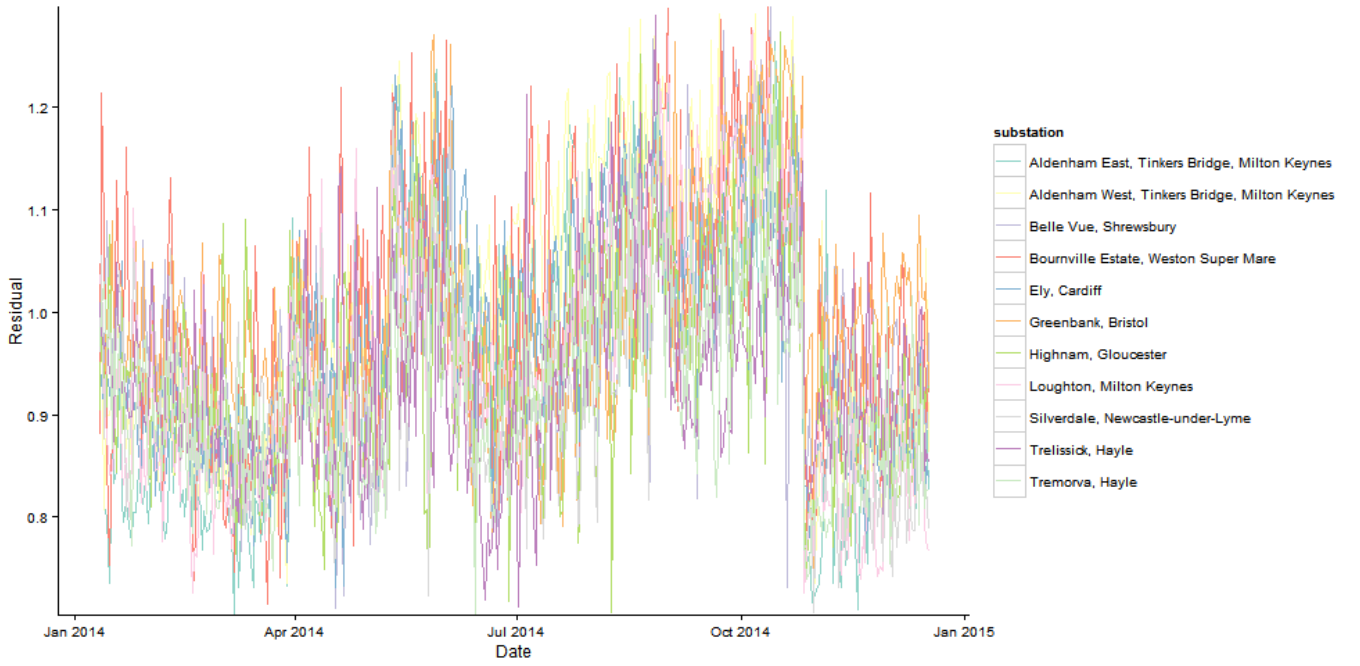

Fig 17: Residuals for measured to estimated peak for all substations

The significant daily variation in the two ratios increases the difficulty in identifying any change in energy usage. Both peak and daily consumption were often more than 20% greater or lesser than the estimate. Therefore, for the effect of any intervention to be measurable and statistically significant, it would have had to be even greater than this. Because of the seemingly seasonal fluctuations in the ratios observed over the course of the year it might be tempting to compare between similar days. This leads to the question of what is a valid comparison. Can a Tuesday be compared to a Wednesday? Is it valid to

compare between weeks? When such questions were explored, it was found that there were many instances of successive days having large variations in the 'measured to estimate' ratio. In some cases there was a 50% increase, thus in order to observe a change in consumption caused by a specific intervention, the effect would have had to be even greater than this. This led us to conclude that to generate attributable reductions in electricity consumption data using behaviour change interventions alone would require the following three project attributes, none of which can be claimed for this project:

- A large number of monitored homes per community to reduce out the 'small sample set' error (in the order of thousands per community).
- A long operational phase (measured in years rather than months) in order to deliver gradual and cumulative changes in behaviour.
- A consumption baseline measured over at least one entire year, with no breaks in data, from which to make as accurate as possible predictions of future consumption.

Based on the projects' design, being comparable to how a DNO would roll out an intervention like this, and the associated limitations of the consumption estimates outlined above, it has not been possible to quantitatively identify any impact that the interventions have had on the data. This is not to say that the interventions had no effect, but suggests that limitations in the scale of the project and meant that any effect would be masked. Testing on a larger scale would not be practical or cost effective.

An example of this can be seen if Bristol's St Paul's Carnival is considered. This longstanding annual carnival takes place near to the monitored substation in Greenbank, and ran on Saturday the 5th of July, 2014. Anecdotal evidence suggests that a large number of residents in the monitored homes attended the carnival, and from this one could expect a possible drop in energy consumption in those homes. The data for this period is shown in figure 18. A visual inspection of the data suggests that this is indeed the case, and of particular note is the lack of an evening peak. However when the data is interrogated the effect is less clear. The daily peak on that day was 85.7% of the predicted peak, but analysis of the wider dataset shows that this is only the 23rd smallest percentage of the estimate on that substation over the course of the project. For all times where the peak was a smaller percentage of the estimate there was no reason to link the drop to an intervention or specific event. Tempting though it is, it is therefore difficult to say that this drop was caused by the carnival and not just a random fluctuation.

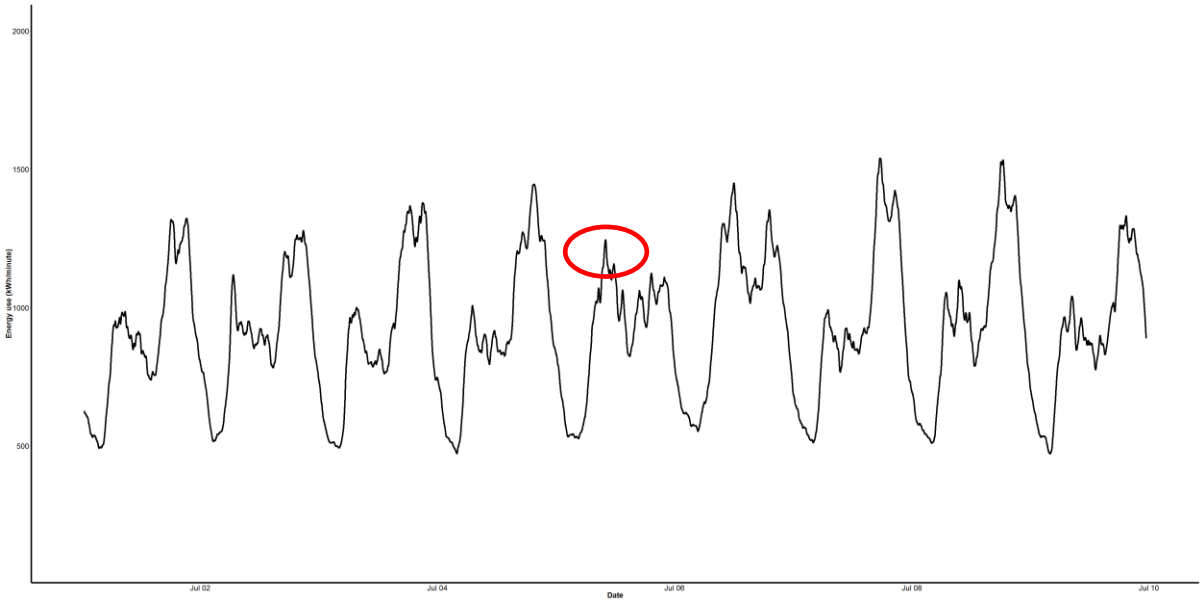

Fig 18: Electricity consumption on the Greenbank Substation around the time of St Paul's Carnival

6.1.2 Assessing the accuracy of the modelled estimates

The sudden drop off in the level of earned rewards of all communities after a few months seemed to demonstrate that their ability to earn rewards against targets set below 100% of their predicted consumption was caused not by measurable behaviour change but by estimation errors. From May it was clear that there was some unexpected and unusual behaviour in the estimates, this raised some concern as to the accuracy and validity of the method of generating the estimates upon which the predicted consumption curves and thus the targets were based. The observed unexpected behaviour included:

- a sudden shift in energy usage patterns and magnitude from the 30th March onwards
- increased energy consumption at weekends compared to weekdays from 30th March onwards
- the peak targets appearing to be substantially higher than would be expected

In order to determine whether or not the model was valid, the underlying model was recreated from scratch. The same behaviour was found and so the results of the model were re-examined in conjunction with the measured data since the start of the operational phase. This analysis was carried out over several months (between May and August), and with the passage of time it was easier to see the changes in context.

Significant issues were first noticed around 10th May when a drop in estimated energy usage occurred. After investigation it was discovered that this tied in with a change in the season variable in the CSE proprietary model. The model has five set seasons that are inputs and which therefore affect the output. As such, at season boundaries there is usually a discontinuity where the estimates change significantly from one day to the next.

Further examination of the data showed another more significant discontinuity at the previous season change around 30th March. Further investigation suggested that the greater scale of this change was due to the effect of BST beginning, an assumption that is supported by existing evidence that lighter evenings cause lower energy usage. The delay in identifying this change was due to the fact that it was masked at the time, since it coincided with the targets for the communities being lowered significantly. As such the drop in reward earned by the community was attributed to this with no further cause sought at that time. The overall trend in the communities for the first few months was:

- prior to March 30th both peak and consumption estimates were significantly higher than the measured data
- After both March 30th and May 10th there was a period where the actual to estimate ratio increased
- As each 'season' in the model proceeded, the actual to estimate ratio tended to decrease

This was a result of the fact that the seasonal attributes assigned by CSE in the proprietary model described the average over that whole 'season'. Thus, the most divergence occurred at the beginning and end of each 'season'. To illustrate this consider the spring season which ran from 30/03/14 to 10/05/14. Initially, the weather was colder and days shorter which meant more energy was used. At the end of the season (as summer approached) the weather was warmer and days were longer. As the same season profile was used throughout this period it led to underestimation of energy usage early on and overestimation later. This suggests that for similar projects running in the future, a more graduated model containing a larger number of 'seasons' would be needed, each of which would only last for a few weeks, rather than the 5 seasons used for the 11 months of the Less is More operational phase.

The third unexpected behaviour (unexpectedly high peak targets from May onwards) was found to be an unexpected consequence of the process of setting the targets by optimisation of reward amount earned (as described above), which had been implemented in order to 'front-load' the ability of the communities to earn reward. This led to the peak target being artificially high in order to ensure that communities would not exceed it during this period.

6.1.3 Quantitative analysis of the GEMs

For the purposes of analysing what happened once the GEMs had been deployed, GEMs were defined as available if a signal had been received from them within a nine hour window centred on the most recent challenge period. This method seemed likely to be representative but could at times be an over or under estimation of the true number.

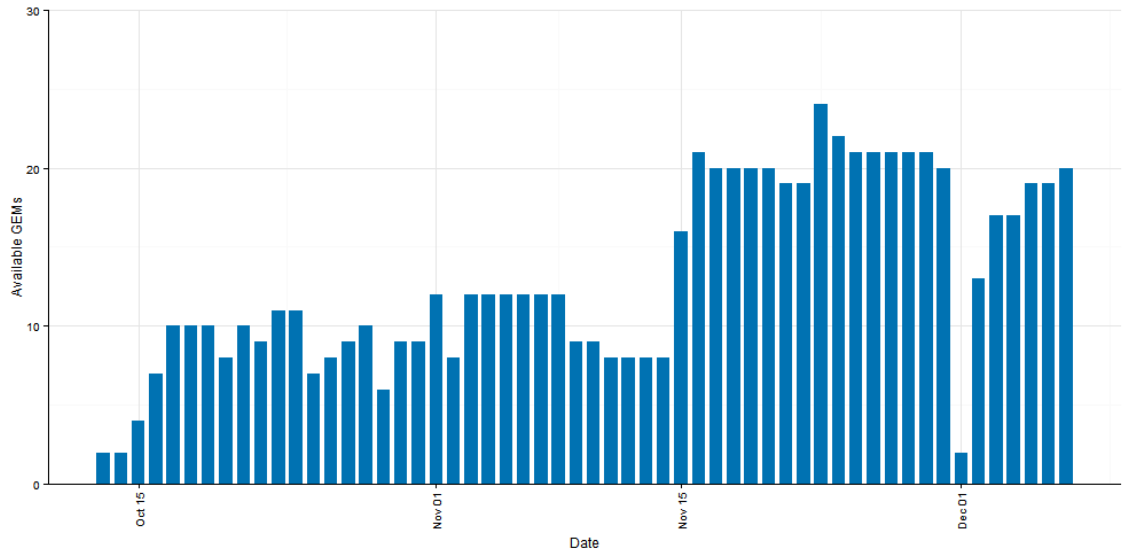

Fig 8: Plot of available GEMs by day

The initial deployment of GEMs took place from 13/10/14 to around 21/10/14. In this time the project team went door to door distributing the GEMs almost every day including evenings and weekends[9]. An operating manual was distributed to each householder receiving the GEM (See Appendix 7). After this time distribution attempts were continued at a reduced frequency because distribution was hampered by the limited range of the radio network. The number of available GEMs was additionally reduced due to fault the emerged preventing them from being recharged once the batteries died. This issue was resolved quickly by Clean Energy Prospector, and the increase in available GEMs around 15/10/14 corresponds to several of these faulty GEMs being replaced along with further distribution to areas previously not covered by the radio network.

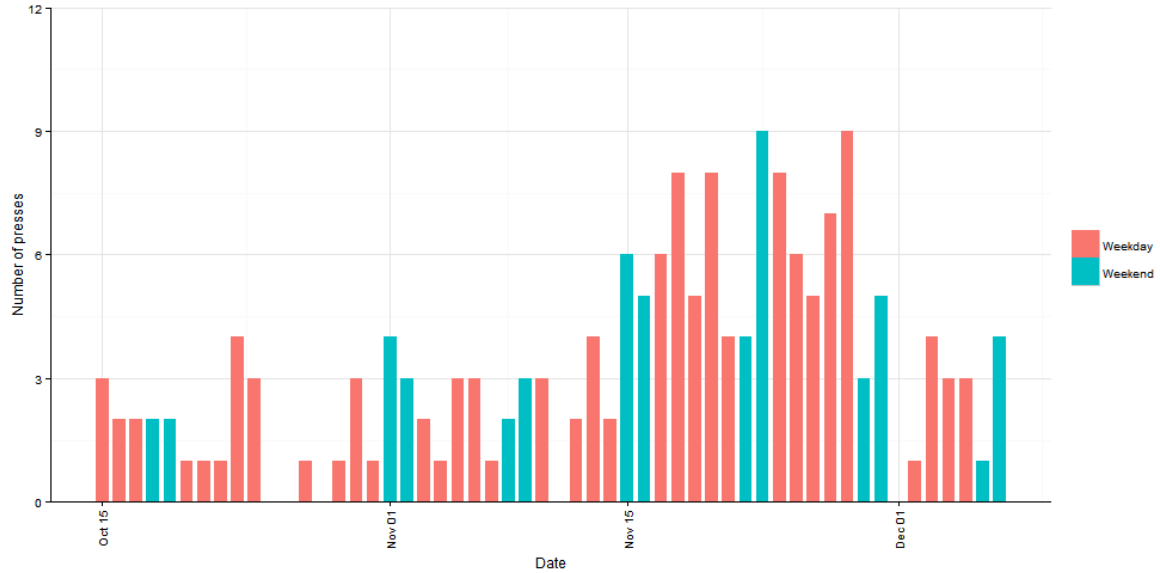

Figure 9: Plot of button presses by day

[9] Previous door to door engagement had been carried out in June and July, based on an earlier delivery schedule, but this had to be stopped when it became apparent they would not be ready in time.

Figure 9 shows the number of button presses per day. There does not seem to be any significant consistent pattern in consumption by day. Participation peaked at 9 per day which was reached on two occasions. On five occasions there were no button presses there were 25th, 26th and 28th October 11th November and 1st December. There were known faults on four of these occasions which likely contributed to this. The mean number of presses was 3.55 with a standard deviation of 2.26.

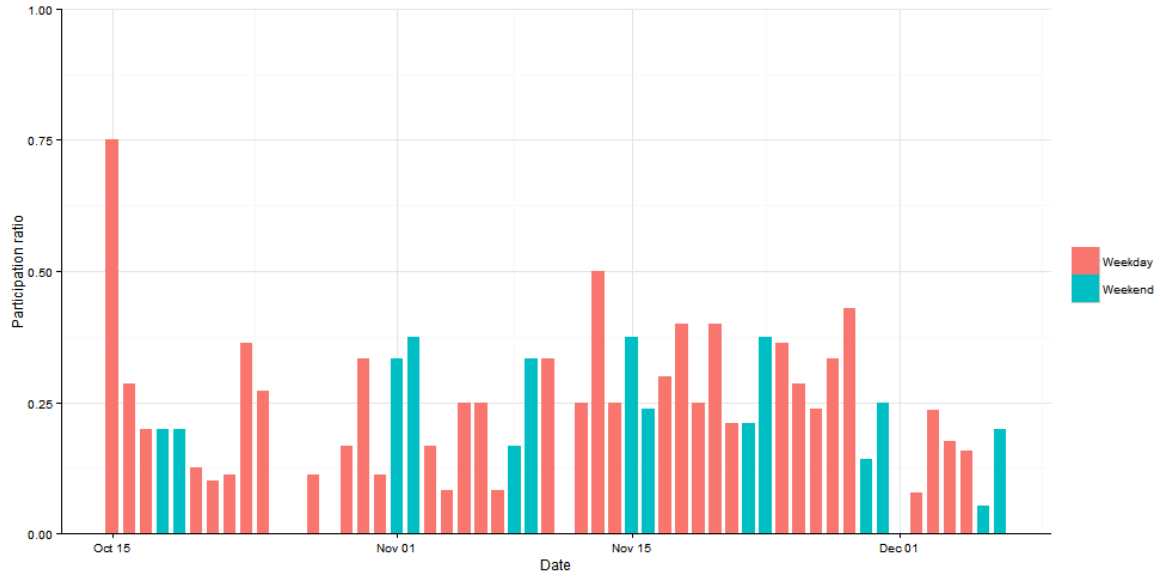

Fig 10: Participation ratio by day

Figure 10 shows the ratio of available GEMs to button presses. As with the raw button presses there does not appear to be any significant relationship between the day and the proportion of people who participated. The mean participation percentage was 25.3% with a standard deviation of 12.8%. The highest participation percentage was 75%, however this corresponds to only three presses.

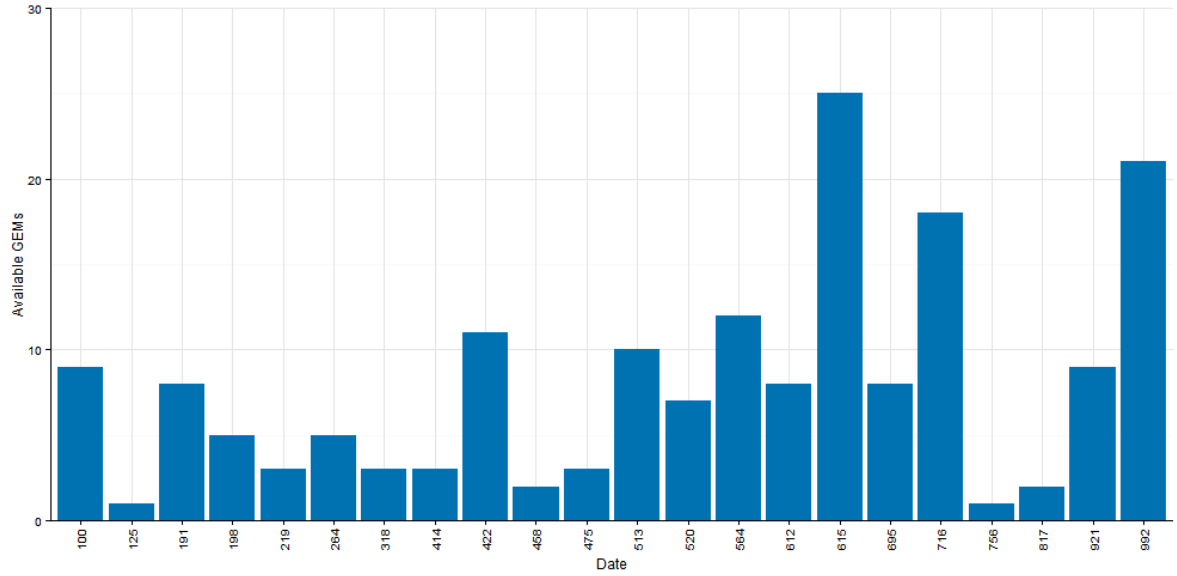

Fig 11: GEM BUTTON Presses by house

The home which participated most frequently took part in the challenge on 25 occasions. There were five homes which never participated (these are not shown). The average

number of button presses was 7.91 with a standard deviation of 6.47. Note all houses have been assigned a random reference number for anonymisation purposes.

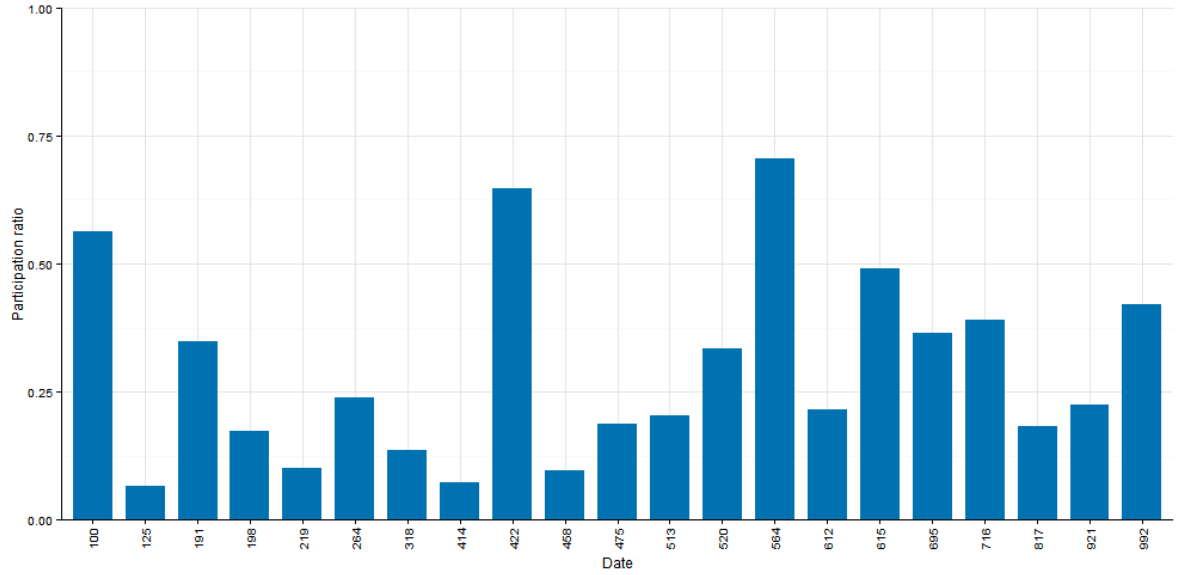

Fig 12: Participation rate by house

Figure 12 shows the participation rate per home. The highest participation rate was just over 70%, however this was over a shorter sample period than some others. The mean participation percentage was 29.3% with a standard deviation of 18.7%. There is a discrepancy between these figures and those per day, this is because the per house figures do not count the homes with no presses.

Analysis

It is clear from the above graphs that no real quantitative conclusions can be drawn from this very short term and small scale trial. There is insufficient data to identify any trends from random fluctuations. Ideally this intervention would have been conducted over a series of months (as was originally planned) and would have involved far more people (this making it possible to see changes in consumption data, which would in turn have allowed us to determine if people's intention to participate (indicated by them pressing the button) was followed through with any action that actually resulted in reduced electricity consumption at the substation.

Had the intervention been carried out over the original planned timetable and number of houses, it would have been possible to test some different engagement strategies. Some possibilities are outlined below.

- Trials of 'staggered challenges' so that groups of houses would have ended the challenge period over a 10-20 minute period, thus reducing the impact of all participating households switching back on together .
- The timing and duration of challenges could have been modified, to determine if there are certain times when people are amenable to adjust energy consumption. We would also be able to find out if people are willing to sustain a challenge over a longer time period.

- Testing to see if interest in the GEM decreased over time. It was hypothesised by the project team that interest and engagement with the GEM would be highest immediately after deployment when it was novel and that it would decrease over time. It would have been interesting to know if this is the case and to trial ways of getting the community to reengage with it.
- Increasing the reward for and highly promote special challenges in an effort to significantly reduce demand. This would have been perhaps the best method to elicit a measurable drop in demand across the community and would help give an idea of what was possible using this approach.

A series of interviews with users of the GEM were carried out after the end of the project. This showed that the intervention was popular, and that people were motivated by working as part of a group (less so by the ability to earn rewards). The interviews also showed that, although people understood that they could only see how many households were taking part (and not which households) they were not interested in making this information more personal. In effect, they were willing to forgo the ability to find out if anybody was not playing their part, or was indicating an intention to join in but then not altering their behaviour, in order to preserve the overall anonymity of community members. They also had useful feedback on changes to the design that they would have liked to see, and many felt (against the project team's original expectations) that they would have liked an individual household monitor to use alongside the GEM.

The recruitment process was also extremely enlightening – whether it was specific to Greenbank is hard to say, but very few householders were resistant of taking a new and as yet untested device into their homes. One even went so far as to ask how much he had to pay for it. Lack of community interest was therefore not a barrier to deployment, and the key failings in this pilot were the major delays during Clean Energy Prospector's development processes.

6.2 Qualitative evaluation

This project was designed principally around the use of the monitoring equipment and the website to track changes in consumption using quantitative measures, and to link these to the interventions that had led to them. The gradual realisation of the limitations in being able to link specific interventions to changes in the data led to a significant re-design in the evaluation plan. Once the intervention period ended in December 2014, a plan was put in place for a large-scale qualitative evaluation of the project, which would instead draw on the experiences of the householders and other stakeholders involved in the project.

6.2.1 Overview

A key stage in the evaluation of the Less is More project was undertaking qualitative research, to develop a broader and more in-depth understanding of the various communities' experiences of the project, as well as those of the charity partners who were delivering activities on the ground. This qualitative data complements the quantitative data analysis, and gives insight into the real, lived experiences of those who were engaged through the project.

6.2.2 Interviews and focus groups

Charity Partners

Telephone interviews were conducted with each of the charity partners (detailed in Table 7).

Community	Charity partner
Silverdale, Newcastle-under-Lyme	Marches Energy Agency
Belle Vue, Shrewsbury	
Loughton, Milton Keynes	National Energy Foundation
Tinkers Bridge, Milton Keynes	
Ely, Cardiff	Severn Wye Energy Agency
Lassington, Highnam	Severn Wye Energy Agency
Tremorva, Hayle	Community Energy Plus
Trelissick, Hayle	
Bournville Estate, Weston-Super-Mare	Centre for Sustainable Energy
Greenbank, Bristol	Centre for Sustainable Energy

Table 7: Charity partner interviews

Topics covered

Interviews with charity partners were conducted to complement the community interviews and focus groups – to understand their experience of engaging with the respective communities, to get a sense of what they felt worked and what didn't, and to understand if their engagement in the project would shape their future work, and specifically whether they would repeat activities they had trialled through the project. The interviews also complemented the reports submitted by each charity partner.

Less is More Communities

In-depth telephone interviews and face-to-face focus groups were undertaken across the 10 communities. Across 9 of the communities (minus the Greenbank community), the focus of this research was the same. In the case of the Greenbank community, the focus of the research centred on a specific intervention that was undertaken in that community – this being the use of the Greenbank Energy Monitor (GEM). Given the unique nature of this intervention it was considered beneficial to better understand how effective it was/how engaged people were with it. The GEM interviews and focus groups began in September 2014 and will continue until November 2016, at which point an intervention-specific report will be produced. For all other communities, this qualitative evaluation report represents the end point of intervention via the Less is More project.

Recruitment

Charity partners undertook the initial stage of recruitment for the interviews and focus groups – it was felt that ensuring this preliminary recruitment of community members was undertaken by someone with whom the community members would be familiar with was most appropriate, and would potentially increase the success of the recruitment. Charity partners contacted people who had been engaged in the project, but with the aim to talk with people who had had varying degrees of involvement.

The efficacy of recruitment varied between the communities. It was notably difficult in Tinkers Bridge (Milton Keynes) and Ely (Cardiff), and this is reflected in the number of telephone interviews that were undertaken and the fact that focus groups were not conducted in either of these communities (note that in Tinkers Bridge, a focus group was organised but only one person attended, so this evolved into an interview). It is unclear why recruitment was difficult, as this does not parallel the predominantly successful community engagement and involvement in these two communities. In the case of Highnam, those who were recruited were happy to do telephone interviews rather than taking part in a focus group, and as such only telephone interviews were undertaken for this community. In the case of the two Hayle communities (Tremorva and Trelissick), a single focus group was undertaken with attendees from both communities – whilst this was practical, it also more truly reflected how these two communities, who are in very close proximity to each other, were engaged through the project (i.e. as a single community).

Table 8 details the number of interviewees and focus group attendees from each community.

Community	Interviewees	Focus group attendees
Silverdale, Newcastle-under-Lyme	5	3
Belle Vue, Shrewsbury	7	8
Loughton, Milton Keynes	5	4
Tinkers Bridge, Milton Keynes	2	N/A
Ely, Cardiff	3	N/A
Lassington, Highnam	5	N/A
Tremorva, Hayle	4	5
Trelissick, Hayle	2	3
Bournville Estate, Weston-Super-Mare	4	3
Greenbank, Bristol	12 (8 reconvened)	1
Total	**37**	**25**

Table 8: Overview of interviews & focus groups (a separate interview process was undertaken in Greenbank, specifically related to the GEM intervention, with most householders interviewed twice)

Topics Covered

The key topic areas explored in the community interviews and focus groups were:

- Overall understandings of the project
- Experience of the charity partner
- Project activities – level of engagement and behaviour changes
- Motivations for involvement
- Legacy of the project – continued behaviours and next steps

Analysis methods

All telephone interviews and focus groups were recorded; transcripts of each were then typed up. The transcripts were then 'coded' within NVivo – a qualitative data analysis programme, which supports the researcher to efficiently analyse across numerous sources of qualitative data. When coding, transcript text is attributed to themes and sub-themes (referred to as nodes and child nodes). Coding is done both proactively (i.e. the theme/sub-

themes are chosen prior to coding) and iteratively (i.e. new themes/sub-themes are created as the transcript is coded). Transcripts are predominantly coded at least twice – i.e. further sub-themes are created with a second coding. 'Queries' are then run, which enables easy aggregation of themed text both within single sources as well as across sources. Matrices can also be created whereby different themes are cross-tabbed against each other, so that potential relationships between themes can be explored.
To illustrate, below are the node and child nodes associated with 'resident motivations for project engagement' – a code used in analysing the community interviews and focus groups:

Theme/node**:** Motivations for engagement
Sub-theme/child nodes: Getting to know neighbours and community; Energy and cost savings; Novelty factor; Environmental motivations; Responsibility for infrastructure.

Below is the result of a 'query' to view coded text relating to sub-themes 'Responsibility for infrastructure'. Full NVivo codes for the analysis can be found in CSE report in Appendix 12.

<Internals\\BV [redacted] [32 mins x 50p]> - § 1 reference coded [0.40% Coverage]

Reference 1 - 0.40% Coverage

I think that's something more of a concern to the distribution company isn't it?

<Internals\\BV [redacted] - § 1 reference coded [1.68% Coverage]

Reference 1 - 1.68% Coverage

I'd like to think so. It's a difficult one to answer really because I suppose at the end of the day to a bit of lay person I've got some understanding where electricity comes from and obviously the sub-stations and the distribution, but like everything, if you could reduce the load on every single sub-station for someone like Western Power Distribution and it's saving them money in terms of maintenance and the upkeep of these things. So, yeah, a little bit, but as I said, it's a hard one to answer that one really.

<Internals\\BV [redacted] § 1 reference coded [1.19% Coverage]

Reference 1 - 1.19% Coverage

Yes, that is sort of…I think that is a very sort of wordy version of…that if one of us feels like it would be nice to get involved with something but, obviously, people want to get involved with something that has significance to them.

<Internals\\BV [redacted] [24 x 50p]> - § 1 reference coded [1.83% Coverage]

Reference 1 - 1.83% Coverage

Yes, it was, I do feel very responsible for the whole energy thing really. We have got to address it and if people don't address it and especially if the Government don't address it then we're going to be in real trouble. So the more that's done to make people aware of the energy crisis that's about to loom up is a good thing.

Findings: interviews & focus Groups (less Greenbank)

Table 9 summarises some of the key findings from the charity partner interviews and reports. Full reports from each charity partner can be found in CSE's report in Appendix 9, whilst timelines of all interventions are in Appendix 8.

Community & charity partner	Overall approach	Interventions/activities & uptake	Relationship with other charity partners	Less is More branding	Project learnings & legacy
Silverdale, Newcastle-under-Lyme (MEA)	After initial meetings with community leaders and unsuccessful attempts to publicise and convene public meetings about the project more emphasis was placed on more informal arrangements.	Information stalls; initial PV promotion; loan of OWL monitors; provision of LED bulbs; door knocking & newsletters. Uptake – no turn out to public meetings; few people around during door knocking; poor attendance at stalls; low take up of LED makeover worth £100.	Helpful to share ideas; helpful to check progress of other communities on website. Found data support advice from CSE helpful.	Community developed their own name for the project.	LED bulbs installed in 5 households. Future work – importance of central hub; engaging with geographic communities which lack existing affiliations is very difficult; high levels of distrust and disenchantment; meeting without a sales pitch was beneficial.
Belle Vue, Shrewsbury (MEA)	After initial meetings with community leaders and unsuccessful attempts to publicise and convene public meetings about the project more emphasis was placed on more informal arrangements. Aim to bring people together in small groups.	Initial PV promotion; LED promotion; loan of OWL monitors. Uptake – low turnout to public meetings, and few people around during door knocking. Coffee mornings – quality not quantity, with pool of people gradually increasing and sense of group developing.	Helpful to share ideas; helpful to check progress of other communities on website. Found data support advice from CSE helpful.	Community developed their own name for the project.	LED bulbs installed in 3 households; a few households engaged in embedding energy efficiency deeper into their culture, and shame that project is ended as potential to make lots of progress here. Future work – those engaged middle class, and interested in energy/climate issues and meeting neighbours; coffee mornings hosted by community members is good approach,& successful to combine with LED makeover. Events need lots of publicity.
Loughton, Milton Keynes (NEF)	Contacted local residents association and parish council – not much success. Slow but steady attempts at engagement.	Leafleting; OWL monitors; thermal imaging; washing at 30; bi-monthly bulletins. Uptake – 5 households at initial meeting; high uptake of OWL Monitors (30 across area); medium uptake of wash at 30 packs.	Very helpful to have multiple partners with whom to share ideas and issues. CSE's building of website very helpful.	Neutral response to branding.	Hope that continued behaviour changes with OWL Monitors; incentive money spent on further energy efficiency activities for the community.
Tinkers Bridge, Milton Keynes (NEF)	Contacted Community Action MK and the Community Council – forged strong links with the community.	Leafleting; free plug in timers; Facebook page; slow cooker event; 7 minutes @ 7 switch off; workshop for spending incentive money with Open University. Uptake – high for free equipment; medium turn out at events; low for 7@7	Very helpful to have multiple partners with whom to share ideas and issues. CSE's building of website very helpful.	Neutral response to branding.	Residents already using very little electricity; partnering with Community Mobilisers was very effective; slow cookers were effective at spreading demand; working with a coherent estate was beneficial for having clearly defined community, but many residents to engage with.
Ely, Cardiff (SWEA)	Using message of 'taking control of your energy costs' (as residents already use very little electricity because many in fuel poverty). Slow but steady engagement, using a co-productive approach where	Saving energy in the kitchen; avoiding leaving appliances on; washing at lower temperatures. Uptake – difficult initially; engaged residents to help with further engagement which helped.	Useful to share ideas and replicate what other partners had done; CSE's project management and building of website very helpful.	Branding / key messages of a project should be discussed with residents first to establish	A lot of mistrust amongst residents. Important to provide space to discuss breadth of community issues, not just those relating to energy. New community group established to build on project. Future work – good to focus on narrow range of

Community & charity partner	Overall approach	Interventions/activities & uptake	Relationship with other charity partners	Less is More branding	Project learnings & legacy
	residents help with running of project.			strong local branding / identity.	behaviours; good to find local people to act as advocates, but this does take time. Talking about broader benefits of saving energy important (e.g. keeping clothes for longer if washing at 30).
Lassington, Highnam (SWEA)	Attempted to engaged with parish council but unsuccessful. Advertised first event in local newsletter and took it from there.	Engagement through newsletter drops; 4 events; OWL monitor hire; home visits Uptake – low; attendance at events was same people who were predominantly already energy aware.	Helpful to learn and replicate what others had done; would have liked more meetings later on in project. Helpful project management from CSE.	Neutral response to branding.	Future work – try to engage a local resident to door knock with you; larger initiative (covering not just few roads) would lend itself to engagement with other community groups (e.g. WI).
Tremorva, Hayle (CEP) **Trelissick, Hayle** (CEP)	Engaged local Town Council; 2 communities engaged as 1. Initial partnership with Tremorva residents association, but which disappeared with time.	Lots of general publicity in local press; door knocking; home visits; slow cooking event; LED bulbs. Uptake – low uptake through door knocking but established visibility for project; some uptake of home visits through which LED bulbs were promoted and distributed; 2 very successful slow cooking events.	Meetings and chance to share ideas very helpful. Doubted how useful website was and whether many residents used it.	Found name helpful with people starting to see it as a brand.	Hopeful that behaviour changes will be maintained. Future work – importance of 'warming up' an area priort to starting a project; larger community settings are easier as can make engagement appropriate for entire community.
Bournville Estate, Weston-Super-Mare (CSE)	Engaged Alliance Homes.	Community survey, drop in events, door knocking; slow cooker event; wash at 30 campaign; home energy health checks. Uptake – low interested in most activities; difficult to recruit resident volunteers; turning point was slow cooker event (90 people!); 15 home energy health checks booked in, although difficult to carry out all.	Supportive and helpful to discuss issues and share ideas.	Helped to act like a branding which was recognisable.	Alliance Homes will continue to give energy advice to residents, and will benefit from CSE resources and relationship. Future work – When working on an estate, very difficult to just engage with just a sub-sect. Incentives for attendance/ engagement are important; door knocking not good approach (plus many residents are disenchanted with 'help'). Important to pitch project messaging at audience to make it relevant.
Greenbank, Bristol (CSE)	Step by step engagement, in partnership with Easton Energy Group. Maintain 'buzz' around project.	Initial leafleting; hosted initial event hosting community groups; promoted GEM; distributed energy saving goodie bags on school run; slow cooker event; wash@30 packs; distributed GEMS. Uptake – interest amongst those already energy aware and predominantly with children; large proportion of community	Helpful crossovers between groups and helpful to share ideas and issues.	People began to associate with the name/brand which was helpful with time.	Legacy thought to be quite minimal as engaged those already energy aware; benefit in greater awareness of Easton energy group. Future work – need to think carefully about approach when working with communities who already use very little electricity; need long lead in time to promote awareness of project before seeking to do interventions.

Community & charity partner	Overall approach	Interventions/activities & uptake	Relationship with other charity partners	Less is More branding	Project learnings & legacy
		not interested.			

Table 9: Summary of charity partner interviews & reports

Understanding of the Project

The majority of people described the project as primarily being about reducing energy use. Approximately half of people specified that it was focused on reducing electricity use specifically. 'Helping people to make cost savings' was discussed by about fifth of respondents as being an aim of the project, with this being most notable amongst Bournville and Tremorva community members. In the case of Bournville residents, this focus on cost savings extended out to the project being about 'trying to get things that we need', 'making life easier' and 'well it's to keep the estate up to scratch more or less I think, and, you know, helping each other around'. Comparatively, none of the interviewed Belle Vue residents noted cost savings as being an objective of the project.

A third (15) of community members introduced the project aim of reducing peak energy/electricity demand, with a quarter (10) going on to make the link to a need to reduce stress on the local substation – interestingly, all of the Belle Vue residents discussed this. This understanding and awareness may link to the project name which was used in Belle Vue: '*Love your substation'.* This name was used in place of Less is More, and directly brings the substation to the fore – as one resident notes:

'It made me think of that, but I suppose if I'm honest, like most people, you just take things for granted. When you see engineers and whatever working on these things it's usually because something's gone wrong or it's just being serviced. I think the name said it all really; Love-your-sub-station, it made you smile'

An Ely resident made the link to possible disruptions in provision: '*Well what I understand is they're trying to get people to use less energy, be more energy efficient because the problem is there's so much energy consumed that the possibility could be power cuts and I was born before the Second World War and I went through power cuts when I was growing up'.*

There was very little emphasis within the interviews and focus groups on the project having environmental objectives – rare exceptions were one Bournville resident, who noted the aim of the project was '*to be more green'*, and a Loughton resident who noted '*we've only got a finite amount of resource in the world and we've all got to play our part in protecting it'.*

→ People may be given the same explanation about a project, but they will each hold onto different bits of this information to form their understanding of the project based upon their own situation, priorities and needs. Capturing how residents understand the project – e.g. whether the project is primarily about cost savings or about environmental issues – should in turn shape engagement practices.

→ Concurrently, names and broader messaging used in the project will shape people's understanding of it, and in turn their relationship to it. The environmental reasons for reducing energy use were cited much less prominently than the financial reasons by project organisers – in turn, residents predominantly viewed it as an 'efficiency' project and not an environmental project.

Partner Organisations

Understandings of who was running the project

A quarter of community members, when asked who they thought was running the project, either responded that they hadn't thought about it, or that they didn't know. These responses came from residents across the Bournville, Highnam, Loughton and Hayle communities. One Tremorva resident noted: '*It's been a bit of an enigma for me, because I've asked several people, who is actually funding this apart from anything else? No, I wasn't entirely sure who was running it. As I understood it, it was an entity that had been set up just for this project*'.

A resident at the Belle Vue focus group commented:

"*It was also to benefit the distribution company by flattening the demand in some way. Prolonging the life of the kit. So it wasn't a totally altruistic thing or a green thing, well, I suppose it was green in that sense but it was also saving them on capital investment I suppose. Well, they're financing it I think, aren't they, or …? It's done through a trust so it doesn't look as much like them, but it is their money behind the project I think. Not that there's anything wrong with that but I'm just aware of it".*

Anecdotally, throughout the project charity partners had reported finding it difficult to explain the difference between the DNO and a retail energy company. Despite the WPD logo appearing on all literature and their role being explained in various newsletters etc, this conflation persisted throughout the project, and was still in evidence at the focus groups:

"*To be honest it's not much I paid attention too. However, I believe … there's a sponsorship. I can't remember there was one of the big six energy companies was I think the sponsorship behind it, I don't know*".

Three quarters of the community members had a sense that they knew who was running the project, but this was quite variable both within and between communities. Highnam (1), Tinkers Bridge (2), Loughton (4), Silverdale (2) and Belle Vue (5) are notable for responses

being an individual (number of responses noted). This undoubtedly reflects the approach taken in these communities, whereby it was a single individual who undertook all of the community engagement. Across the 44 community members, 7 people referred to the respective charity partner involved, whilst only 4 referred to Western Power Distribution being involved in the project. In the case of Bournville, a couple of residents felt the project was being run by Alliance Homes (who CSE partnered with), whilst in Ely, the project was understood as stemming from Action in Caerau and Ely (ACE) (and not Severn Wye Energy Agency).

Whilst community members had variable understandings of who was running the programme, and in some cases no knowledge, this predominantly did not translate into *confusion* about who was running it – perhaps reflecting that most residents did not dwell on this issue, and that it was not of importance.

Community members were asked to consider whether it matters to them who is running the project. Opinion was mixed. Some residents noted that it doesn't necessarily matter, as long as the people are friendly and the project delivers what residents need. Other residents stressed the need to '*feel like it was coming from the right direction*'. A key issue that was discussed was the importance of the project being run by a local organisation, or someone who understood the locality. This sense is captured by this Bournville resident:

Interviewer: *Okay. Did that feeling that it was at least run by a local organisation, did that make you feel anything?*

Respondent: *Yeah, it made me feel, it's difficult to say, more like you know what's going on in the local area, if you see what I mean. Rather than coming in say from London and not knowing the local things that go…. It's better than somebody from coming outside the area and going bang, bang, bang and then leaving and forgetting all about us.*

The following focus group extract is interesting for its discussion of the benefits of having a local organisation running a project where a project has a short timeframe.

Interviewer: *Does it matter who's running the project?*

Respondent1: *I would say so, I think for somebody who hasn't got a working, living understanding of a local community to come in, it would be like yourselves coming in. He was able to add the local contacts to it and the reference points, he knew exactly what we were talking about.*

Respondent2: *I would disagree with that. I see it doesn't need to have someone but maybe someone who's got the ability to adapt and speak to other people...Yes, it helps but if that's someone who's got the skills to pass on the information or look out for the information, no problems at all.*

Respondent3: But I think it goes back to what you said at the beginning about the timeframe that these projects have and if you haven't got an awful lot of time to engage with a community, I'm sure it does help.

Whilst only discussed by one resident, the following quote stresses their need to feel like the project was being run by both a trustworthy organisation, and one that has the capacity to respond to the project outcomes:

'*It does matter because you want to know that the people that you're dealing with, if you're … at some point you're exchanging personal information like emails and that's kind of tied in with your electricity usage and your house details and things so you want to make sure that it's somebody reputable that you're getting involved with … And also have the power to do something about it afterwards and that they will pay up the money that they've said they're going to provide to the community.*'

The involvement of a 'power company' was discussed by some residents, and in most cases this was done in a neutral way. One resident noted that it made her feel 'suspicious', whilst another stated that having a local charity involved was important to her, and '*if it had just been a power company, I wouldn't have gotten involved*'.

Experiences of charity partner

The majority of residents noted that they had not had any experience of their respective charity partner (or the person who they saw as running the project from that organisation) prior to the project. Notable exceptions were: Silverdale, where two residents had volunteered alongside Marches Energy Agency in a previous project in their community; Belle Vue, where one resident was aware of Marches Energy Agency; Highnam, where one resident was aware of Severn Wye Energy Agency; and Tremorva, where the resident remembered another energy efficiency event run by Community Energy Plus.

Whilst most residents had not had experience of their charity partner prior to the project, the majority of residents felt like the project was locally run, by someone who was familiar with their local area (even where they were not local to the community). Where there were single individuals from the charity partner who became 'the face' of the project for residents, this sense of it being a local project was strong. An exception was one Silverdale resident who felt that the project needed someone who better understood the community:

'*The campaign was poor and I think partly that was because of the understanding of the people round here. I mean we came here three years ago and these are a breed unto themselves. They're not your normal, average community. And I think you needed someone that was more on their level perhaps and not so out of it, shall we say, off their level*'

The level of interactions with the charity partner through the project was variable, depending on the level of engagement of the resident with the project. In some cases residents noted that the only interaction they had with the charity partner was through email correspondence; in other cases, interactions were through email, telephone and face-to-face, and over multiple occasions.

→ Having a consistent individual who is delivering the project community engagement activities creates a strong sense of these individuals being the 'face' of a project and being who is running the project. This is helpful where the delivery partner may not be locally known, and can support the sense of a project being locally-based.

→ However, this does not negate the importance of having local knowledge, understandings, and contacts/networks which come from long-term embeddedness within a community – this is particularly key where a community has multiple and complex social issues.

→ Partnering with local institutions and networks, and delivering project activities through already-established community activities (i.e. piggy-backing) supports and can speed up engagement and trust in the project.

Project Activities

Residents' learning of the project

Residents first became aware of the project in various ways. The most common was through leaflets that were posted through their letterboxes. In a few cases, the first time a resident said they became aware of the project was when someone knocked on their door or telephoned them[10], when they read about it in a local newspaper, or where they happened to coincide with a project activity. In the case of leaflets, many residents noted that it was lucky that they had read the leaflet, as predominantly they put them in the bin (as residents get a lot through their doors). A couple of residents noted that after reading the first leaflet, they came to recognise the leaflets when they received further ones, highlighting the importance of consistent design and having an identifiable logo. In Bournville and Ely, the respective 'community hubs' were also mentioned as a place through which residents had learnt about the project (e.g. seeing a poster) – this highlights the importance of having a community space through which members of the community can be 'recruited'. The absence of such a hub in Loughton was noted by residents.

In a few communities, 'trusted' and known figures were involved in the engagement of community members. In Ely, residents who became involved in the project supported Sam Froud-Powell with engaged more residents through door-knocking and distributing leaflets; in return for which they earned timebank credits. In Belle Vue, Philip Newcombe engaged a couple of local councillors, who themselves then further supported the community engagement through door knocking. One resident in Ely noted that she had learnt about the project through friends who had said that they had learnt about energy saving through the first 'Energy Club' and recommended that she attended the second meeting. In Bournville, one resident said that she became aware of the project when someone knocked on her door and was conducting a survey to find out about which elements of the project residents would be interested in (e.g. having a home visit, getting freebies).

[10] Interestingly, the only way we could telephone them was if they had previously given their phone number on a project prize draw form or similar, which suggests that they did not register or remember the project but where more interested in the potential prize on offer.

→ Community hubs are very important spaces for community engagement projects. In their absence, hosting engagement events at residents' homes could be an alternative approach.

→ Recruiting residents to be project ambassadors can be an effective way to support further engagement and embed a project in the community – this approach takes time and persistence, but is worth the effort if successful. Any available resources to reimburse or incentivise people for their volunteering time can help – timebank credits are a fantastic mechanism as they mean this money is re-circulated through the local economy.

→ Consistent branding helps develop the sense of project identity, and helps residents recognise and respond to project publicity and communication

Residents' active engagement with the project

Residents became *actively* engaged in the project in various ways, and involvement levels were very variable. As noted by all the charity partners (Table 9), engagement levels were predominantly low, and where in some communities a core group of people did build around the project, this took time to develop. There is not a clear picture in each community of exactly how many houses were actively engaged – it was noted by some interviewees and focus group attendees that they were aware that some of their neighbours, whilst not being openly engaged with the project, were seeking to reduce their energy use. This is clear in Loughton, for example, where only a handful of households appeared to be actively engaged with the project, but where OWL monitors had been distributed to 30 households across the project area by the end of the project.

This lack of visibility regarding how many households were actively engaged resonates with the finding that the households who were openly engaged, predominantly engaged with the project on a household level, and not on a community level. The nature of the project does lend itself to engagement solely on a household basis – because it is about reducing domestic electricity use, as noted below:

'So it felt like it was very much a project of individuals that were isolated, it was pure fluke that we all happened to be in the same area' (Loughton resident)

'We didn't attend but I was aware of the newsletter and the literature early on but I'm away quite a lot in Birmingham and Milton Keynes working and whenever the events were happening it coincided with other stuff we were doing. But we bought an energy monitor, we've got energy light bulbs and I've been looking online to monitor things so it impacted on our behaviour but I was aware I wasn't being more sociable and joining in these things and my attending here was because I felt a bit guilty about not being more socially involved in this stuff' (Belle Vue resident)

A Greenbank resident noted that it is important for her to visibly see who in her community is taking part, and how this strengthens her sense of her community:

'I get quite excited about the idea of a community spirit and people caring, that being visible, more exciting and more motivating and we're all in it together'

The community-based events across the communities did create opportunities for residents to engage with the project on a community level, in so far as residents met with other community members within the context of the project, which in some cases would have facilitated broader discussions around their energy use: in Loughton members of the community walked around their neighbourhood with infra-red cameras to witness collectively how heat is lost from their homes; slow cooker events across many of the communities created an opportunity for people to come together; and stalls and pop-up events at community events, such as in Silverdale and the Hayle. In most cases these community events were one-off events, so this community level involvement did not maintain momentum or help to develop the sense of a community-based project. In Belle Vue, Ely, and Tinkers Bridge more regular community-based events took place, and these communities are noticeable for residents talking about the project as a community project with their involvement being at both a household and community level. In Ely and Tinkers Bridge, the projects were very much run through existing community-based organisations/networks (ACE and Community Action MK respectively), which is likely to have supported the experience of the project as a community-based one. In Belle Vue, there was not such a partnership, but a few community-based events were organised which took the form of coffee mornings – this was slow to garner interest, and whilst only a handful of houses out of 168 connected to the substation took park, it was obvious from those who did form the core group of attendees, that these events were very beneficial, both for discussing energy saving ideas, but more importantly for fostering a sense of community – as demonstrated in this focus group extract:

Respondent1: Whenever we had our coffee mornings, he put it in a broader context because when you've got a group of people from a local community, although he was giving us broader context it was very much about what it meant to us, so the information was there but the focus fell and it was as a community

Interviewer: And when you first heard about the project, what was it that engaged you in it? Why were you interested? You talked about potential cost savings and energy bills, is there any other?

Respondent2: Mine was purely community. Cost saving wise, I already knew about energy in bulbs and that side of it so I was already renovating the house, sorting all that out. Mine was purely the community.

Respondent3: An opportunity to-

Respondent2: It's an opportunity, yes.

Respondent4: I felt that because I've only been here about three years.

Respondent2: But also if there was anything new on the market, if there was anything I didn't know about to see if I can incorporate that.

In the same community, one resident who is very house-bound because she cares for her husband, describes how it felt positive to be able to contribute to a community project but solely from her home:

'My initial feeling was that in our position, we are very peripheral because of our situation. You know, we are at home most of the time and have quite a limited opportunity for participation in things. When I read the first flyers…I thought, "Yeah, we can do this" because I was welcoming the opportunity to be involved in something that I could perceive that even people stuck at home and who do not have opportunities to get out and be part of things have, to some extent, an altruistic and community-based function. So I was quite pleased how Phil sort of made us feel welcome'

In Ely, a few residents were very much involved on a community-basis – this was facilitated by regular community events, but also the approach Sam Froud-Powell took, whereby volunteer residents were recruited to help deliver elements of the project (e.g. leafleting). This was facilitated by residents being given timebank credits for their time. One resident discussed how the project had encouraged her to become engaged in her community more generally, where before she hadn't been engaged at all.

An Ely resident described how the financial reward helped to create a sense of a community-based project, and even felt this helped with engaging householders because it took the focus away from them as individuals:

'Well it is a community project because hopefully when you say it as community sometimes it makes the difference but rather than saying everybody, like you know you should do this but if like, this was in a way an incentive and you know for five streets to be nominated and then find out then you know what we saved then would come back in a cheque for the community…So I think it made a difference being a community thing…I also think that once you start to look at saving, changing the way you're doing things…Once you've done it even if it's for the fact that the community is going to get something you're not going to lose that are you?'

This was also stressed by a Tinkers Bridge resident, who discusses the Open University-facilitated event that was organised in her community for community members to talk about what their reward money could be spent on. This was notable as an approach; in most communities householders were asked to make suggestions on an individual basis (e.g. through a survey or comments box).

'I would say yes. It's a community [project]. *We knew if we could reduce it together, there'd be more money to put back in… Maybe before Christmas, and we got an orange packet with some bits in and we all sat together, and literally there was about ten or twelve of us actually came and discussed it on the Thursday night…we split up into two or three groups and then obviously we swapped this… I think it was two groups actually and two bits of A3*

paper that we put lots of ideas on, swapped and then put our own ideas on those as well; but there was quite a lot on there' (Tinkers Bridge resident)

Residents also became engaged in the project at various points through the year – so it was not the case that all residents became aware of the project at the beginning and then remained engaged throughout – one Ely resident noted how she had read all the project leaflets that were dropped through her door, but had only become actively engaged when she heard the £4,000 cheque was being given to the community at the Hub, and so she attended the event where upon she signed her name down to have a home energy health check.

Less is More website

The majority of residents did not use the website – in many cases residents were not aware that there was a website; other residents visited the website once (instigated through a leaflet identifying the website) but then did not revisit it. There was the general sense from residents that this wasn't 'what interested people'. There were suggestions regarding how the website could have been improved, notably: making the website more image based with less text; making the graphs more easy to decipher through using more line marking; being able to more easily compare performances between the different communities and against a baseline.

→ It takes time to engage – patience, persistence and time are therefore critical ingredients. It's important to use multiple avenues for communication which pick up on the various ways which community members learn about new things (i.e. don't just rely on leafleting – put posters up, get heard on the local radio, go to community events, attend regular community clubs etc.). Repetition is important, and not presuming that residents will have 'heard it all before'.

→ Community engagement is often about quality rather than quantity – Only with a very long timetable will it be possible to move beyond a core group of quite committed individuals.

→ For community-based projects where much of the 'activity' and behaviour change is happening at the household level, it can be difficult to get a sense of how many people are actively engaged with the project. Having something which is visible at the community level which demonstrates engagement, and which people can sign their name up to and say 'yes, I'm engaged with this project' could be beneficial in helping build momentum. This may be a poster people put in their windows, or a flag on their gate, or it could be case studies of engaged residents regularly published in local newsletters or put on community hub notice boards.

→ It's crucial to maintain momentum with community-based engagement activities, particularly where many of the changes people are making are at the household level. Regular community events also create opportunities to make visible what people are doing individually, gives people a sense that 'things are happening', and where this is important, builds the sense of the project as a community project.

→ Approaches which are based on the slow but consistent development of social capital (e.g. friendships, sharing, reciprocity, trust) but where there is not a strong agenda within this, can work really well (Belle Vue's coffee mornings are an example of this approach). This requires time and persistence.

→ In some communities, residents will become engaged with a project primarily because they want to meet their neighbours and they want to build a sense of community – this may be particularly noticeable in areas where there is little sense of community, and of course it is likely that engagement as a community will be most difficult in these areas. However, if there is this desire amongst residents – this should be realised early in the process, and built upon and support through the project where possible.

→ Having a web presence can be really helpful for a project – this can easily be achieved through setting up a Facebook page, and doesn't require the development of a specific website. The former is a platform that can be set up by someone from the community, is more interactive (people can post comments etc.), and is more likely to garner community interest and engagement.

Residents' Behaviour Changes

Behaviour changes were discussed by respondents from across the different communities. Such changes varied from turning off lights and appliances that were not in use; monitoring and controlling usage through OWL monitors and taking meter readings; using energy saving 'gadgets' to reduce usage; and changing daily practices, such as washing and cooking, so that they are more energy efficient. These changes are discussed below.

Changing daily practices: washing & cooking

Ely and Bournville residents discussed changes they had made to their washing practices. In the case of Bournville, residents talked about using the washing lines that they had been given, which in turn meant they had reduced the amount they were using their tumble dryers (as part of the initial household survey that was conducted in Bournville, residents were given the opportunity to request washing lines).

'I got a washing line because my old washing line, well was defunct and I was using my tumble dryer because I couldn't use the washing line because every time I hung the washing out it folded up on itself. I've got a new washing line. I've actually dried clothes outside this year already'

In Ely, a 'Wash at 30' campaign was run, encouraging residents to wash their clothes at 30°. All 3 residents who were interviewed talked about how they had changed their washing practices as a result, with one resident learning about the campaign through helping to deliver leaflets:

'Yeah, I done some of the energy leaflets for Sam as well so…I've been having a read on them like the washing machine on a 30 temp, and all that, I didn't know, I usually stick it on about a 60 with my lot…Well, now I do most of my washing on a 30, I think I do only a one, like boil wash, once a month just to give the washing machine a good clean out and the towels a good boil, to be honest'

'Wash at 30' packs were also delivered to residents in Highnam, Loughton, Belle Vue, and Bournville. Interestingly, it was talked about the most by Ely residents; this may be because the approach in Ely was delivered in partnership with Global Action Plan, which enabled a more intensive and focused campaign on energy saving washing behaviours.

In Hayle, Bournville and Tinkers Bridge, slow cooker events were run at which residents could learn about how to use slow cookers, and were given slow cookers to take home. This proved to be a very effective way of engaging residents (high attendance at events), and in turn actually changing residents' behaviours – a Trelissick resident noted how she was using her slow cooker three to four times a week, a Tinkers Bridge resident said she was using hers more, whilst 3 of 5 Bournville residents noted that they were now regularly using their slow cooker, with one resident stating that they were also cooking healthier meals as a result:

'I didn't know about slow cookers at all, I'd never even heard of a slow cooker…I was actually fortunate enough to win one as well so I actually use that quite a lot. I got the big one. My grandchildren come round, I do things like chicken, the chicken stew. I didn't know you could make cakes in it and the cake I made in it was lovely. Brilliant, absolutely brilliant…I'm cooking fresh actually. I used to buy little Waitrose stuff, the pre-cooked food and that sort of thing and just bang it in the microwave. I stick my slow cooker on and way-hey. I've actually learnt something. Finding something that I'd never even heard of and it's made quite a difference to how I cook'

Changing daily practices: general electricity usage

Many residents across the communities highlighted how the project had increased their general awareness of their electricity consumption. This encouraged them to switch appliances off when not in use, encourage other members of their household to be more 'energy aware', and in some cases consider the broader implications of resource use.

'Well, the fact that it made me think about what I was using, and what lights were on and switching them off, and things like that, which goes deeper into the general thing of saving it up, saving our energies in a general way. I mean, we are all going to be in trouble in the future…So anything we can do that is already in existence to save the power, or to make best use of it, has got to be a good thing' (Belle Vue resident)

'We have also diversified fuel generally in the house. So this is not just electricity. We put a wood burner in so we can, you know…so it is not just the electricity that we have affected. We do not use the central heating as often and this is, again, socially good because it stops my husband being in his room on his own, looking at his computer, because we can heat one

large room. So you know, it is not just in terms of the substation that has had effect. It is other things. It has given us the impetus to do other things' (Belle Vue resident)

For some residents, they noted how they already used very minimal amounts of energy generally – for environmental and/or financial reasons. One Belle Vue resident noted how changes in her behaviour were '*fine tuning*' because she already had very low energy usage, whilst another Belle Vue resident described how his house was already very energy efficient, but how the project had encouraged him to look beyond what he was already doing to broader resource use, including possibilities of joining a car-club.

Some residents engaged with shifting their electricity usage away from peak times; however, this was in a minority of cases. A couple of Belle Vue residents and one Highnam resident noted how they have started shifting their dishwasher and washing machine usage to outside of peak hours because of the project. A Loughton resident notes how she no longer '*puts anything on now at peak times*', and ties this in with more effectively using electricity that her solar panels are generating during the day. One Loughton resident noted how she made sure her slow cooker was turned off by the time peak hours started. Where other residents have started to use slow cookers, this will inherently spread demand (where their other cooking appliances are electric), but this was generally not a motivation for residents. A Loughton resident noted how shifting behaviours away from peak hours is difficult:

'It's always hard to reduce your demand, specifically, in the peak hours, I suppose. You can probably do things to generally reduce the amount of electricity that you use, by turning things off when you're not using them, and stuff. Unplugging things, maybe, but that doesn't save a massive amount, but in terms of peak hours specifically, I don't think there's anything…I don't often think, "Oh, it's seven o'clock it's probably peak time, I'll leave it an hour," because often if I'm doing a wash at that time it will be, "Oh no," and I've just discovered I need something for tomorrow and I want to get it done sooner rather than later'

This is also echoed by a Greenbank resident who explains how the needs of her family members disrupted her attempts to shift usage away from peak hours when using the GEM:

'Slightly by things like uniforms, my son, always lands me right before he needs it, so I have to get that...I try to be organised and ahead of all this sort of stuff if I can'

Several Greenbank residents noted that they would have liked more information on exactly what changes would have made more difference to their electricity consumption during the peaks when the GEM was active. This shows how constant reminders of information are important, since much of this information had been provided in earlier newsletters.

Monitoring energy usage

OWL monitors were taken up by residents in Highnam, Loughton, Silverdale, Belle Vue and the Hayle communities. These seemed a very effective way for residents to more visibly

understand their energy usage, to clearly see which appliances were energy intensive, and to be able to communicate and demonstrate this to their children.

'It's on display in the kitchen so we can see it. It is quite interesting I think, you do get quite, you know, when you see that figure go up, just silly little things, you know, when the washer and the tumble dryer's on and the dishwasher's on, and you think my god we've used up all the energy you normally would. But it's also showing the children about turning TVs off. And sometimes in our house there could be two or three TVs on any one time. And like we tried to keep under 10 a day, which is quite a challenge because even if we weren't there we'd be using five just with things on, fridges and stuff like that' (Highnam resident).

'I think it's been an eye opener, the power monitors that we were supplied, when you see anything going on, you think, "My goodness me, it costs that much to run those!" Particularly things about the kettle, and the toaster, and the iron…The dryer, that really seems to...I didn't realise it uses so much power' (Tremorva resident)

The following extract from the Loughton focus group highlights the general consensus amongst attendees regarding the usefulness of the OWL monitors:

Resident1: *We also got one of the owl meters from the table day and that for us has been the most useful thing…*

Resident2: *I second the owl meter.*

[general agreement]

Resident2: *They were really good and I've also got young children so, well they're of primary age so the perfect age for kind of looking at the numbers and seeing that they're …*

Resident1: *Something happening.*

Resident2: *Something happening and that they can make a difference and how these things all add up. And the odd light left on here, and the computer left on there and the TV left on all does make quite a difference when you start to multiply it up…And we've got ours in the kitchen…it's kind of at a point where we see it every day…and you sort of think, ooh, it's usually running on at 12 or 13 and it suddenly spiked up, what's going on, kettle's on or something.*

However, it should be noted that this was not the case for *all* residents, as one Loughton resident notes:

'The figures going up and down didn't really… I don't know, it was kind of interesting, but it didn't really help me reduce my electricity usage, I don't think'

One Belle Vue resident was inspired through the project to monitor his household's daily electricity consumption, which increased his awareness of how electricity is used within his house, but also encouraged him to explore ways to reduce this consumption:

'We tracked the energy and the significant cost has been in the financial saving, even though I've changed tariffs but it's actually monitoring the units on a weekly, daily basis that I've seen over the last 12 to 18 months, just such a significant change. It was the project that got me started on that. I used to keep all the bills anyway but I never paid much attention, you just paid the bill but now every night when I come downstairs I take a reading and I put it into a spreadsheet and graph it. They laugh and joke at me about the way I monitor, but it's not, it's just something that's just there. It probably has changed the way we or me probably more than others look and do things, but I'm just mindful all the time of the next step. I've managed for the past year now to get my monthly energy consumption down for every month'

Installing energy saving measures

Many residents discussed the installation of energy saving measures which they received through the project. This included energy saving plugs (Bournville and Ely), foil (Ely), and light bulbs (Highnam, Silverdale, Belle Vue, Hayle). This Belle Vue resident describes how through using an energy monitor, he could clearly see the energy and cost savings made through installing the LED bulbs that he was given through the project, and subsequent bulbs he bought himself:

' The more I got involved in it, and because it was continually taking daily electricity readings and I was seeing the benefit of, I suppose the main thing was replacing bulbs. What I started to do was buy LED bulbs myself and gradually start to replace other bulbs in the house. The more I replaced the more I saw my electricity consumption coming down. And because I've got records going back for the past four years I can compare month-on-month for the last four years and this year since I'm involved in the project and the bulb replacement I've seen such a difference in my energy consumption on a daily-to-monthly rate, it's just encouraged me to keep going with it and look at other ways to reduce my electric consumption in the house.'

A Bournville resident organised to have cavity wall insulation installed after she was given advice and contact details through having a home energy health check. Residents in Bournville and Ely also installed draughtproofing measures.

→ Barrier busting is a good approach to shifting energy behaviours – such as providing washing lines and slow cookers

→ Electricity usage needs to be made more visible – using energy monitors is a really good and engaging way of doing this. The GEM also seems to have had some impact in demonstrating community scale consumption.

→ Energy saving behaviours which also engage with other lifestyle issues can be an effective way of engaging residents and of addressing multiple issues at once – slow cooker events were popular with residents, with subsequent benefits to residents being both reduced energy use but also shifts in food behaviours towards healthier and more affordable ones; in Ely, some residents became interested in the wash at 30 campaigns because they engaged with the 'keep your clothes for longer' messaging, rather than the 'save energy' messaging.

→ Encouraging residents to shift their demand so that it is more evenly spread across the day only makes sense to residents if it is part of a broader campaign to more generally encourage a reduction in electricity usage – shifting demand does not directly benefit them, but reducing overall usage does. In this project, only residents in more affluent neighbourhoods sought to shift their usage away from peak hours. Where the GEM was deployed, this messaging was much clearer, but residents needed more detail on which actions would make the most difference (need quote above for this).

→ The installation of LED lighting proved an effective way to reduce electricity usage. The Silverdale resident who is on prepayment and talked about how immediately he could see the cost savings he was making through installing LEDs is a great case study to demonstrate this. However, given the upfront cost of LEDs, it is unlikely to be a viable option for poorer households without projects like this where residents are given them for free.

→ In poorer communities, residents are already using minimal amounts of electricity. Home energy health checks can be really beneficial to residents in these situations, as advice is personalised and support can extend beyond their existing energy use to, for example, making sure residents are accessing external support programmes, such as benefits, or financial support to install insulation. In these communities, project messaging needs to be sensitive to the fact that residents are likely to already be using very little, and again links made to other lifestyle benefits alongside cost savings.

Resident Engagement: Motivations & Benefits

Saving energy and money

Saving energy and money were obvious motivations behind residents becoming engaged with the project. Some residents articulated their motivation as a purely financial one.

Whilst residents felt that they were indeed saving energy, many discussed how they felt less sure about how much money they were actually saving. Some exceptions existed – one Belle Vue resident who was closely monitoring his energy usage and monthly bills saw a *'significant'* reduction in them; a Loughton resident noticed from tracking her electricity bills that her usage had reduced by 17% over the year of the project; one Highnam resident said that they were paying £40 less per month for their energy bills (although they noted that he

couldn't separate out how much of this was attributable to energy saving, and how much to a reduction in prices); whilst one Silverdale resident who had a prepayment card, could easily see if his payments were going down – as he did when he installed LED lighting:

'It will make a difference because I've seen it myself. I didn't think it would be as big as it was. I'm on a pre-payment meter. It was in the house when I moved in, and that, to be honest, that for me has been the biggest eye-opener on energy usage. Previously I used to have a monthly direct debit …It would go up, it would go down, be paying next to nothing in the summer, pay through the nose in the winter, whereas now I literally see it ticking down. That for me has been the biggest thing that's made me aware of my energy usage, whereas previously I'd leave my lights on, leave my computer on, and not really think about it until the bill came in, of course. Whereas now I'm forever going round switching off the lights...'

In the Hayle focus group, residents discussed how monthly or 6-monthly bills (especially where the householder pays the same amount each month regardless of consumption) do not feel immediate enough with regards understanding whether you are saving money, and therefore are not such a strong incentive; comparatively, they noted that OWL Monitors give you in-time information about savings, meaning they are more likely to continually incentivise householders.

Indirect financial benefits were also noted – one resident in Bournville and one in Tremorva noted how they had cut down on their food costs through using their slow cooker (e.g. buying cheaper cuts of meat, buying fresh ingredients); two residents in Ely stressed the benefit to them of receiving timebank credits for their involvement in helping to run elements of the Less is More project there:

'I've enjoyed it, I've really enjoyed it and I've got to meet people and see things and do things I'd never thought possible, and go on trips and you know, just do things with my life' (Ely resident)

Community involvement

A few residents stated that they were motivated to be involved in the project because it provided a potential opportunity through which to become more engaged in the community and to meet people. One Ely resident described how she became more engaged in the project because she wanted to help increase the broader level of engagement across her community:

'I thought, well hang on a minute, there's x amount of houses in Ely and I grew up in Ely, I was away for some time and now I'm back in Ely I thought why don't more people come to these events, you know? So I went to that and I became more engaged, so much so now I'm never bloody home'

Residents in Belle Vue and Ely clearly discussed the benefits they've felt from being more engaged with their community. In Belle Vue, this was noticeably facilitated through the coffee mornings, whilst in Ely, two of the residents interviewed were encouraged to help

run parts of the project (and become 'Ely ambassadors') through which they met people in their community:

'We are a community but everybody's busy with their own lives and generally we don't speak to people outside of a small stretch of neighbours and that's been one of the upsides of this has been that [laughter] we've connected with other people in the community that we wouldn't necessarily have done…I don't know whether that was one of the intended outcomes of this project but it's certainly been an outcome, a very positive one I think' (Belle Vue resident)

'Yes, I've made some good friends as well, I've got to be fair…We meet up at different events, you know, our paths do cross and they're friends for life and I've met people of all ages, you know' (Ely resident)

A Loughton resident noted that whilst she had hoped that she would get to meet people in her community through the project, this did not actually come to fruition:

'They were talking about creating an online forum or an email distribution list to provide some engagement but that never came to fruition so it felt like it was very much a project of individuals that were isolated, it was pure fluke that we all happened to be in the same area… And it was quite interesting talking to the people just because I don't know a lot of people locally so it was quite interesting to come along and see what was happening'

Novelty factor & 'freebies'

Residents in Bournville and Ely noted how they became engaged in the project because it 'was something new'. In Bournville, the slow cooker event seemed to be a key initial engagement event for residents; knowing that there was the opportunity to get a slow cooker was also a strong incentive.

In Bournville the general provision of 'freebies' was also cited as an incentive for engagement by two residents:

'Sounded interesting, we obviously wanted a slow cooker and wanted to know how to use it really'

'Yeah, I would have gone along to get the free slow cooker, and I always think it's good to get inspiration for new meals…and somebody came around. If I'm honest it's probably more to do with the freebies as well…Yeah that was why, because I think it said on the back to tick…you had a choice of freebies. My washing line outside had recently broken, so I thought, "Oh, I'll get a new one!"'

Community pot

Interestingly, many residents did not feel that the presence of a 'pot of money' which the community could earn through reducing their electricity consumption necessarily motivated them to become engaged with the project. This was notable across the various communities, regardless of how affluent the community was. It was also evident that many

residents from across the communities did not know what the money that they had 'earned' was going to be spent on, even where they had had some involvement in trying to decide what the money could be spent on.

Some residents noted how it was difficult to decide upon something to spend the money, whilst others stressed that they wanted to think of something that would benefit the broader community and not just the houses connected to the substation.

- → Opportunities to make visible the cost savings made by reducing electricity usage is beneficial – OWL monitors can be helpful here, as well as case studies about people who have closely monitored their bills and noted cost reductions in response to making changes to energy behaviours.
- → Community involvement is a strong motivator and subsequent benefit for some residents – seeing community projects like Less is More as an opportunity to build broader social capital should be a project objective built in at the project design stage. It is likely that through building social capital, residents are more able and likely to build a deeper energy consciousness into their daily practices.
- → Where residents' lives are very much focused in and around where they are living (e.g. where their networks of friends and family, and where their daily lives are very much locally based), they are more responsive to, and likely to engage with, 'new things' happening in their localities – community events, if properly pitched, can be effective in these cases (e.g. the slow cooker event in Bournville had 90 people attending, with residents noting that they attended because it was 'something new, something different'). Similarly, more than 80 people attended the 'Greenbank Gathering' in Easton, which was not just focused on energy, and allowed the Less is More project to be positioned as part of a much wider range of community activity.

Legacy

Continued behaviours

Several residents noted that they will continue some of the energy saving behaviours inspired through the project. These actions included small things like switching off appliances such as televisions and PCs, paying attention to use of kettles, changing the temperature for clothes washing, and drying clothes outside instead of in a tumble dryer. The slow cookers which were given out seem to factor as a large part of any sustained energy saving behaviour that residents have started.

As noted previously, a behaviour which was triggered by the project was sustained daily meter reading and recording by one Belle Vue resident. During the course of the project, this resident installed LED light bulbs and charted month on month unit usage. He stated his intention to keep up this part of his daily routine: '*the aim for this next year, 'cause I'll try and keep the readings going, is to try and keep it around the level that I've used for the last year 'cause it will be harder to reduce it any more than I have.'*

Several residents alluded to how useful the OWL energy monitors had been and continue to be in alerting them to their household energy usage. One Highnam resident remarked that the batteries of their OWL monitor had expired recently which they had noticed straight away – thus suggesting that they do keep an eye on it daily.

Increased general awareness seemed obvious as a continuation since the project's end – one Belle Vue resident remarked that he would definitely be bearing all that he'd learned for his next house renovation project. One of the Ely residents said that '*once you start and do it I don't think you change back*'. Similar things were mentioned by residents in Highnam and Loughton.

Next steps

Several residents expressed interest in some of the events/themes of the Less is More project continuing. In Ely, one resident said they would be interested in the energy meetings carrying on and another one said they definitely had a sense that the work to highlight household energy efficiency and cost saving would continue in the community as '*there're still people who are energy unaware or very wary and all that*'. There was certainly a hope that the work and sentiment would be ongoing.

There was a similar feeling from one Silverdale resident although this was in the context of the multiple energy related projects in the area: 'I'm hoping that will result in something else and it's not just going to be the end now because I think more and more, you know energy prices and sustainability are not going to become less of an issue going forward they're going to be more of an issue going forward'.

During the Belle Vue focus group, the idea of incorporating the themes of the Less is More project into an annual community event was put forward to continue raising awareness of the issues of electricity demand and energy efficiency in the home. This was also brought up during the focus group in Hayle as a next step although there was no indication of who would initiate this.

Related to this, it was felt in Silverdale that the project may have been more effective had there been a community building as a focal point – their community centre had just closed down due to lack of funding. So the idea of tacking the project onto an existing community focal point or event seemed to be. There was interest in the idea of having some sort of evaluation feedback at the very end of the project during several focus groups. This idea arose when the facilitators were asked about the aims of the phone interviews and focus groups.

What Could Have Been Done Further/Better?

Outlined below are additional activities that residents would have liked to have seen as part of the project, as well as suggestions made as to how people could have been further engaged.

Further feedback

Residents noted how they would have liked further feedback generally. This related to: how they were 'performing', both on a household and community level, with regards reducing their electricity consumption and meeting the community targets: more regular general communication throughout the project; and in terms of the community pot and what it was going to be spent on (quite a few residents did not know how the money was going to be spent). Suggestions included: regular feedback flyers outlining how the community is doing with regards their electricity consumption; regular email bulletins/newsletters reminding residents about the project, highlighting what has happened/what is going to happen (and include a children's page within the newsletter); and regular monthly meetings. A Highnam resident stressed how she would like to see communication about energy use continue into the future, such as through having regular pieces in their local magazine.

Several residents from different communities stressed the importance of not solely relying on email communication, given that some residents do not use email. A Silverdale resident stressed the importance of diversifying the communication channels – e.g. through using local radio stations; using Housing Associations' communication channels (as residents are more likely to pay attention to formal communication from their Housing Association).

Household level data / more personal approach

Linked to 'further feedback', residents in Higham and Belle Vue thought that they would have benefitted from household-level data which could demonstrate to them whether the changes they were making were having an impact. This is something that householders can do to some extent with OWL monitors and by taking daily meter readings, but the latter does not tell the householder whether they are managing to flatten out their demand.

The generally good take up of OWL monitors across the communities reflects this desire amongst householders to make their energy use more visible, and to have more in-time information on their energy consumption.

A Belle Vue resident noted how she would have liked to have seen a more personal approach with encouraging householders to reduce their usage:

'Maybe it wasn't personal enough. Going back to the fact that there were only a few handpicked communities taking part, that actually interested me because I thought they're not doing it just everywhere so I think that interested me and made me think it is going to be precise then so maybe that wasn't a key thing'

This was also reiterated during the Hayle focus group, where residents stressed the differences between the two Hayle community areas, and that any approach needs to be sensitive to this:

Respondent1: I think the two areas you picked in Hayle, if you look at the target areas, Trelissick area, you'll probably have more senior members of the community there. So, where the advantage might be, a greater advantage would be for the energy usage would be, obviously, families with children and teenagers. If you think of all the things that a

teenager has in their bedroom, switched on, probably, 24/7. Then, as you've just mentioned regarding the washing machine, they are then putting clothes in, if you've got young children running around every day - the washing, and those types of things. So, whether they do it again, it is then targeted on the younger families

Respondent2: All the people that went on this cookery day, we were elderly and it was during the day and I felt that the people that would really, really benefit from this are the young mothers who are out to work who can't afford dear food or anything like that and it would be really a benefit to them to hold evening courses.

One opportunity for more personalised advice could have been to identify houses which have solar PV (which was the case in Belle Vue, HIghnam, Tremorva and Bournville (the latter being on social housing) and to give more focused advice (where needed) to make sure householders understand how their PV interacts with the mains electricity they receive, and how they can effectively make use of what their panels are generating.

Community champions

Silverdale residents discussed the idea of having community champions who help to push forward the project:

Interviewer: Okay, so you feel like success of things like this really depend on having those key individuals within a community?

Respondent1: Absolutely, it definitely does, yeah. Like community champions or something, that's a bit of an overused phrase, but I think it's right though. So people who live and work and have family in the area that are really keen to be involved and then they tell their friends and their friends and their friends…Retrospectively it's easy to say that, but you couldn't have predicted it. But retrospectively that probably is maybe the right way forward for this particular type of community… it just depends on who you're dealing with and this is definitely a, I mean what makes our area, especially in my opinion, Park Side, is how friendly and community minded everybody is. So if you've got the right critical mass'

As noted, this approach was successfully used in Ely. However, it was also unsuccessfully trialled in Bournville where CSE and Alliances Homes were unable to recruit any local residents. This approach also relies on people having the time and resources to help.

More community emphasis

In some communities, there was a desire amongst residents to engage with the project on a community-basis. Where this did not transpire, some residents stated that they wished this had been encouraged further. Suggestions for doing this included: regular community meetings; establishing an online discussion forum; working through existing community groups/networks. In wanting further engagement, residents did note the forces working against this: low levels of engagement; lack of a community hub or focus; lack of existing community groups/networks to partner with; and defining the community in an unnatural and limiting way (i.e. substation-based), which meant that even where more residents would have been interested to be engaged and could have in turn created more

momentum around the project, they were not able to do this because they were not in the project area (this was noted by residents in Belle Vue and Tremorva). If charity partners had had more flexibility to engage with the broader community around the substation, this may have supported greater engagement with the project.

Greater sharing between Less is More communities

In Loughton, residents discussed how they would have liked the opportunity for greater sharing and comparison with other Less is More communities:

Respondent1: I really wished, perhaps as you say because people have called it different things, I kept looking, and perhaps someone else would have a good idea about this and I never found anything…Obviously I looked under ""less is more"" in the various areas. I was really surprised that there was nothing I could find about what other people were doing. It would be interesting to find out the compare and contrast of it

Respondent2: And I think also if there'd been some sort of little online discussion group that people could say or figures were appearing there and there was the newsletter and people were encouraged to ask questions and join in… it could have kind of fostered a sense of community but there wasn't … particularly that currently doesn't exist because everybody is so busy'

Community reward money

Whilst not necessarily something that was suggested by residents, it became clear through interviews and focus groups that many residents did not know what the community reward money was going to be spent on, or if a final decision had been made. This was the case whether or not the residents had been engaged in the decision-making. This may be because residents had missed communication about this, or had not remembered – which is possible given that residents overall did not feel very motivated by the community reward money – but either way this seems like a missed opportunity to facilitate conversations about community need that could be addressed, and to celebrate the achievements of residents as part of the project.

Findings: interviews & focus Groups (GREENBANK)

The Greenbank Energy Monitor was a specific and detailed intervention deployed only in Greenbank. As such, the qualitative analysis in that area has focused only on this intervention, and not the wider project.

Two sets of interviews were carried out in the Greenbank area. The first set of interviews (12), during the summer 2014, asked questions about resident's interest in a community based demand response activity, and the extent to which knowing that others in the neighbourhood were participating was a motivating factor.

The second set of interviews (8), of people previously interviewed, took place after the GEM had been trialled in the households, in December 2014 and January 2015. There was also

one focus group, with five of these, which took place following the interviews, in January 2015.

Key Findings

- The GEMs were popular among those interviewed, although they had many suggestions for improvement of the interface.
- The idea of the social benefit of reducing peak electricity demand was new to many people, and poorly understood
- More time would have been needed to get used to the GEM, and learn about the actions which make a difference, in order for the intervention to be more effective
- The lack of individual household monitoring limited the opportunity for residents to learn by experimenting about what actions made a big or a small difference to their electricity demand
- Respondents were motivated by the social and environmental benefits of reducing peaks as well as by the money gained for the community
- Many were also motivated to save energy for financial reasons, and some perceived that they would financially benefit by using electricity at off peak times, although this was not necessarily the case. There is some misinformed awareness of Economy 7 tariffs
- The community based, not for profit, and local recruitment process was a key success factor
- Respondents were motivated by knowing that others were also participating, feeling that alone they would not be able to achieve much, but that the sense of being part of something bigger made their contribution have the ability to make a difference
- They were also concerned about privacy and 'big brother', and were not keen on the idea of knowing the names of the people who did and didn't participate.
- On the other hand, the idea of being in touch with neighbours to share ideas and information about how to achieve peak energy demand reduction appealed.

This intervention has a lot of potential to be taken forward, and the community in Greenbank where the GEM was initially trialled has learned a lot through the process of the trial and the discussions in the interviews. Continuing the process, with an updated version of the GEM, and provision of household electricity consumption to that household (e.g. through an OWL monitor or similar), could be effective.

More Detailed Feedback

Feedback on improvement to GEM design:

- There were technical problems with some of the GEMs which meant that they didn't work for everyone

- The location of the GEM was important – several people placed it somewhere that they would see it all the time, in the living room or kitchen, but one person had to put it near their front door for it to have sufficient radio signal, and this made it very annoying to press the button.

Focus group respondent: "We started with ours in the kitchen on the side of the fridge and it was great but then we found out after 2 weeks that it wasn't working there. So the fellow came and we put it by the front door which was really hard because we weren't looking"

- There was varying opinion about whether the GEM would be improved if it made a sound
- Some liked the flashing lights, whilst others didn't understand them

Interview respondent: "I think the pulsing lights of like how you were doing it was really good in, sort of, reporting back"

- People were not keen on the idea of the GEM giving names of people participating/not participating
- It appeared to people that a small number of people were participating each time, relative to the number participants thought could have joined in, which was disheartening

Interview respondent: "I was surprised how low it was, 'cause yes, it gave you a figure, didn't it? And it said how many had clicked and to begin with it was always quite low, sort of round one, two or threeish kind of and then towards the end it seemed that people were using it more."

Motivation:

- The idea that other people were doing something was motivating
- For some households, it was the children who really liked it, and got into using it. Teenagers were less interested.
- The recruitment outside the primary school worked really well, and meant that the door knocking wasn't cold
- People liked having someone knocking who wasn't looking for money, but who was just looking for information.
- It worked better that the door knocking was in summer – not wanting to open the door and stand on the doorstep when it's cold.
- There were mixed feelings about sharing individual household data with others – generally negative, concern about 'big brother'. But interested in the idea of sharing street level data, competing between streets
- Also a lot of enthusiasm for the idea of sharing tips and expertise with each other – 'how did you do that' 'I did it like this', realising by talking to neighbours that damp is an issue for many houses in Easton, not just their own

- One person observed that the lights are on at 6am in the shops in the eastgate centre, and that must be making much more of an impact than lights at home – this is something that could be addressed
- People involved might have talked more with their neighbours if it had been in the summer
- The fact that people who the respondents knew personally were knocking on the door made a big difference to their interest in the project.

Learning

- Participants would have liked to have had information about their own household usage – they did not get any direct feedback to themselves
- The project as a whole made people aware of the issue of time of use of electricity, although there was quite a lot of confusion and uncertainty about what actions would make an impact and what times are the most peak
- The main thing that people did in response was to switch lights off, although some did more, changing their cooking patterns, and avoiding doing the laundry

Focus group respondent: "Obviously lots of people may be wasting electricity by having lights that don't need to be on and people just turning those sorts of lights off and not having to do anything really major like do their washing at a different time or not watch the television or not do their work on the computer. If everybody made little changes would that be enough?"

Focus group respondent: "Also I think that people should be given a bit more information as well on what will help. Because you know I don't… I know obviously that an electric kettle draws a lot of energy and washing machines and electric cookers and everything, there's lots of things that I think we should have more information on."

Interview respondent: "The cooker and the kettle, we've been very conscious not to use that, and the washing machine as well because that's a classic thing, you know, I'll come home from work and I'll put the washing machine on and I'm cooking dinner and things like that. Although I try to remember to text teenage sons to remind them to put it on when they come home from school at four o'clock but it doesn't always work.

In the first interview, interviewees were asked to draw a line around the area on a map that they consider to be their neighbourhood, which are shown below in Figure 19. Boundaries drawn around 'neighbourhood' vary in size, but many of the main boundaries are in common. This shows that people's perceived 'neighbourhood' does not map directly onto the area served by the substation (indicated by the red circle).

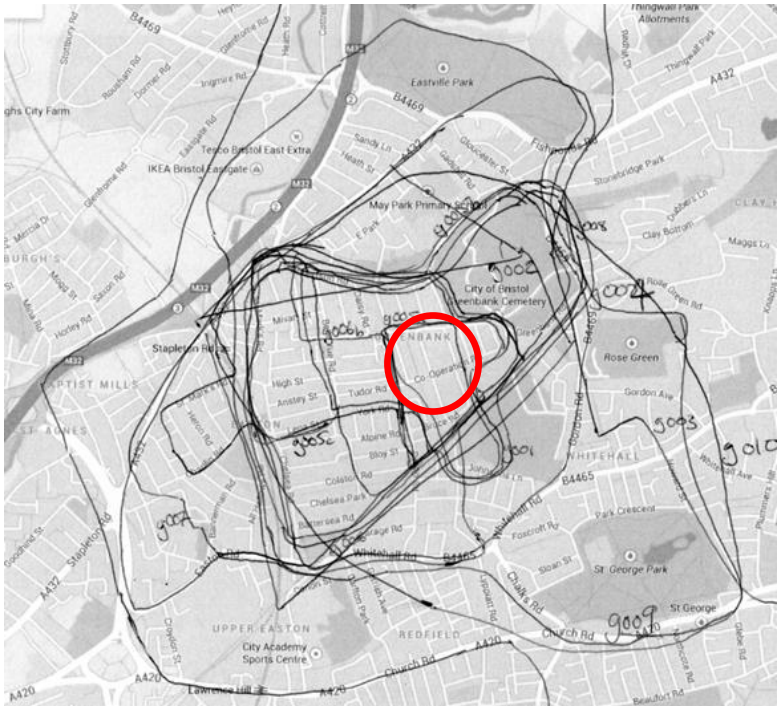

Fig 19: Greenbank residents' perceptions of their community boundaries, overlaid with the substation

6.3 DNO Implementation

Distribution Network Operators are ultimately responsible for the cables, overhead lines and transformers that feed many of the domestic properties in the UK. They replace these network assets when they are overloaded or too old to continue being used, however sometimes a recently replaced transformer is required to be upgraded due to increased demand causing overloading. An alternative solution to this would be targeting the cause of the issue but engaging with the community to reduce the demand.

6.3.1 How a DNO would need demand reduction carried out

The project from, WPD's perspective, was focused on trialling the practicalities of implementing such and intervention and establishing how best to carry it out. There were a few factors that needed to be considered when designing the project to ensure it interventions were indeed being carried out in a practical way for the DNO.

The first obvious factor was the constraint that needed to be circumvented, it was considered that a distribution transformer was good compromise between cost of replacement being high enough, number of properties low enough for engagement to be manageable and enough examples of predominately domestic properties without commercial properties masking any impacts. An 11kV feeder was briefly considered however the scale of the project would have needed to be increased and there was concern on the level of noise from non domestic customers and unengaged would mask the impact of the interventions. Ironically as discussed above, the small sample size led to difficulties accurately predicting the predicted usage.

The length of time planned for collecting base line data was planned to last 6 months. Six months was selected to emulate the summer months between the constraint was identified in spring and the beginning of autumn when interventions would start to circumvent the constraint in the coming winter. However with hindsight for the benefit of the project a full twelve months would have been better for optimising the models with a full annual dataset, albeit impractical to implement in reality.

For demand side response to be useful to a DNO the response needs to be reliable with close to 100% availability. This project is has proved that this sort of community based demand response is not reliable and predicable enough and therefore is not appropriate for a DNO to circumvent constraints. There are other options of demand side response that could be more effective and are being investigated around tariffs and direct control of appliances and home storage. Also the aggregate LV interventions could be used more effectively on constraints on the 11kV allowing for sufficient volumes and diversity.

6.3.2 Substation/neighbourhood overlap

One of the most challenging aspects for the charities while trying to engage with communities was communicating the relatively abstract idea of the LV network fed from single distribution transformer. This did not overlap with any community definitions and meant excluded parts of the community in the engagement. This undermined the concept of the community engagement and invariably meant the engagement needed to be aim at collocated individuals. This was particularly the case in areas without a central hub and even in communities where there was one, it was invariably outside the trial area.

It was widely noted that the community engagement would have been easier if it was indeed at a community level. However this would require a proportional increase in resources to carry out this intervention. This increase in geographic would probably include several additional distribution transformer to solve an overload issue on a single one. Arguably the ratio of resource to impact would be better, the absolute cost of this resource would be higher.

Another element not to be forgotten is network constraints, by their nature, are location specific. There is a risk that if a wider group was engaged with the sub group that actually impacted the constraint were under represented, that the overload would persist despite good wider engagement. For these reasons a focused engagement on the specific homes that affected the constrained substation was carried out. Even though this proved to be challenging, if the engagement was broadened, the impact on the specific constraint, and the main reason of doing the intervention in the first place, would probably be lessened.

6.3.3 Costs and time scales

The cost of replacing a distribution transformer is relatively cost effective, particularly when considered as a lifetime cost due to its long life. Assuming a relatively expensive transformer replacement upgrade at £30k and with an extension of life of 30 years from the intervention of a load reduction of 15%, the annual cost would be £960 comparable to

changing the transformer on year 1. With feedback from the charities pointing out this would be viewed as an insignificant value of a community reward, particularly if considered spread across all the homes on the substation, this was increased for the purposes of the project. This did not include costs associated with the project either, namely the monitoring kit and the cost of the resources to carry out the interventions themselves. After considering all of these traditional reinforcement actually proves to be quite cost effective compared to targeted community engagement.

The other area where community engagement proved problematic to compare to traditionally reinforcement was around how long it took to implement. Even ignoring the 6 to 12 months for base lining the demand, it took the communities several months to 'warm up' to the project, several more to become engaged in the project and then a few more to start to change their behaviours impacting demand. Even if a bespoke transformer needed to be built from scratch, it could be delivered and installed between 4 and 6 months.

6.3.4 Concerns around reliability and long term impact

As just mentioned a transformer will last for at least 40 years, over this time there is an installation cost and maintenance costs, although the latter is required which ever transformer is there. For an equivalent ongoing engagement a significant cost would be required to ensure that the community stayed engaged. The drop off of engagement could be from people getting into bad habits, engaged occupants moving out to be replaced with non-engaged or simply forgetting once the novelty has worn of. In any case consistent reinforcement would be required.

Also, people are unpredictable; the large variability of demand from the data demonstrates this quite well. There is not guarantee that local or even national periodic events could change the community demand sufficiently to cause overloads on the transformer. This is always a risk if the transformer is likely to be overloaded and if reliant on community interventions. If an overload does occur there are limited actions that the DNO could take without an automated way to shed demand.

6.3.5 DNO involvement in the engagement

The engagement activities were carried out by the charities with little involvement from WPD. This seemed work well as the charities were well versed in this type of engagement work and as they were charity organisations, there were fewer suspicions around ulterior motives. If WPD has led the engagement there would have been confusion of who WPD were, and most likely mistaken as an energy supplier. There was a significant distrust of the electricity industry which seems to stem from suppliers but tarring DNOs with the same brush. Having a local and impartial organisation which helped build trust, to successfully engage with the community, would have been significantly more difficult for WPD to achieve. On the flip side, as WPD was less involved it was difficult to increase our profile, with only a select few of the engaged customers realising our involvement despite all literature being co-branded.

For future interventions similar to this, having a mixed team of a local trusted and recognised third party and DNO representatives would be more beneficial to raise WPD's profile without impacting on the trust of the community too severely.

6.3.6 Social engagement

Once the initial engagement had been carried out the communities became more aware of the project, it was widely viewed in positive way. Key positive elements were around being involved in a community project, the ability to earn a community reward (although this did not seem to be a direct driver) and the ability to save energy and therefore reduce bill through better education and energy saving devices.

All three of these drivers were designed to reduce either the peak demand or the energy in general however there were much wider benefits for the individuals involved. This was often related to the saving of energy and consequently bills, however being more socially active in the community, being inspired to cook fresh meals with cheaper ingredients with slow cookers and improving their knowledge of energy in general.

It was noted that even though the less affluent areas tended to be quite frugal already with their energy use there was a significant social benefits around this energy education and community interaction. In these areas the likelihood to find fuel poor individuals was more likely and some of the small changes which were introduced to the customers through the project helped.

It was also clear that to make the messaging effective it was important to focus on energy rather than just electricity. From the customer's perspective the purpose seemed very one sided just to help the DNO unless a more general approach as used. This potentially opens an opportunity to collaborate with Gas Distribution companies to improve energy education.

6.3.7 Social drivers

The concept of engaging at a community level did seem to modify people's behaviours and attitudes as documented in the qualitative analysis. This however did not materialise in a statistically significant impact on the demand itself. Arguably if the interventions continued this could have gathered momentum to have a quantifiable impact however as discussed above it would be impracticable for a DNO rely on this sort of intervention to circumvent a constraint.

However the social engagement seemed to be strengthened by the community element of the project. This seemed particularly the case in Greenbank where the GEM directly indicated the number of individuals partaking in the engagement. This added a level of peer pressure to encourage an action to be taken. As the GEM was not trialled for long enough it was hard to establish how much impact, in terms of reduced demand, it could have made. Probably out of all of the interventions this seemed to have made the biggest impact in people's engagement.

One of the other aspects that was notable was although the initial and continual engagement with the project in general was helped by a community approach, it did not necessarily have the same impact when individuals were carrying out specific actions. Customers typically did not use the website to assess how the project going at a community level. For the homes that were given OWL monitors this was a tool which was engaged with more. The focused and immediate impact of feedback was important. This was also carried through from the home energy assessments, people were more likely to do things differently if guidance was tailored specifically to them rather than given in more general form.

6.3.8 Conclusions

The project was designed to assess if the community demand side response was an effective way of dealing with network constraints. It was setup to help increase the likelihood of registering a quantifiable drop in demand in a way that would be feasible for a DNO to implement.

- The substations selected were specifically selected with minimal non domestic demand and embedded generation to reduce noise in the results.
- The locations were selected, in most cases, where there was some existing relationship with the community already to help with the engagement.
- This engagement was carried out by local energy charities with expertise in this sort of engagement.
- The community incentive was artificially set high to encourage engagement

However despite of this there was no statistically significant impact in the demand. This clearly shows that if community intervention did not impact the demand in this circumstance then it would not be implementable by the DNO to mitigate network constraints.

There were limitations in the approach that hindered the engagement though, mainly around the lack of definable community around the area fed from substation and the relatively short time scales. As discussed above, the trailed timeframes and engagement locations were crucial for the impact of the demand reduction to be useful to the DNO.

The small numbers of customers did make it difficult to quantify the impact, however ultimately a DNO would want the peak demand to be reduced consistently below a specific limit by a significant margin. This was demonstrated partially by the communities earning the rewards albeit reducing their demand below a limit selected to be achievable rather than a strict limit.

Despite the lack of quantifiable demand reduction, the real benefit was around the social benefits to the communities themselves. The increased energy literacy and understanding allowed the project to support the communities around their energy usage. This was partially from the energy saving equipment but also the wider support that was created for the project.

The some engagement techniques used in the project could be used to help engage with fuel poor and venerable customers through WPD's social obligations work. The techniques used could help improve the effectiveness of this sort of engagement. Even though the customers on the whole did not appreciate WPD's involvement, the engagement could be carried out with more direct WPD involvement to improve this. Also the focus could be shifted to officially to energy saving (as was done in the project anyway) and educations of the wider energy stake holders focusing on WPD and what a DNO does. As mentioned above this would be a piece of work that could be done on collaboration with the gas distribution operator.

7 Performance compared to the original Project aims, objectives and Success Criteria

At a high level, the main aims and objectives were to establish if community energy interventions had an impact on demand back at the distribution substation. There was also the intention to develop a community energy device. Both of these were achieved however each individual criteria are discussed further in detail.

7.1 Collection of community demand data

This was fundamental to the project to the project in a number of ways: creating the baseline for the targets, measuring the impact of the various interventions and the source data for the website and community energy monitor.

The monitoring kit installed was the GridKey units which were set up to send data directly to CSE's server from GridKey's server. This information was then the basis of all the activities above and consists of more than a trillion data points. It comprises of one minutely, feeder level data of all three phases at the LV board of each of the 11 monitored substations.

7.2 Development of community energy monitor

This was achieved through the development of the GEM. There focus of the monitor shifted slightly during development as a live representation of the community demand was actually achieved via the website. The focus of GEM was more on being a catalyst for an intervention. The monitor still had a representation of the live demand, alongside the target, but only while a challenge was active. These were scheduled during the typical peak demand periods.

The community-wide energy monitoring device was successfully designed and produced in a small production run of 50 units. The unit was tested in 23 homes (part of a wider substation group of 212 dwellings). Delays in the manufacture and deployment of these units resulted in a trial period for this device that was measured in weeks rather than

months, which has severely curtailed the ability to quantitatively assess its effectiveness. Initial qualitative analysis suggests there is potential to attempt a larger trial of a similar device.

7.3 Low Carbon Technologies

Although the project was originally viewed as an opportunity to measure communities with Low Carbon Technologies (LCTs) to build up WPD's knowledge of them, it was not the main focus of the project. The main focus was on demonstrating community demand side response therefore when selecting the communities the other key criteria (few non domestic, wide spread of community types etc) were given higher priorities than the LCTs. In fact from the initial screening there was not a significant concentration (although there were some) in any of the communities. After further debate during this process it was agreed to actively avoid LCTs to ensure as few variables affecting the demand to make it easier to cross reference demand fluctuations with specific interventions. Although there is not any additional data for LCTs from this project the GridKey monitors could be repurposed to investigate this further.

7.4 Effectiveness of community demand side response

This was one of the main outcomes of the project, under this implementation trialled there was no statistically significant variations in demand due to the interventions carried out. This effectively suggests that community focused demand side response cannot be used by DNOs to circumvent asset overloads and that conventional reinforcement is a cost effective and time efficient way of dealing with overloads.

7.5 Community Engagement and Incentives

Although the community engagement was not quantifiable through the change in demand it was easily identifiable through the qualitative analysis. The engagement was essentially split into three stages: gaining trust of the community through initial engagement, getting the community to change their behaviour and finial coordinating the community behaviour to have a quantifiable impact on the demand. The first two parts of the engagement was done well and the qualitative analysis points to this. However the final part of the process to achieve the impact was not.

It has been demonstrated that the provision of a community level incentive will act as something of a motivator, but that this is not an overwhelming driver for most participants, and is tied in rather complex ways to bigger questions around community cohesion and activism. It is doubtful that the provision of a substantial financial incentive at the community scale would be a necessary pre-requisite of similar projects in the future.

7.6 Budget and timescales

The project was deliverd under budget as listed below. It did, however, need to be extended due to some delays during the set up phase. This was predominantly due to the manufacturing delay of the GridKey units which had a follow on impact on the baseline

demand gathering exercise. The extension allowed the operational phase to be shifted so it ran for almost a year allowing the interventions to be trailed.

7.7 Additional learning objectives

Once the project had started, other aims were developed, which were to demonstrate whether:

a. an accurate prediction of community-level demand could be developed against which to measure reductions in demand.
b. a statistically significant level of change in demand could be categorically linked to one or more targeted interventions.
c. local people would demonstrate that they felt some level of responsibility for reducing pressure on the local infrastructure.
d. different messengers are more or less preferred by communities.

There was mixed success against the delivery of these additional learning objectives. While a model was developed with very high levels of accuracy overall, issues with the small number of homes in each monitored area have meant that using it to demonstrate statistically significant changes in consumption has not been possible. This is more a limitation of the project's implementation than it is of the model itself, and is linked to both a limited baseline collection period, too short an intervention period, and sample communities that were too small in size to cancel out atypical behaviours.

This in turn has meant that an impact on the second of these objectives was also not observed – it was not possible to demonstrate a statistically significant change in consumption data on any occasion during the operational phase of the project that could be categorically linked to any particular intervention. Though correlations were seen on a fair number of occasions, a causal relationship was not determined.

Qualitative evaluation did suggest that the project activities did in some areas engender a sense of responsibility for, and interest in the 'health' of the local substation. This is an important outcome (and one that could be built on) because it is a departure from the norm, where community members pay no attention to the LV network in their area unless and until it fails.

There was also evidence from the qualitative evaluation that the messenger is important, but that it is not necessarily the case that the messenger needs to be local or in some way 'of the community'. Partnerships with existing community organisations are important, but it has proven possible for an 'outsider' to become the trusted face of such an intervention programme.

8 Required modifications to the planned approach during the course of the Project

There were a few aspects of the project has changed over the course of the project. There was delay that required the change notification to extend the project. Additionally the focus and aims subtlety shifted over the course of the project.

8.1 Set up phase delay and extension of the project

As explained above the set up phase was delayed due to issues in manufacturing the GridKey kit in the Far East. This has a knock on impact in the timescales however did not impact the designed approach other than a slightly shortened baseline collection time frame.

8.2 Low Carbon Technologies

Also as explained above the focus was shifted away from collecting data on LCT as part of the project in preference to concentrate on getting as reliable as possible data around conventional domestic demands. This helped keep the number of variables that affect the demand down to a minimum.

8.3 Change of analysis from quantitative to qualitative

As detailed in section 5 there was a shift from purely quantitative analysis to qualitative analysis once it was established that the interventions where having limited impact on the demand. There was still amble quantitative analysis undertaken, detailed in section 6.1 however to get a real indication on how effective the interventions had been in terms of behaviour change and impact on the communities themselves more detailed qualitative analysis was undertaken as described in section 6.2.

9 Significant variance in expected costs

Activity	Budget	Expenditure	Difference
WPD Project Management	£40,000	£39,004	-2%
CSE Project Management and Analysis	£178,900	£185,000	3%
Other Charities	£120,000	£120,000	0%
Equipment	£94,000	£59,439	-37%
Community Awards	£50,000	£40,257	-19%
Total Spend	**£482,900**	**£443,700**	-8%

LCNF Funding	£434,565	£399,330	-8%
DNO Contribution	£48,335	£44,370	-8%
Total	**£482,900**	**£443,700**	-8%

There are two significant underspends as part of the project: Equipment and the Community awards.

9.1 Equipment

There were three main reasons why there was a significant underspend on the equipment. The first two are related to the GridKey monitoring kit. The original budget had been derived from old costings of the this kit, when it came to buying the GridKey equipment a framework agreement has been put in place which had a reduction in cost from the original budgeted amount.

The second component of the budgeted cost which did not materialise was in the installation of the equipment. From the learning of LV Templates a proportion of cost has been set aside for fixing, moving or repairing the installations. Although some of this was used, these costs were avoided from doing comprehensive surveys of the substations prior to installation.
The final proportion of underspend was associated with the GEM. Clean Energy Prospector were so significantly delayed in the delivery of the GEM, their final payment was withheld. As they had missed both the initial deadline and an extended deadline making it impossible to do a meaningful trail with the GEM within the time scales of the intervention period.

9.2 Community Award

Although it was possible that a community would be able to earn the full award it would have required them to have hit every target each day from the beginning of the intervention period. Although during the early months the targets were less onerous, while the profile of the project was low, every community had lost the ability to earn some of the total budgeted award. As the project's profile improved the excursions reduced however it expected that the full award was unlikely to be earned.

10 Lessons learnt for future Innovation Projects

There are a few key learning points on how future projects could be run.

10.1 Community engagement projects

Although there was engagement its effectiveness was hampered by short timescales and lack of overlap of the intervention area on to a recognisable community. These are two elements that would need to be changed for another community based project. First of all a longer baseline collection period would be beneficial, secondly a broader sample size to avoid the unpredictability of small groups of homes. Also, and probably most crucially matching the intervention location to a recognisable community boundary, preferably with a social hub. The disadvantage of this, as discussed in section 6.3, is that the project cannot be mapped to specific DNO constraints. Therefore this type of intervention would need to be focused on energy reduction in general rather than a DNO led activity around network constraint management. Thus making it a community led rather than the DNO as the DNO benefits are secondary to the communities.

It would also be suggested that individual household monitoring was considered, this allows the decoupling of the monitoring to specific DNO assets and allows an aggregated view of engaged homes. This however makes assessing the impact on the wider grid more difficult as all the unengaged homes and non domestic properties are not included in this data set. It allows the engagement to be more energy based, important to the customer, compared to power based, which is important to the DNOs.

10.2 Greenbank Energy Monitor

The GEM, despite its delays and clunky interface the concept of the GEM seemed to strike a chord with the community. Although it was never sufficiently tested the idea of pledging an action and then seeing the impact and if other members of the community were joining in seemed popular. If enough individuals were actively involved there would have been the possibility that it gained a critical mass to reach the wider community, similar to how some posts on social media go viral. It is an intervention which could actually help deal with the time critical peak demand issues without resorting to direct control of appliances. It would be an intervention worth considering in future projects.

11 Planned implementation

As the project set out to explore if community engagement lead demand side response was a valid option for network constraint management and there was not a statistical significant impact and was significantly more expensive than conventional reinforcement, this sort of intervention will not be taken forward to business as usual. However the project does hold useful learning for future demand side response services purchased from community groups or ESCOs.

However the engagement techniques and the learning around improving energy literacy, saving energy for customers and having a positive impact on the community has been passed onto the social obligations team to see how interventions of this time could be implemented for communities with a high number of fuel poor homes and vulnerable customers.

12 Facilitate Replication

Further details of the engagement are included in the CSE report (link in references seaction). Both WPD and CSE are happy to discussion details of the project in further depth on specific elements of the project, see contact details below. Initial findings were disseminated at last year's LCNI event and this will continue at next event. There is also the intention to do a specific dissemination as part of the Community Energy fortnight in September inviting representatives from community groups, DNOs and suppliers.

13 Contact details

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14 References

The CSE report can be found on the link below.

Main body:
www.cse.org.uk/downloads/file/LCNF-community-energy-action-less-is-more-report-2015.docx

Appendices:
www.cse.org.uk/downloads/file/LCNF-community-energy-action-less-is-more-report-2015-appendices.docx