UNIVERSITY OF EXETER
Energy Policy Group

Cornwall Local Energy Market – Organisations Survey

Rachel Bray & Bridget Woodman

EPG Working Paper: EPG 2003

Abstract: In 2019 the University of Exeter undertook a survey with the organisations who participated in the commercial trial component of the Cornwall Local Energy Market project.

The Organisations Survey included an online survey which was emailed to all participants, and interviews held with 10 organisations. This report outlines the results of the Organisations Survey and is scoped around three research objectives.

Keywords: LEM, organisations, business, trading, flexibility, innovation, networks, local, renewables

Contact: Rachel Bray r.bray@exeter.ac.uk

Date: 10/07/2020

European Union
European Regional Development Fund

Disclaimer

This report contains the views of the University of Exeter working as a project partner on the Cornwall LEM Project and does not in any way represent the views of Centrica plc

The Cornwall Local Energy Market is part-funded by the European Regional Development Fund under the European Structural and Investment Funds Programme 2014-2020

Contents

Summary

In 2019 the University of Exeter undertook a survey with the Cornish businesses and organisations who participated in the Cornwall Local Energy Market (LEM) project.

The Organisations Survey included an online survey which was completed by 28 participating organisations, and interviews held with 10 organisations. This report outlines the results of the Organisations Survey and is scoped around the following three research objectives:

Objective 1: Evaluate organisations' experience of the LEM so far.

Objective 2: Identify characteristics that might define who is likely to or unlikely to engage in the provision of flexibility, energy or other services via a local energy market.

Objective 3: What might encourage organisations to participate? What needs to change to incentivise participation?

Key Findings

23 respondents thought that the LEM concept was a good idea; whilst the remainder were neutral. No one thought the concept was a bad idea.

23 respondents had assets installed as a result of contact with the LEM. Of these, 11 organisations had seen a positive impact from these assets by the time of completing the survey, although another 9 organisations stated that it was too early to tell.

All survey respondents who had originally contacted the LEM for energy advice (12 organisations) stated that they received the advice which they sought. Of these, 6 organisations said that the advice received had a positive impact on their business operations, whilst 5 organisations stated that it was too early to tell.

Both the positive and the negative feedback centred on the level of support received from the Cornwall LEM team. Those who said they had a positive experience (20 organisations) praised the team for being friendly, helpful and enthusiastic. Those who said they had a negative experience (3 organisations) however needed additional support with installing equipment, setting up IT and website capabilities, or training.

Less than half of the organisations who were originally interested in trading flexibility on the LEM platform actually traded. Conversely, over half of the organisations who weren't originally interested in trading would now consider trading given more information and dedicated support. However, there was little or no awareness of current market opportunities, despite most organisations having a good understanding of energy issues.

Several key barriers to engagement in a LEM were identified. The majority of these barriers were external to the LEMs control and included cost (e.g. cost of technologies and cost of export connections); lack of policy support from government and restrictive planning regulations. However, respondents saw a remit for the LEM in helping organisations to understand and overcome some of these barriers. There was also a need for support from the LEM to help organisations understand and engage in energy trading opportunities such as flexibility markets and National Grid balancing services.

Introduction

The Cornwall Local Energy Market (LEM) programme is a four-year trial from the end 2016 to 2020 jointly funded through the European Regional Development Fund and Centrica. The project is led by Centrica in association with project partners Western Power Distribution (WPD), National Grid ESO, N-SIDE, Imperial College London and the University of Exeter (UoE).

The Cornwall LEM programme comprises of five key work packages:

WP1. Development of the LEM flexibility trading platform and trials.

WP2. Residential battery storage installation and trials.

WP3. Industrial & Commercial engagement, installations and support.

WP4. Project management, communications and compliance.

WP5. Research and reporting.

UoE Involvement in the Project

UoE's involvement in the project comes under WP5 - Research and reporting. UoE's remit in Phase 1 was to analyse the current GB policy and regulatory environment to identify the regulatory barriers to establishing local energy markets and suggest possible solutions.

Through the development of the flexibility trading platform the LEM project aims to create a local marketplace for flexible demand, generation and storage in Cornwall. Via the platform the distribution network operator (WPD) and the electricity system operator (National Grid) can procure flexibility from distribution connected assets in Cornwall; allowing both supply and demand side providers to participate in trading and optimising capacity on the network. However, this model of electricity trading and network operation differs significantly from the way in which the UK electricity system currently operates.

Markets and network operation have historically been designed to reflect the 'conventional' centralised configuration of the system, rather than supporting smaller scale, more active local participation. Policies and regulations in place at the moment may therefore act as barriers to the development of a model which allows more local trading of power and flexibility.

The Phase 1 report, 'Policy and Regulatory Barriers to Local Energy Markets in GB' was published in May 2018 (Bray, Woodman and Connor, 2018) and can be located on the UoE website https://ore.exeter.ac.uk/repository/handle/10871/33607. The report identified 72 issues which mainly fell within 6 broad areas:

1. Access to existing markets (such as the Wholesale Market, the Balancing Market, the Capacity Market and Ancillary Services) which have not been conducive to small scale generation.
2. The creation of new local markets (focussing on the anticipated future role of the Distribution Network Operators (DNOs) and the services they can be expected to provide.
3. The existing trading rules and the challenges these pose to more innovative trading solutions (particularly the Supplier Hub Model).
4. Connection tariffs & rules (including curtailment of local generation by the DNOs).

5. Network Charges and the impact of Ofgem's proposed changes to network charges on small scale generation and behind-the-meter[1] (BTM) generation.

6. Data (particularly the lack of data and access to available data).

This report constitutes part of Phase 2 and predominantly concerns the expectations and experiences of the businesses and organisations who participated in the Industrial & Commercial work stream of the Cornwall LEM project (WP3) and the I&C users of the flexibility trading platform (WP1). In parallel with this survey work, UoE also undertook a survey with the 100 householders who participated in the residential component of the LEM project (WP2). The Householder Survey report has already been published and can be found here: https://ore.exeter.ac.uk/repository/handle/10871/120972.

In light of this combined qualitative analysis; along with stakeholder interviews, UoE will then provide a final report in Phase 3 .The final report will detail any recommendations for policy and / or regulatory change which may be required in order to enable the development of local energy markets across GB. The Phase 3 report will be available by the end of 2020, which is the project end date.

Overview of the I&C work stream (WP3)

In total, 252 Cornish businesses and organisations have had some form of contact with the Cornwall LEM project through the I&C work stream offerings. The work stream comprises 3 dedicated services which could be awarded to these organisations:

1) Installation of significant capital equipment at participant business sites.

2) Grant award of £1000 or more towards the cost of an advanced electricity sub metering system.

3) Non-financial assistance in the form of a minimum of 12 hours energy related expertise.

Once contact was made with an organisation, typically an arrangement was made to visit the site by one of the LEM project's energy engineers, who would conduct an initial walk-through survey and discuss the site's energy situation and forward strategy. The initial visit and discussions might then be followed by more targeted discussions and meetings if a potential solution for inclusion in the LEM project was identified (Parish, 2020).

Inevitably not all sites / participants progressed through to receiving one of the three service offerings, either through the organisation withdrawing from the project or through the Cornwall LEM team being unable to support a request. For instance, in several cases, the availability and cost of a new network connection; the upgrading of an existing connection; or the addition of export capacity to an existing connection, became a defining factor in project viability (Parish, 2020). Consequently, although 14 organisations engaged in detailed discussions, designs and negotiations with respect to major asset installations; of these, only 6 organisations actually progressed through to installation. These installations were procured by Centrica who retain ownership of the equipment, but which the organisations have access to free of charge (see Figure 1 for total number of service offerings received to date[2]).

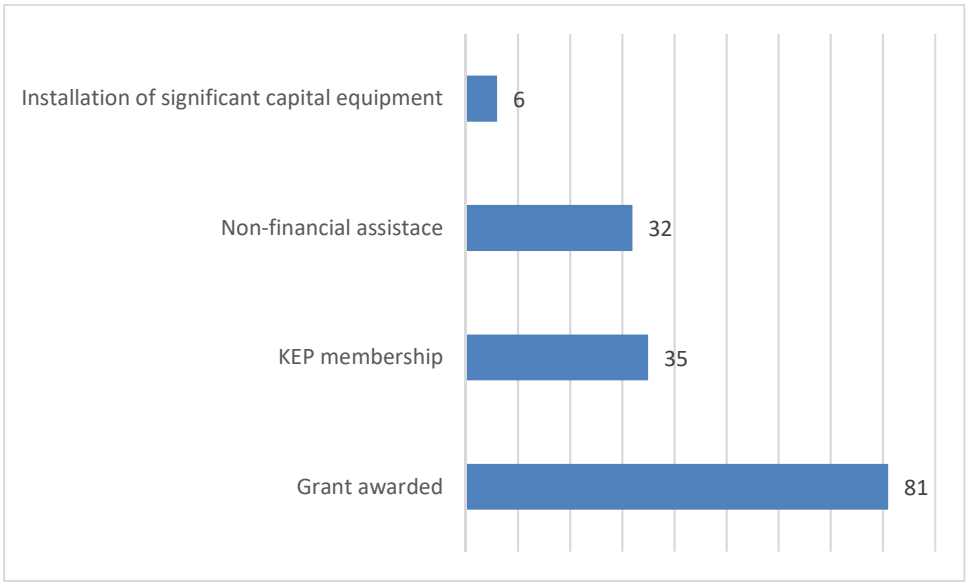
[1] BTM generation is any generation that happens onsite, on the energy user's side of the meter, such as solar PV, heat pumps, EVs and battery storage

[2] As this survey was conducted before the end of the Cornwall LEM project this may not represent the final figures

Assets installed included battery storage systems, combined heat and power plant (CHP) and utility scale wind and solar power generation equipment. The total renewable energy capacity installed under the project exceeds 4.8 MW with a further 2.6 MW of battery capacity.

In addition to the 3 service offerings shown above, the Cornwall LEM team, in association with the project's research partners the UoE and Imperial College London, created a Knowledge Exchange Partnership (KEP) which any organisation in Cornwall was able to join. The KEP held a series of bi-annual seminars throughout the project period aimed at providing organisations with up-to-date advice on emerging flexibility markets, including guest speakers from industry. To date speakers have included representatives from BEIS, WPD (the local distribution network operator) and aggregators[3] working within Cornwall.

Figure 1 Product received (by number of organisations)



Overview of the Cornwall LEM flexibility trading platform (WP1)

The Cornwall LEM designed and built a bespoke online market trading platform to enable Cornish businesses and organisations to participate in trading generation and flexibility[4] to both earn additional revenue and to help optimise capacity on the distribution network.

The LEM platform allows buyers (i.e. WPD and National Grid ESO) to place bids for flexibility, which the platform then matches with seller offers (i.e. the businesses) through auctions that run from months ahead through to week ahead and day ahead to intraday, with a gate closure two hours ahead of dispatch time.

[3] Aggregators bundle together generation and flexibility from multiple sites to act as one combined unit in electricity markets; thus enabling participants to engage in markets which they could not have accessed individually, either due to volume restrictions or licensing restrictions (Bray and Woodman, 2019)

[4] Flexibility, also known as demand side response (DSR), can be defined as the ability for consumers to either change their electricity usage in response to market signals (implicit DSR), or to sell demand reduction/demand increase in electricity markets (explicit DSR) (Bray and Woodman, 2019). The LEM trading platform allows businesses to trade explicit DSR.

The LEM householders also participated in market trials, albeit their involvement was managed remotely by the Cornwall LEM team, rather than the householders being actively engaged in using the platform themselves (see UoE's Householder Survey report as referenced earlier).

While the Cornwall LEM project funded installations that would enable both I&C and domestic customers to provide flexibility services, fewer flexibility customers were recruited than were expected, which can be attributed in part to location, the lack of available appropriate network connection capacity and the lack of industrial and commercial loads that may be attracted to flexibility offerings. The customers that were recruited, however, provided significant combined capacity (WPD, 2020).

The market trials occurred in 2 phases (see *Box 1*). Phase 1 trials commenced in May 2019 and ran until August 2019 and were conducted with WPD under a Quote and Tender arrangement (whereby WPD quoted their flexibility requirement and sellers tendered for the service). Thirteen events were scheduled during Phase 1 with WPD paying in the region of £300 p/MWh for a total combined capacity of 18MWh (WPD, 2020). Events were either for demand turn-down / generation output (to increase volume on the network) or demand turn-up (to decrease volume on the network).

Box 1

Feature	Phase 1	Phase 2
Purchasing method	Quote and Tender	Spot Market
Trial duration	May 2019 to August 2019 – with WPD only	September 2019 to December 2019 both WPD and National Grid December 2019 – March 2020 National Grid only
Conflict resolution	None	Included in the market clearing algorithm and Transmission / Distribution coordination was supported via the dashboard providing visibility of services purchased by each party
National Grid participation	No	Yes

Source: Adapted from 'Visibility Plugs and Sockets Closedown Report' (WPD, 2020)

Phase 2 trials commenced in September 2019 and ran to December 2019 with WPD and National Grid ESO both procuring services; and then from December 2019 to March 2020 with just National Grid ESO. Phase 2 ran as an auction-based spot market for flexibility services, as a contrast to the tender model in Phase 1. The spot market was designed to allow for joint procurement by both WPD and National Grid ESO concurrently to test how such an arrangement would operate as this joint procurement arrangement had never happened in practice prior to these trials. The LEM platform coordinates DNO and ESO flexibility procurement ensuring conflicting resources are not simultaneously dispatched, and that contracts for national services do not increase or create congestions at the local level.

In Phase 2 there were 77 reserve contracts, and 49 utilisation contracts cleared by the platform from 385 Bids and 107 Offers. The total contracted volume was 218MWh of reserve capacity of which 99MWh was utilised.

Organisations Survey Overview

In late 2019 and early 2020 UoE undertook an evaluation survey with the organisations involved in the Industrial & Commercial work stream (WP3) and the market platform trials of the Cornwall LEM project (WP1). The Organisations Survey included an online survey which was emailed to 160 organisations in October 2019[5]. We received responses from 28 organisations (17.5%); of which 10 organisations (6%) also agreed to follow-up interviews which were held at their premises in January 2020.

This report outlines the results of the Organisations Survey and is scoped around the following three research objectives:

Objective 1: Evaluate organisations experience of the LEM so far.

Objective 2: Identify characteristics that might define who is likely to or unlikely to engage in the provision of flexibility, energy or other services via a local energy market.

Objective 3: What might encourage organisations to participate? What needs to change to incentivise participation?

In order to answer these objectives, the survey and interview questions covered both a quantitative and a qualitative nature (see Appendix 2).

For more information on the scope and format of the Organisations Survey please see the Methodology section in Appendix 1.

Organisation Profiles

The first section of the online survey was entitled 'About Your Organisation' and consisted of 4 questions covering the organisation's location within Cornwall; number of employees working at the site; the primary operation; whether they had any generation, storage or energy monitoring equipment installed prior to their involvement with the LEM.

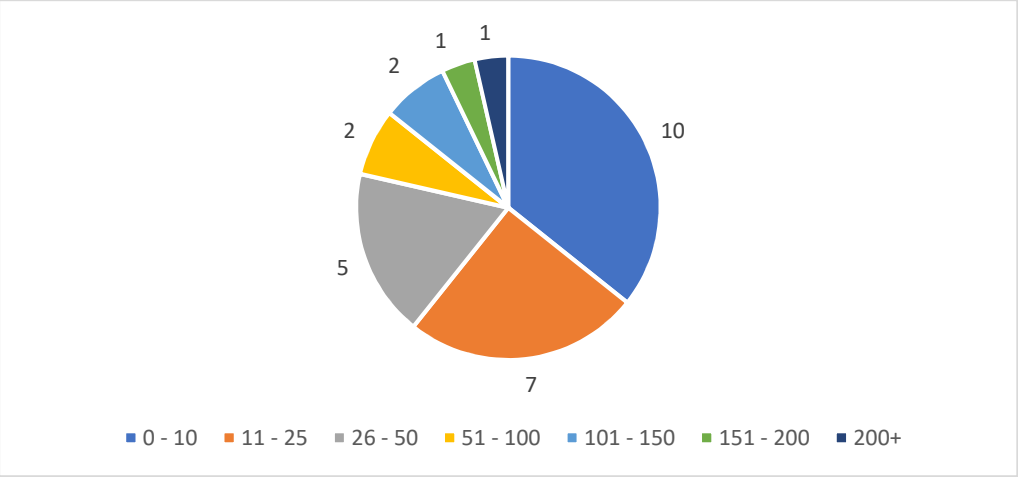
Q1 asked for the first part of the organisation's postcode so that we could assess whether we had received responses from across Cornwall. The 28 responses covered 18 separate town or village locations throughout Cornwall ranging from the far south-west peninsula up to Liskeard in the east of the county. Concentrations were found in the more heavily populated urban areas such as Truro, St Austell and Falmouth.

Q2 asked how many employees worked at the site. Based on the number of employees we can say that 27 out of the 28 respondents are categorised as small or medium sized enterprises (SMEs). The definition of an SME is a business with fewer than 250 employees and SMEs make up over 99% of all UK businesses, although the majority of these actually employ fewer than 10 people (Rhodes, 2019).

[5] Although 252 organisations to date have had contact with the LEM, we could only offer surveys to 160 due to several factors: some organisations made contact with the LEM after the survey date; some no longer wished to be contacted or had gone into liquidation; and some organisations were not relevant to the survey exercise e.g. research institutes

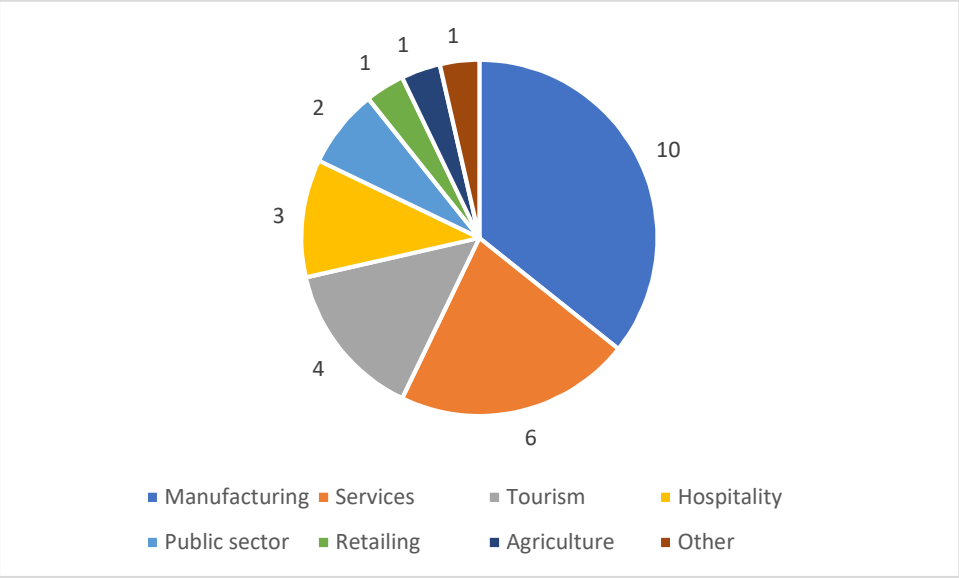
As can be shown in *Figure 2*, most of the survey respondents employed fewer than 50 people; with the highest concentration in the 0-10 employees' category.

Figure 2 Number of employees (by organisation)



Q3 asked what the primary operation of the site was. Ten organisations stated that manufacturing was their primary operation; followed by services (6) tourism (4) hospitality (3) and public sector (2). Retailing and agriculture were both represented by only one organisation as shown in *Figure 3*.

Figure 3 What is your primary operation? (By organisation)



Q4 asked the respondents whether they had any generation or storage assets or monitoring equipment installed at the site prior to their contact with the LEM, of which 16 sites did. Of these 16 sites, 14 had solar PV; 4 had solar thermal; 4 had biomass boilers and 4 had energy monitoring equipment. Only one site had previously invested in some kind of storage capacity.

Objective 1: Evaluate organisations' experience of the LEM so far

Overview

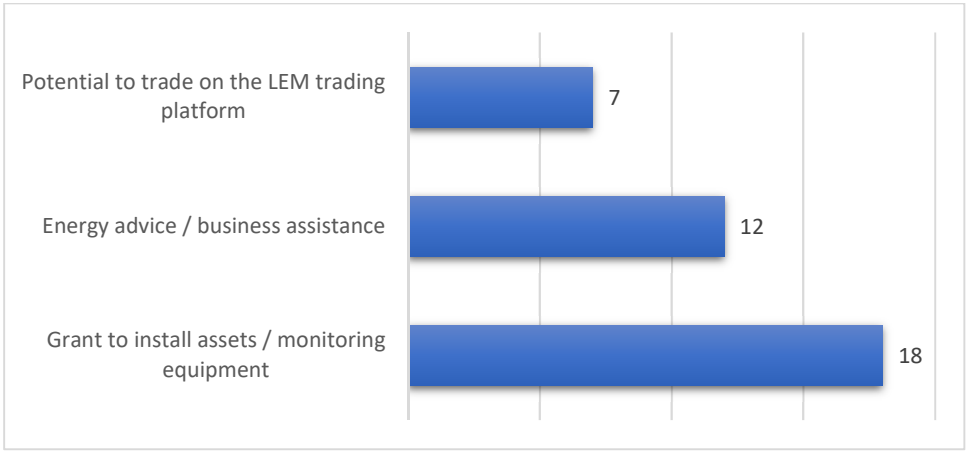
In the online survey Objective 1 was explored through Q6 'What were you initially in discussion with the Cornwall LEM about?'; 'Q7 'Did you have any assets / monitoring equipment installed as a result of your contact with the Cornwall LEM?' Q8a and 8b relating experience of using the Cornwall LEM online platform; Q9 'Overall would you describe your contact with the Cornwall LEM as a positive or negative experience?' and Q10 What are your key thoughts on the Cornwall LEM project?

In the interviews Objective 1 was explored through question 2 'Were you satisfied with the outcome?'; partly through question 3 'Have you used the LEM platform to trade flexibility?' and through question 6 'Have there been any other positive or negative experiences of being involved with the Cornwall LEM project that haven't been discussed so far?'

Results

Q6 of the online survey was a filter question to find out what the respondents had originally been in discussion with the Cornwall LEM about. As respondents could have had more than one area of interest which they wanted to explore with the LEM (e.g. energy advice and grants to install assets), they were able to select more than one answer if applicable. Discussions regarding grants to install assets and / or monitoring equipment was respondents most frequently mentioned reason for being in contact with the LEM (18), followed by energy advice (12) and the potential to trade flexibility on the Cornwall LEM trading platform (7) as shown in *Figure 4*.

Figure 4 What were you initially in discussion with the Cornwall LEM about? (Please select all that apply)



The responses given in Q6 then led to several filtering questions relating to the aspects of the project selected. We will therefore look at the follow-up / filtering questions based on the ranking. Interview data is also included where applicable and is referenced as such.

Grants for installations

Q7 23 organisations who responded to the survey had assets and / or monitoring equipment installed as a result of their contact with the Cornwall LEM (*Figure 5*); of which 16 received full grants; and 4 received partial grants to cover purchase and installation costs (*Figure 6*). Of those whose original intention in Q6 was to seek a grant, only one organisation said that they didn't go on to get a grant

from the LEM. Conversely, 5 organisations whose original intent in Q6 had either been to seek energy advice or to trade on the LEM platform, went on to have assets installed as a result of their contact with the LEM.

Figure 5 Did you have any assets / monitoring equipment installed as a result of your contact with the Cornwall LEM? (By Organisation)

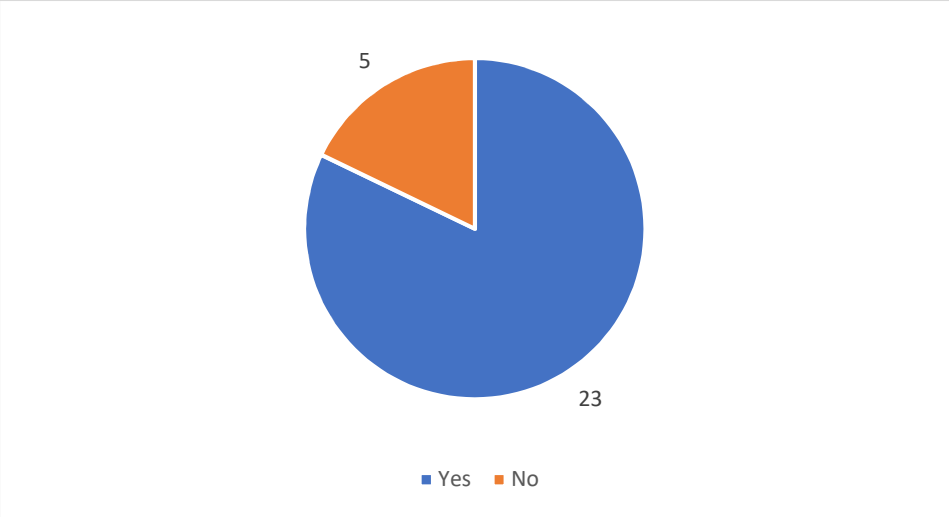
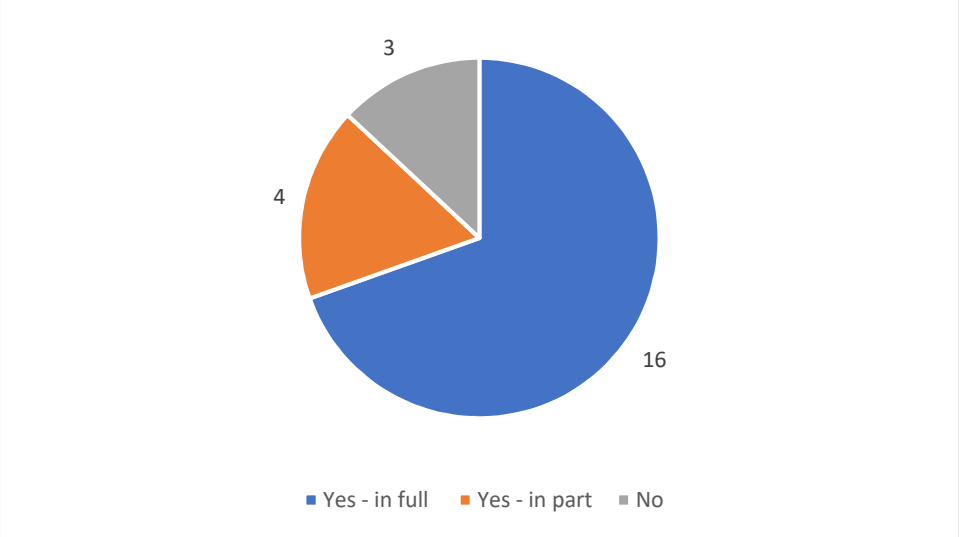


Figure 6 Did the LEM provide you with grant funding to install these assets? (By Organisation)



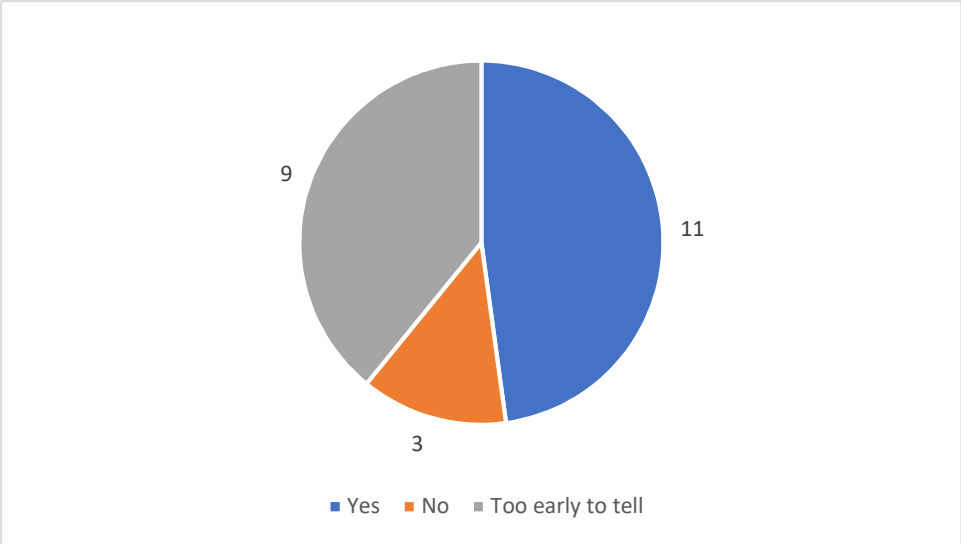
However, interview data shows that 2 organisations had originally approached the LEM wishing to have battery storage installed but were offered monitoring equipment instead; therefore, although they had assets installed, they weren't the assets originally desired. Both of these organisations were however pragmatic regarding this and stated that they understood the reasons for not receiving storage:

> *"I filled out the original application form and I got an email back saying something like, "Oh that side of the trial is full, but would you be interested in energy monitoring?" Which is what we did explore…it's been great that we've had the chance to put this equipment in and to try it."*

"I wouldn't have been surprised had we pushed much harder on the storage route that they could quite rightfully or legitimately have turned around and said, "But we need to monitor the building for a year to get a handle on it."

In the online survey the 23 organisations who had assets installed were asked in Q7c whether the installation of the assets had a positive impact on their organisation's energy usage or behaviours. Eleven stated that there had been a positive impact; three said there hadn't; whilst nine thought that it was too early to tell (*Figure 7*).

Figure 7 Has the installation of this equipment had a positive impact on your organisation's energy usage or behaviours? (By organisations which had assets installed)



Of those who had seen a positive impact, reasons given included:

"We are now able to generate almost as much electricity annually as we use."

"Uncovered poor control of significant power using assets. Provided a list of measures to take to reduce energy bills and carbon emission."

"Understanding our energy consumption at an individual equipment level has allowed us to understand the impact of efficient use of each asset and understanding true costs."

During the interviews it was apparent that interviewees were impressed with the capabilities of the monitoring equipment:

"The amazing capability of these sensors to monitor individual circuits in the building, these little wireless sensors that they've got, that's all very impressive and tick box for that."

"One thing we were always struggling for was information on what buildings were actually billing, let alone what bits of their buildings were billing. So, this technology is just a transformation, the potential for it is enormous… Particularly the software that goes with this technology is potentially very, very useful in lots of ways, fair billing, understanding the billing, understanding where the energy has gone. It also highlights where you need to put in effort."

"But no one ever asks, "Well, actually, how much power am I using?" Because if you can't save on a base rate, it might be because I'm using too much power or irresponsibly using power, how much do we use? But I wouldn't have thought of that before. I don't think many people would have done before."

"It's made us more aware. Because before, same as in your house or wherever else, you just use power as needed and when, but when you've got the idea that it's on your screen that you can see exactly how much power you are using and when, you can be a little bit more smarter… So, it actually helps me run my business a bit better."

Reasons given in the online survey for not seeing a positive impact included lack of training in how to use the software and set up the collection of data; and no follow-on support in how to maximise use of meters and other monitoring equipment. This was reflected in the interviews, although interviewees generally took the onus for not following up on this themselves. Some interviewees admitted that they hadn't managed to make the most of the data reporting from the monitoring equipment due to time requirements (the organisation hadn't got around to doing it) but they also highlighted that they would have preferred someone to set up the analysis for them:

"Hands up, guilty of not analysing it, assessing it, out of laziness, lack of time, lack of engagement."

"Now I have to say, I haven't had time really to get the best out of it, which is my fault and there is some organising of the reporting side bit that I need to do, that I haven't had time. If I had any criticism at all it would be that another session with somebody more familiar with the software would be more than worthwhile…I would need to be sitting with them for a day or two to get the best out of it."

In addition, one interviewee hadn't got around to installing the equipment:

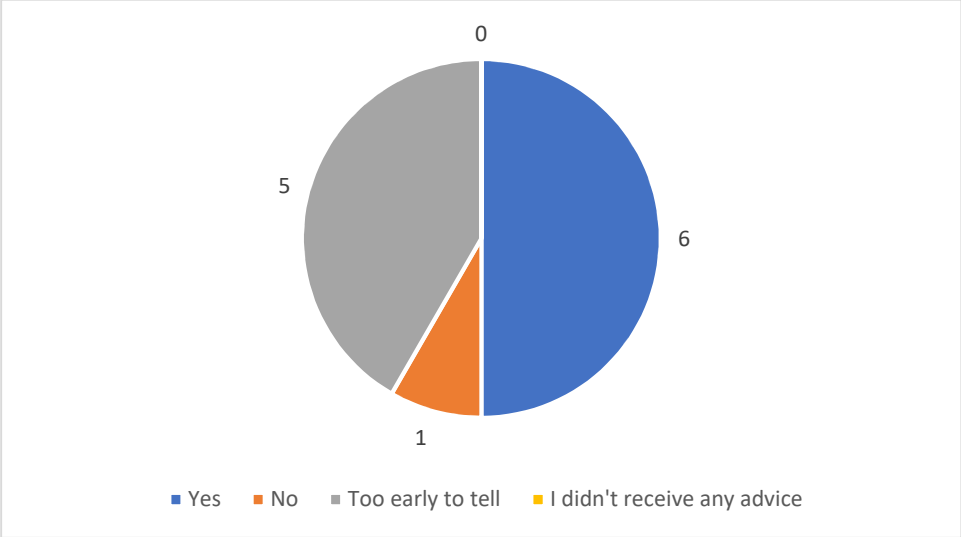
"Unfortunately due to pressure, time and what have you, and personnel, it hasn't yet been fitted, would you believe, so it's still in a box….I guess it would have been great if there had been a box we could have ticked that said, look, for £200 or whatever, we will have a man come in and do it, ensure it all works. We'd have probably paid the £200. But it didn't help because it's all stuck in a box."

Energy advice

12 organisations who responded to the survey had initially been in contact with the Cornwall LEM for energy advice. Reasons given included needing advice on installing assets such as battery storage, PV and CHP; energy monitoring system improvements; reduction in energy consumption and reducing energy bills.

All 12 organisations indicated that they had received the energy advice which they had requested. In addition, 6 said the advice received had a positive impact on their organisation's energy usage or behaviours; although 5 stated that it was 'too early to tell'. Only one organisation stated that there had been no positive impact. However, when asked, this organisation indicated that they hadn't seen a positive impact *as yet*; so their response could possibly be counted within the 'too early to tell' category (*Figure 8*).

Figure 8 Has this advice / assistance had a positive impact on your organisation's energy usage or behaviours? (By organisations which received energy advice)



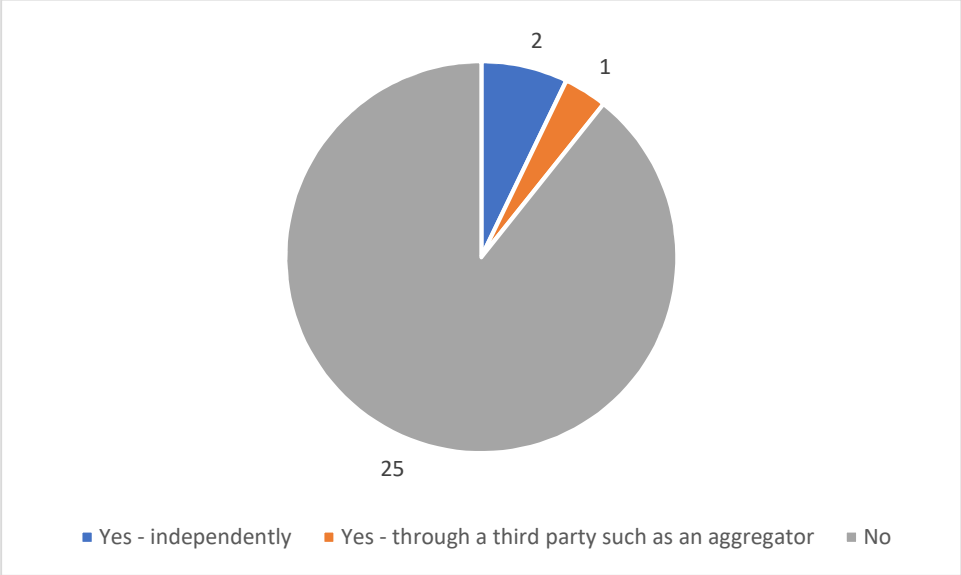
Of those who had seen a positive impact, reasons given included:

> *"We found the information and advice provided very supportive and gave us the confidence to make improvements and investments in energy management system."*
>
> *"We have implemented power monitoring across the main site, installed LED lighting and reviewed the possibility of steam producing CHP."*
>
> *"Realisation of when and how much energy was needed."*

Trading *(Q8a & 8b)*

Although 7 organisations who responded to the survey stated that they had initially been interested in learning about trading on the LEM platform; only 3 organisations had actually used the trading platform; 2 of them independently and one via a third-party aggregator (*Figure 9*).

Figure 9 Have you used the Cornwall LEM trading platform? (By organisation)



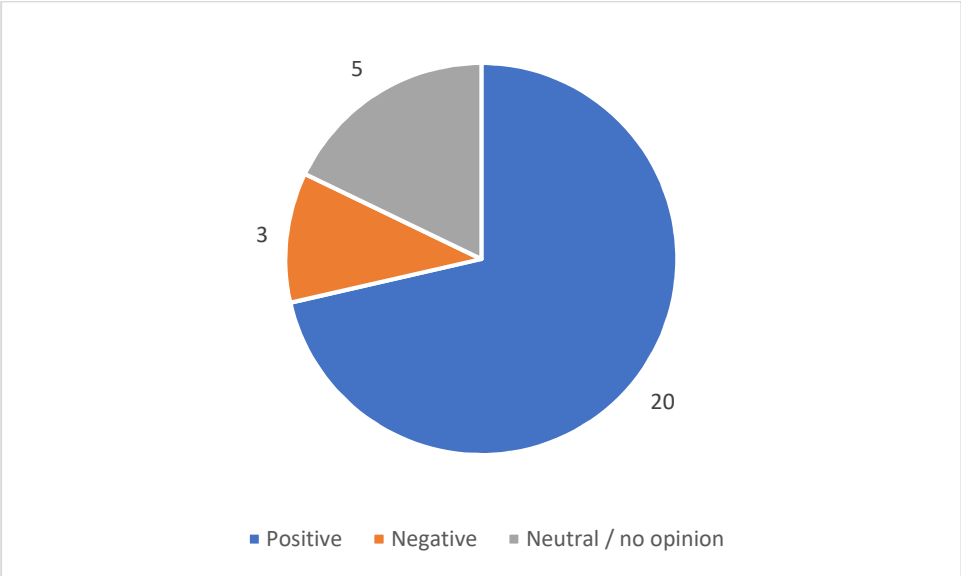
The 2 organisations who had used the platform independently both stated that they found the platform easy to use. However, all 3 organisations who traded were unsure whether they had received a realistic price for their flexibility.

Trading is discussed in more detail in Objectives 2 & 3.

Positive and Negative Experiences

Q9 in the online survey asked respondents whether they would describe their contact with the Cornwall LEM as a positive or negative experience. Twenty organisations described it as positive; 3 organisations as negative and 5 organisations were neutral (*Figure 10*).

Figure 10 Would you describe your contact with the Cornwall LEM as a positive or negative experience? (By organisation)



Positives

Positive experiences in the online survey included:

> *"Clear communication and support."*
>
> *"Friendly, helpful advice given in a way that made energy usage understandable."*
>
> *"Interesting project run by enthusiastic team of people sounds like a great future opportunity."*
>
> *"Blown away by the simplicity of install and level of insight the system provides."*
>
> *"I learnt a lot through my meetings with the team."*

One respondent also mentioned the Knowledge Exchange Partnership seminars which had been set up between Centrica and the academic project partners. These are a series of bi-annual seminars aimed at providing businesses with up-to-date advice on emerging flexibility markets, including guest speakers from industry. To date speakers have included representatives from BEIS, Western Power Distribution (the local distribution network operator) and aggregators working within Cornwall. The respondent's comment was:

> *"I still attend the seminars and find them extremely interesting passing on any information that I feel will be useful to my wider team members."*

More detailed comments on the positive aspects of the Cornwall LEM project were included in the face-to-face interviews. These included increased awareness of energy usage within the business premises; the support of the Centrica team and the fact that they had been able to benefit from free or subsidised equipment:

> *"The support, the admin support and process was pretty good."*
>
> *"Every time I need something, we email across or phone calls and yeah, straight back and they're extremely helpful."*
>
> *"I think they are passionate and it's nice to see because it's for the right reasons as well, you know, because I think people need to be very much more aware in this day and age and exactly where bills are coming from, where power is coming from. Everyone takes it for granted whereas we need to be a little bit more aware this day and age."*
>
> *"XX yes. Really very keen and very knowledgeable about what he was doing, really enthused, really nice, very nice person. He's been very helpful we had some minor things around reporting and things. He's been excellent."*
>
> *"Yes, it's been good, and like I said before, we wouldn't have had the opportunity to do that, because we wouldn't have spent that money."*
>
> *"Something I don't really understand is that I can't believe that it cost us nothing… just hope it will carry on and help other people in the way it has us."*

Negatives

Negative experiences reflected those reported above under the Grants for Installations section and mainly focused on the need for additional support and / or training from the LEM team in order to get the best out of their equipment. Comments made during the online survey included:

> *"Need additional support on the operation of local meters and the website."*
>
> *"Assisting in the website setup to clearly quantify our import / export."*
>
> *"A little more training would be helpful."*
>
> *"At times I felt that the advice was a bit too technical for my level of understanding and I sometimes felt that this limited the scope of actions that we could undertake."*
>
> *"Better IT support"*

The need for further support was expanded upon through the interviews with one interviewee remarking that:

> *"We are pretty knowledgeable players; I wouldn't like to think what would happen with an unknowledgeable player in the same situation…. Quite how they would have dealt with it or what satisfaction or otherwise they would have had, I'm not sure."*

One interviewee also expressed dissatisfaction with the outputs of the LEM. This organisation supported the ethos of the local energy market concept but felt that the Cornwall LEM had failed to deliver on this concept:

> *"You just felt, it was such a wasted opportunity. I don't know to this day what the output of the LEM programme are/were."*

Q10 asked for respondents' key thoughts on the Cornwall LEM project. From the 21 comments received there were only 2 negative comments: -

> *"From our experience a lost opportunity."*
>
> *"Waste of our time."*

The respondent who made the first comment agreed to be interviewed to confirm their viewpoint, which is included in the Negatives section above. The second respondent however declined an interview so no further detail on this can be ascertained.

Most of the comments however were positive towards both the overall concept of the LEM and towards the project itself. Comments included:

> *"An incredible service given that it is all grant funded. Without this service I would not have known where to find energy management support."*
>
> *"A great idea that needs to be continued. Could be a way to move towards a net-zero-carbon future."*
>
> *"It has been a great way to educate business and to engage as much or as little as we have needed to understand and promote the concept and implementation of a Local Energy Trading platform."*

"I believe it is the way forward. We need to promote energy generation at a more local level to be used on site or shared in the area. The reliance on the grid and its infrastructure will lead to problems in the future, if we do not change the approach."

"Fantastic project and very happy to be a part of it."

Analysis of Objective 1

As shown above, 23 survey respondents had assets installed as a result of contact with the LEM. Of these, 11 organisations had seen a positive impact from these assets by the time of completing the survey, although 9 organisations stated that it was too early to tell. As assets had been installed throughout the 3-year period of the Cornwall LEM some organisations would have had their assets installed much longer than others when the survey was released in October 2019, and indeed others may have had assets installed since the survey date. Therefore, the survey data needs to be viewed as a snapshot in time and may not accurately reflect the end of project data (the Cornwall LEM project will be closed at the end of December 2020).

All 12 survey respondents who had originally contacted the LEM for energy advice received the advice which they wanted. Half of these respondents said that the advice received had a positive impact on their business operations, with 5 organisations stating that it was too early to tell. It is also apparent from the survey responses that a percentage of those whose original intent had been to seek energy advice also went on to have assets installed as a result of their contact with the LEM.

Both the positive and the negative feedback on involvement with the LEM centred around the level of support received. For those who said they had a positive experience comments included praise for the Cornwall LEM team who were seen to be friendly, helpful and enthusiastic. This was echoed through the interviews and in addition interviewees commented on how the installation of equipment had made a difference to their awareness of day-to-day energy usage, enabling reductions to be made and assisting in business planning.

However, those that had a negative experience stated that they needed additional support with their equipment, whether that be at the installation stage, setting up the IT and website capabilities, or just through training and clearer instructions.

Two interviewees stated that they originally sought installation of storage equipment from the LEM, but instead they received monitoring equipment. Both interviewees didn't see this as a negative of the project; although one interviewee was somewhat disappointed and made the following comment:

"It sounded as though the project discovered it could begin to hit its targets with some quite large users much faster than myriad numbers of small users, which I can understand entirely."

This is an interesting observation. Did the LEM concentrate too much on the installation of large assets, to a handful of businesses, at the detriment of the smaller organisations? Indeed, would the aggregation of many smaller assets have had as much, or if not more, learning potential for the LEM project in terms of being able to either trade on the LEM platform or optimise the distribution network?

With the Cornwall LEM having only a finite amount of both time and money that could be spent, it may have been the more prudent decision at the time. Indeed, the difficulties encountered securing export connections was an overriding factor in negating several sites; as was the feasibility of organisations

being able to provide flexibility even if an export connection had been secured. However, any future iterations of the LEM project should consider the aggregated role that multiple smaller assets could play.

It should also be noted that very few organisations actually engaged in trading on the LEM platform, despite the best efforts of the LEM team in assisting them to achieve this. From the survey data we know that although 7 respondents originally engaged with the LEM to learn about the potential of trading; only 3 of these actually entered into trading. Those that did use the trading platform said that it was easy to use, so it wasn't the technical difficulty of engaging with the platform that provided the barrier. Respondents' thoughts on trading are discussed in full in Objective 2.

Objective 2: Identify characteristics that might define who is likely to, or unlikely to, engage in the provision of flexibility, energy or other services via a local energy market

The Organisations Survey undertaken by the University of Exeter forms only one part of evaluating Objectives 2 & 3. Alongside the Organisations Survey we also undertook a Householders Survey with the 100 householders who participated in the Cornwall LEM project. Therefore, we recommend that both surveys are read in order to gain a fuller perspective of Objectives 2 & 3.

Overview

In the online survey Objective 2 was explored through questions 5, 6, 8, 13 and 14.

Q5 gave a list of motivational factors for being involved in the LEM project; whilst Q6 aimed to determine what the respondents had originally been in discussion with the Cornwall LEM about, to find out what had prompted them to join.

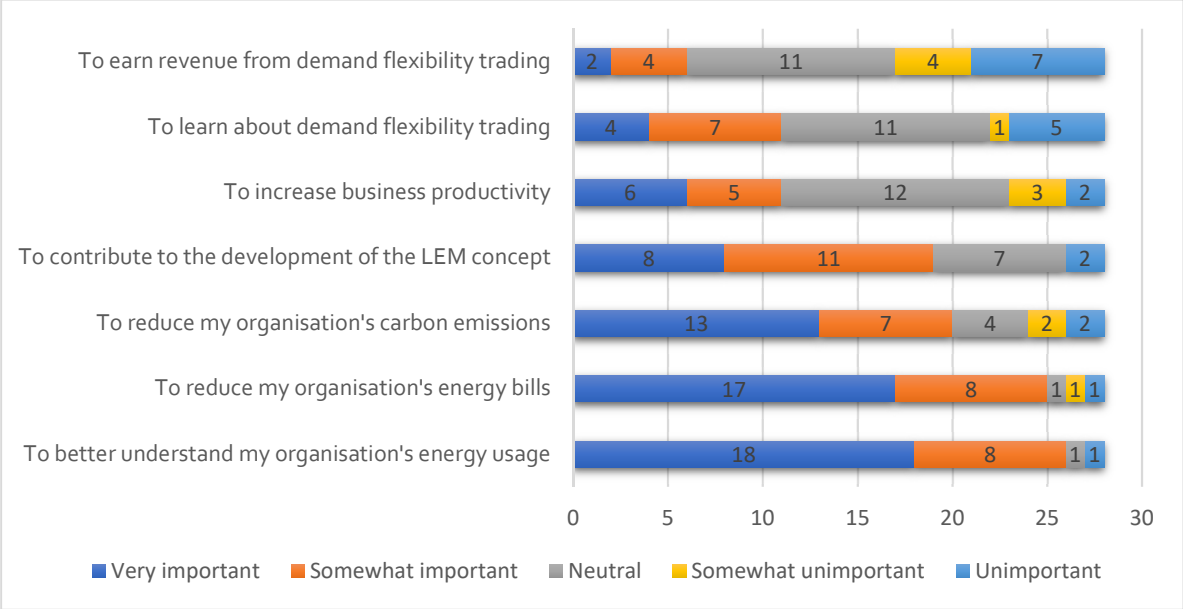
Q8 and its subsidiary questions related to use of the Cornwall LEM trading platform; Q13 related to whether the organisations had traded generation or flexibility previously in any other electricity trading markets and Q14 asked at what geographical scale organisations would prefer to trade e.g. into national, regional or local level markets.

In the interviews Objective 2 was explored through question 1 'What were your reasons for being involved in the Cornwall LEM project?' and through question 3 'Have you used the LEM platform to trade flexibility?'

Results

Q5 gave a list of 7 motivational factors for being involved in the LEM project and asked respondents to score each factor on a 5-point Likert scale from 'unimportant' through to 'very important' as shown in *Figure 11*. Most organisations wanted to better understand their organisation's energy usage and to reduce their energy bills, followed by reducing their organisation's carbon emissions.

Figure 11 Motivational Factors for being involved in the Cornwall LEM (by number of survey respondents)



This was explored further through the follow-up interviews. Here we found that although the organisations did want to better understand their organisation's energy usage, in every case they were already somewhat aware of energy issues and wider environmental concerns prior to their involvement with the LEM project, but were keen to expand their knowledge and impact. For instance, some organisations were involved in renewable technology retailing, some had a dedicated Energy Manager, whilst some businesses promoted their environmental credentials as a key marketing opportunity. We also found that several organisations undertook site visits to their premises to showcase the value of low carbon and renewable technologies and / or gave energy related talks to their peers and local communities. Comments included:

> *"Every time we see anything that comes through by email or people mention things to us at meetings or forums that we go to, we always say yes to everything, every bit of advice we can get. Every discussion we get involved in, every trip we can offer people here, we just do it."*
>
> *"To help save the planet, absolutely environmental concerns, above all....It is the one thing we do, if we've got any spare money, we put it into more* [renewable] *generation. We don't do anything else with it. We don't sort of fly off to the Maldives or whatever."*
>
> *"And I was also aware that we do have, whilst it's not an enormous amount of power, the way we use the building means that there is energy coming off the PV which we're not using, that could be utilised."*
>
> *"My entire professional career was tied up with looking after energy consumption in different forms."*
>
> *"I was invited to talk on energy. I've got a little PowerPoint talk here where I can bring in the grid for four months, Western Power for four months in terms of the format of the production. Then you go from there to your local power monitor, to look at what you're doing in your own home, you know, and suddenly you can apply it right across the board."*

As previously discussed in Objective 1, Q6 was a filter question to find out what the respondents had originally been in discussion with the Cornwall LEM about. 46% had been in discussions regarding grants to install assets or monitoring equipment; 31% had sought energy advice regarding the installation of assets / energy monitoring system improvements / how to reduce energy consumption; and 18% were interested in the potential to trade flexibility on the Cornwall LEM trading platform. These outcomes are described in Objective 1 although trading is discussed in more detail below.

Q8 - Trading

Although 7 organisations (25%) in the online survey stated that they had initially been interested in trading on the LEM platform; only 3 organisations had actually used the trading platform; 2 of them independently and one via a third-party aggregator.

The 2 organisations who had used the platform independently both stated that they found the platform easy to use. One of these organisations stated in interview that:

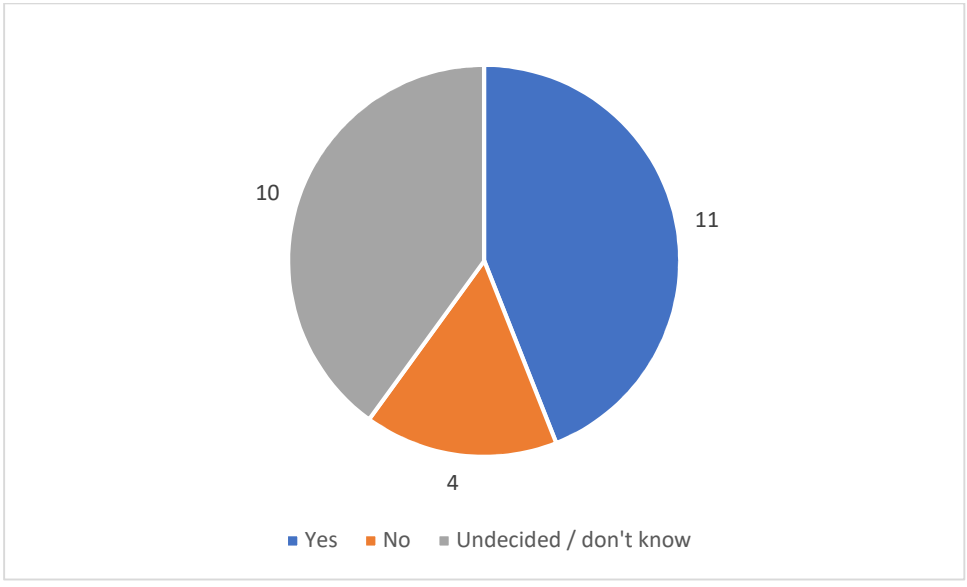
> *"I know it sounds horrible, but if things are extremely hard to use, it would limit how much I'd want to do it because we're very busy so, if it's something that's a chore, you're less likely to keep doing so many. So, when you've got the communication side laid down and it works seamlessly really, I'm quite happy with that."*

All 3 organisations who traded were unsure whether they had received a realistic price for their generation / flexibility as they didn't know what the true market price was. During the interviews one heavy electricity user who is trading regularly on the platform stated:

> "[Our electricity bills] *are around 15-16k per month. So, anything to come back on that helps us out. So, every time we do a trial, you're still looking at making £100, £200, £300 on a trial. So, therefore, if you're doing a trial twice a week, it's still a significant saving where it helps wage bills, so, it's absolutely still worth doing."*

Of the remaining 25 organisations who hadn't used the platform 11 organisations stated that they would be interested in using it at some point in the future; with 10 organisations undecided and 4 not interested in trading as shown in *Figure 12*.

Figure 12 Would you be interested in using the trading platform at some point in the future? (by organisation)

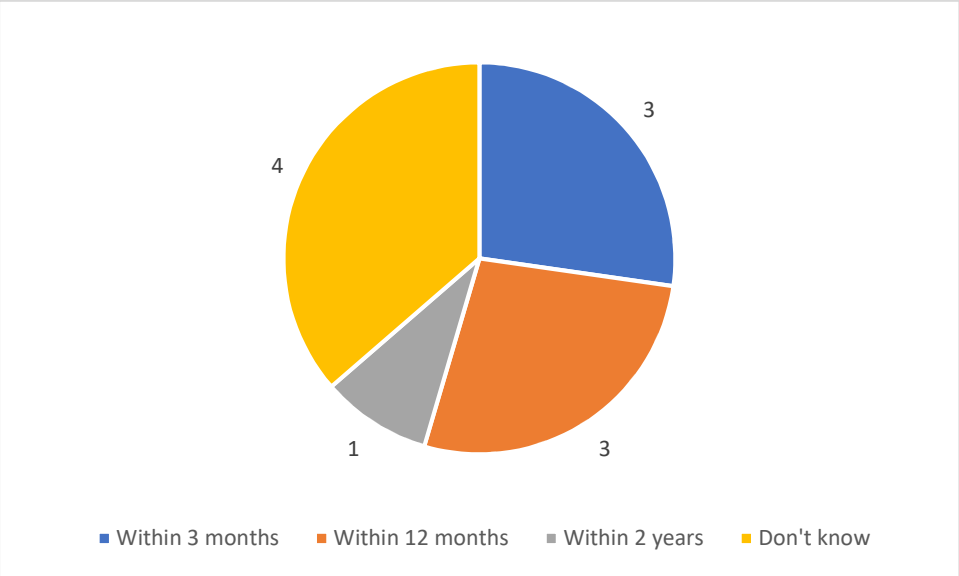


One organisation commented further through interview that:

> *"We have not sat down and hunted around looking for any trading arrangement we could engage in. If someone came back to us and said, "Do you know LEM Cornwall has got an offering? Would you like to participate?" We might be up for it…Any discussion about localised community trading is of interest."*

Of the 11 organisations who would be interested in using the platform in the future, the majority stated that they would like to use the platform at some point within the next 12 months as shown in *Figure 13*. However, 4 organisations didn't know when they would use the platform.

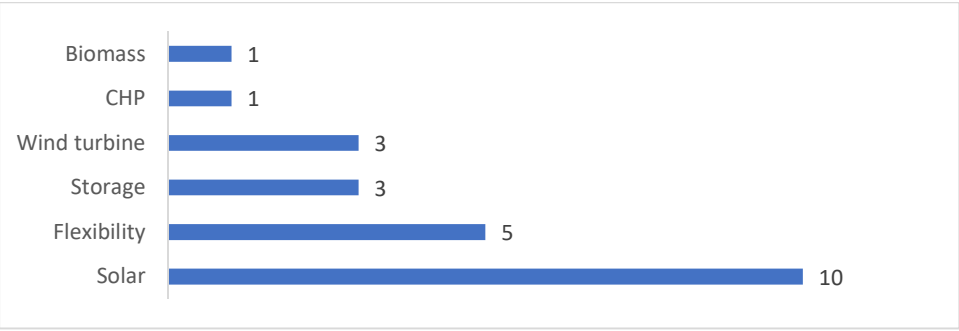
Figure 13 When would you like to use the local energy trading platform? (By organisation)



We then asked all the organisations (apart from the 4 who indicated that they had no interest in using the trading platform) what type of assets they would be seeking to utilise in trading on the platform. Organisations could choose more than one option depending on their installed technologies and / or ability to flex demand.

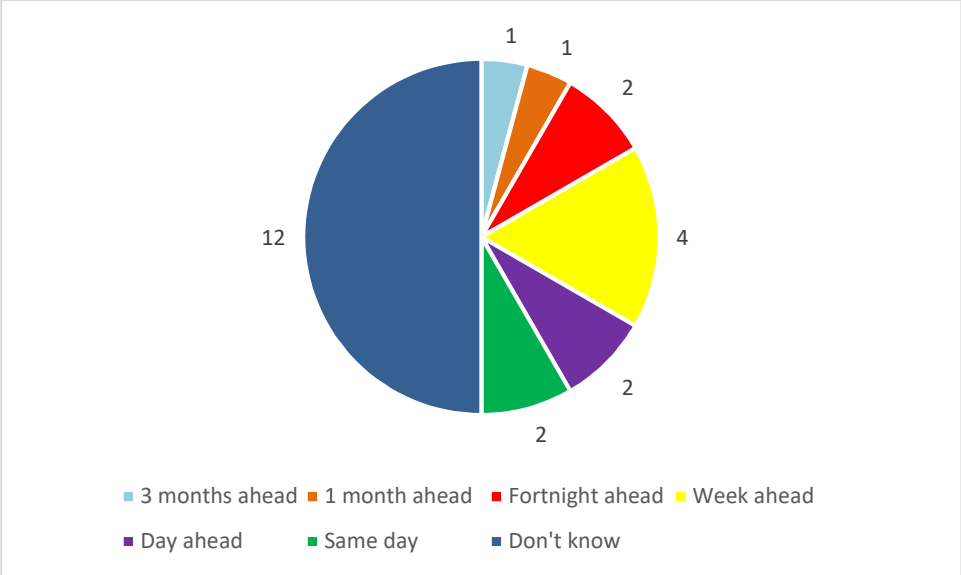
Although there were various technologies identified, the majority sought to trade solar generation as shown in *Figure 14*. Five organisations also sought to trade demand flexibility, whether that be through load shifting by demand turn up or demand turn down, to meet an identified need by the DNO (WPD) or National Grid.

Figure 14 What assets would you be seeking to utilise in trading on the LEM platform? (Respondents could choose more than one factor)



We then asked the same organisations how far in advance they would prefer to trade. However, half of respondents (12) said that they didn't know; with the remaining respondents broadly split across all the other options; albeit 4 respondents said they would prefer to trade a week ahead of dispatch (*Figure 15*).

Figure 15 How far in advance would you prefer to trade? (By organisation)



When asked why they preferred the selected timescale given above responses concentrated on being able to meet production demands – too long a timescale meant that they didn't know what the production demand would be; and too short a timescale meant that they didn't have time to factor in flexing demand and meeting production timescales. Those that preferred to trade a week or a fortnight in advance stated that:

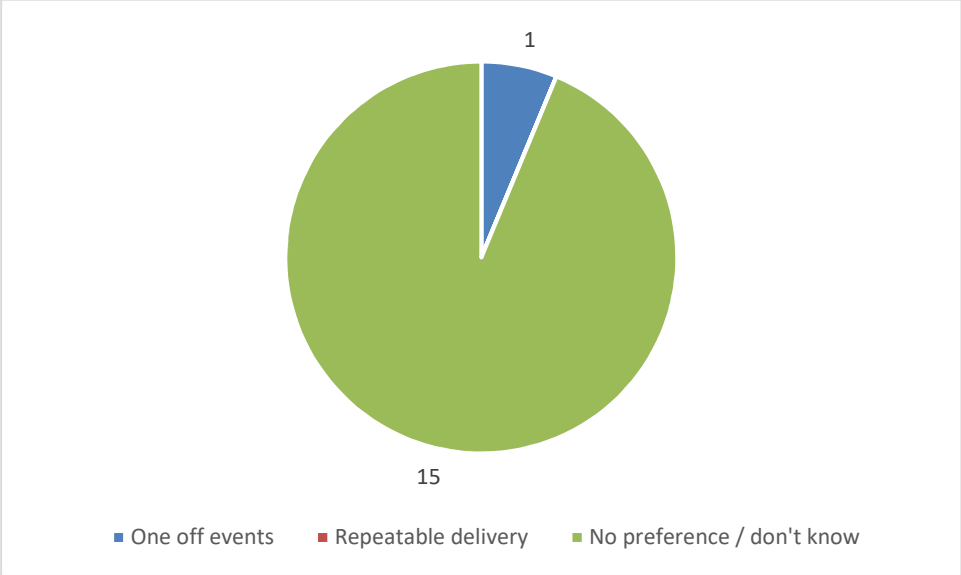
> *"Should enable planning to flex production around demand windows"*
>
> *"Will allow us to amend production to suit the demand/trade."*
>
> *"Cannot predict our production demand too far ahead."*

No explanations were offered during the survey for the other preferred timescales. However, during the interviews one organisation who is trading on the platform stated that:

> *"I've got the log-on to the website myself, so I can click on different packages. Because they ask you whether you want to power up or power down. And we probably do it at least once, maybe twice a week."*

When asked whether their organisation would prefer to trade in one off events, or have a fixed contract for regular repeatable delivery; again the organisations were largely unsure, with 15 organisations stating that they had no preference or didn't know as shown in *Figure 16*. Only one organisation selected 'one off events', whilst no one selected 'repeatable delivery'.

Figure 16 Would you prefer to trade in one off events which fit around your existing business acticities; or have a contract for regular repeatable delivery? (By organisation)



Q13 asked "Has your organisation previously traded flexibility via generation, storage or demand in any National Grid or Western Power Distribution markets; or participated in Triad or Red Band avoidance?"

Three respondents stated that they had participated in Triad[6] avoidance and Red Band [7]avoidance. Two of these three respondents had also traded demand flexibility previously in a National Grid market, one of which had traded independently, whilst the other had traded through a third-party aggregator. In addition, one other organisation had also traded previously via an aggregator; although they were unsure which market they had entered.

Therefore only 4 organisations who responded to the survey had previous experience in any kind of demand flexibility provision prior to their involvement with the Cornwall LEM. Interestingly, none of these organisations were ones who had participated in trading on the LEM platform, meaning that the ones who had were all new entrants to trading markets.

Q14 asked "Would you prefer to trade at the national level (National Grid), regional level (Western Power Distribution) or through more local opportunities?" 25 organisations answered this question, of which 11 would prefer to trade in a local market; 1 would prefer to trade at the regional/ WPD level and 11 had no preference.

[6] Transmission Network Use of System charges (TNUoS) are levied by National Grid for the maintenance and operation of the transmission network. An organisation's TNUoS charges are calculated retrospectively on their electricity demand over 3 half hourly periods of peak demand (Triads) between 1st November and 29th February. An organisation's TNUoS charges can therefore be reduced if consumption is decreased (either by demand turn down or by use of on-site generation / storage) when a Triad is expected (the Triad dates aren't known in advance) (theenergyst, 2017).

[7] Distribution Use of System charges (DUoS) are levied by the UK DNOs for the maintenance and operation of the distribution network. Charges are levied across 3 time bands throughout the day – red, amber and green. Red bands occur at times of peak demand and incur higher costs to users. Therefore, an organisation's DUoS charges can be reduced significantly if consumption is decreased during red band charging periods. Unlike Triads these times / days are advertised in advance (theenergyst, 2016).

The respondents who preferred to trade at the local level were all able to provide a reason why they chose this route. Responses included:

> *"This scale seems more approachable as a medium sized business that is only just starting out on its sustainable energy journey."*

> *"At our level of production the local market is more appropriate."*

> *"Retention of value in local economy. Higher utilisation of locally generated low CO_2 electricity. Easing of local grid constraints. Reduction in peak demand penalties."*

> *"To be able to better balance local needs."*

> *"Turbines etc. should be seen to be benefitting the local community first to overcome the objections to them."*

> *"The geography of Cornwall and the changing population and energy requirements throughout the year, lends itself better to a Local Market."*

However, those who had no preference generally needed more information to be able to make a choice as they had no prior experience of trading:

> *"I don't have enough information or knowledge of trading to comment. We don't produce enough of our own energy to trade any significant energy."*

> *"We are small fry, so it has to be very simple."*

The one respondent who would prefer to trade at the regional level was also the respondent who had the most experience in trading prior to their involvement with the LEM project. Their reason given was:

> *"Feels like an appropriate level for impact."*

Analysis of Objective 2

Through the data received from both the online survey and the interviews we discovered that most respondents wanted to better understand their organisation's energy usage and reduce their energy bills. We also found that every organisation interviewed were already somewhat aware of their energy usage and wider environmental issues prior to their involvement with the LEM project, but were keen to expand their knowledge further. These organisations were therefore not complete novices in energy matters and several were already informally educating their peers and neighbours either through community forums or through hosting site visits to their premises; whilst some were in the business of selling and /or advising on the installation of renewable technologies. A caveat should therefore be made to this survey work that the interviewees were not representative of the majority of Cornish organisations. As one organisation stated:

> *"We are pretty knowledgeable players; I wouldn't like to think what would happen with an unknowledgeable player.... what satisfaction or otherwise they would have had, I'm not sure."*

This level of expertise and engagement by the organisations also has implications for any future LEMs. It is therefore recommended that any future LEM proposals should either seek to recruit the more environmentally aware organisations in the first stages of the project (before rolling the project out to a

wider audience), and / or engage in educational programmes (such as the KEP seminars provided by the Cornwall LEM) much earlier in the LEM process to increase awareness and understanding. This is explored further in Objective 3 *What would need to change to encourage more organisations to participate in a local energy market?*

However, this level of energy awareness did not easily lead to organisations entering into flexibility trading through the LEM platform. Although 7 organisations in the online survey stated that they had initially been interested in trading on the LEM platform; only 3 organisations had actually used the trading platform; 2 of them independently and one via a third-party aggregator.

Of the remainder of respondents, 11 stated that they would be interested in using the trading platform at some point in the future (generally within 12 months); with a further 10 organisations undecided. However, it is apparent that these organisations don't currently have the knowledge needed to make decisions on which markets they wish to engage with, what timescales they want to trade in or what will be expected of them. And as shown by those who did participate on the trading platform all were unsure whether they had received a realistic price for their generation / flexibility as they didn't know what the true market price was.

WPD were willing to pay around £300 per MWh for flexibility traded through the platform, but would a more variable price be on the one hand, more conducive in kick-starting demand flexibility trading; and on the other hand, take better account of actual flexibility need on the network (e.g. to unlock a network constraint at a particular time and place would it be reasonable to expect a payment of up to £500/£600 per MWh to overcome this constraint at short notice)?

It is encouraging to learn that the 2 organisations who had used the trading platform independently both found the platform easy to use once they understood how it worked. There is therefore a case that a lot of upfront support and advice is needed to enable organisations to get to a point where they feel confident enough to trade, but that once they are trading successfully this level of support can then be reduced.

> *"Initially, it wasn't that easy. But once I had been talked through it by XX and then the first couple of trials I've been on myself, he was on the other end of the phone or Skype making sure what I've done is correct and he monitored that as well, so that's phenomenal… it made a world of difference."*

Objective 3: What might encourage organisations to participate? What needs to change to incentivise participation?

Overview

Q11 asked 'What would need to change to encourage more organisations to participate in a local energy market such as the Cornwall LEM?' whilst Q12 asked 'What do you think of the concept of a local energy market for the trading of flexibility via generation, storage or demand by local providers? (Whether or not you think the Cornwall LEM succeeds at this)

Q15 gave a list of 13 factors and asked whether any of them would make trading easier or more attractive to the organisations. Q16 asked respondents to rank on a 5-point Likert scale how significant they thought 11 given issues were to trading flexibility.

Q17 asked respondents if they had any additional comments they wished to make on trading.

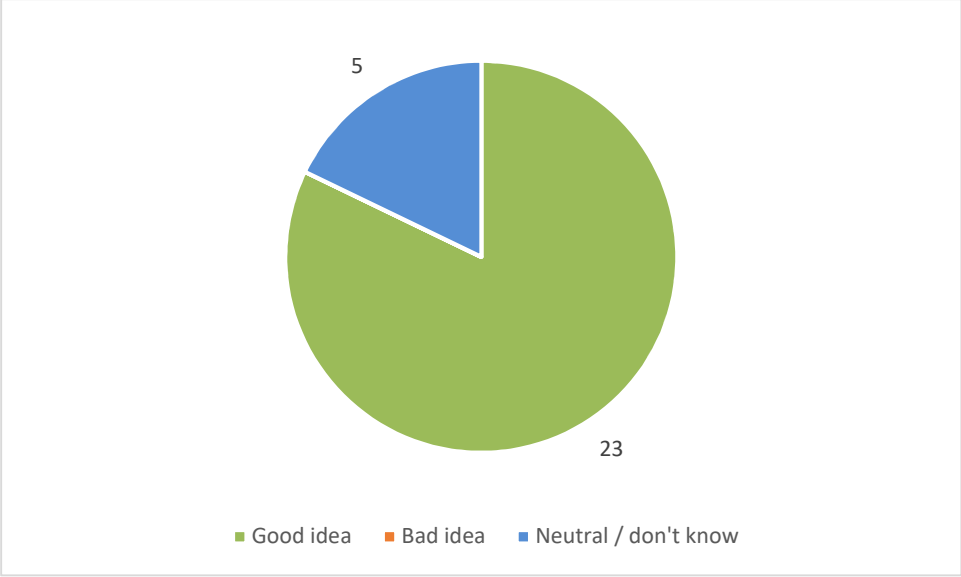
In the interviews Objective 3 was explored through questions 4 & 4a 'What services do you think a LEM should provide?' and 'Would those services make a LEM a more attractive proposition for your organisation?'; and through questions 5 and 5a 'What do you think needs to change to create a successful LEM?' and 'Have you encountered any barriers from external organisations?'

Results

LEM Concept

In Q12 23 organisations thought that the LEM concept was a good idea; whilst 5 organisations were neutral. No one thought that the concept was a bad idea (*Figure 17*).

Figure 17 What do you think of the concept of a local energy market? (Whether or not you think the Cornwall LEM succeeds at this)



We added the caveat 'whether or not you think the Cornwall LEM succeeds at this' as we wanted to know people's views on the actual concept of a LEM, rather than their experience of the Cornwall LEM. To this effect, whilst comparing the results of Q12 against the results in Objective 1, Q9 ('would you

describe your contact with the Cornwall LEM as a positive or negative experience?') we found that 2 of the 3 organisations who stated that they had a negative experience with the Cornwall LEM actually thought that the concept itself was a good idea; whilst the third organisation was neutral on the concept.

When asked to briefly describe their response to Q12 comments included:

> *"We are facing difficult and unsteady times so I think that anything we can do to come together as local markets/business groups is essential in order to continue being sustainable businesses both environmentally and financially."*
>
> *"Local production and use of electricity is self-evidently better for the planet that relying on central generation from fossil fuels."*
>
> *"Retention of value in local economy. Possible easing of local Cornish grid constraints. Possible reduction in peak demands - and inherent cost penalties. Greater utilisation of renewable generation on a local basis."*
>
> *"It is a sensible way to free up capacity offering an incentive to those willing to do so."*
>
> *"It overcomes the shortcomings of the grid in accommodating embedded generation and provides local control, participation, ownership and incentive for everyone involved."*
>
> *"Like the idea of generating, storing and using it locally. Less reliant on national generators."*
>
> *"It's flexible, you choose what you put in!"*

Interview responses also majored on the perceived benefits of the LEM concept:

> *"It seemed such a simple thing and I just don't quite know why it hasn't really been thought of before."*
>
> *"As somebody living in Cornwall, seeing all the renewable energy, I just think, the idea of being a genuine local energy market I think is exciting."*
>
> *"I love the concept, yes, because people said to me, "Why can't we have local networks?" Well, this circumvents a local network idea by having a virtual local network and I never thought that was possible."*

Interviewees were also interested in the possibility of purchasing electricity through the LEM if it became a supplier of electricity, or if it was possible to cross match local generation with local electricity demand.

> *"We've so far talked about it* [the LEM] *in terms of us selling, but we might be interested in buying locally. So, yes. We would be up for discussing that."*

This was a topic which was also popular in the Householders Survey as it offers those without microgeneration the option to participate in the LEM through the purchase of locally generated electricity traded through the LEM platform.

What would need to change to encourage more organisations to participate in a local energy market?

The responses to **Q11** in the online survey centred on the need to raise awareness of the potential environmental and / or financial benefits of the LEM concept, along with the need for follow-on support for participants:

> *"I don't think anything needs to change, it just needs a bit more promotion to get more on board."*
>
> *"As always they will be interested in economic benefits. However, the increasing concern over climate change may encourage folk to explore any CO_2 reduction potential of a LEM."*
>
> *"It is important to educate businesses and people about how the energy market and infrastructure work. I believe at present a lot of people would not understand the need for LEM."*
>
> *"Information and assistance!"*
>
> *"Follow up and support to generate referrals/case studies etc."*

Through the interviews responses centred mostly on the benefits of being involved in a LEM and the need for promotion of the concept to other organisations:

> *"There could be the demonstration of 'how does a local energy market actually benefit the environment?' So, they could make a story about what carbon reductions we're seeing, low demand reduction we're seeing, how we can maximise the use of renewable, reduce the import into Cornwall and keep value in Cornwall. If they could spell all of that out.... If they've got a business model that could support that, then I think that people would engage."*
>
> *"To be honest, every business in the local area that's using a large amount of power, so, any factory, any fabricator, engineering shop that uses large bits of kit, I wouldn't understand why they wouldn't be a part of it. Because even from a standpoint, forget the financial side of things, even the fact I can look and see exactly when I'm using power or not using power is advantageous to me to run the business. So, I don't understand why everyone doesn't have it really."*
>
> *"The awareness is certainly there in terms of the need to do something. You can't turn on the radio without someone reminding us that the climate emergency is real. Yet always, every single time people say, "Yes, but what can we practically do, right here, right now, today?"*

External issues

Interviewees also discussed issues external to the LEM which needed to be overcome to enable other organisations to both install assets and be in a position to fully engage with the LEM. These issues were far more fundamental than the ones outlined above in respect of profile raising and engagement. They included a lack of political support from government regarding environmental issues, the cost of gaining export connections, restrictive planning policies and regulations, a lack of impartial energy advice and peoples' mistrust of energy companies.

Although these issues themselves are not under the LEM's control, in some cases interviewees thought that the LEM could help organisations overcome some of these issues by liaising with external bodies on their behalf. Comments included:

- ***Lack of government support***

"If the government really wanted to do something about energy and decarbonisation, it needs to put it into this [a LEM concept]. *There's no will and there hasn't been for 40 years."*

"I just don't think that our government have got the seriousness of it. I'm only delighted that the county council have, the county council seem to have really got it and they do understand that zero net carbon 2050 is going to be hugely demanding."

"It does need to be politicians, national politicians need to have the robustness to say to people, if their business is based on 20th century technology, trying to heave huge lumps of steel into the sky, burning vast quantities of carbon, then it's the wrong bloody business! We just need to get on and if a policy doesn't help achieve that goal, it's the wrong policy."

- ***Cost of export connections***

The cost of getting an export connection from WPD has meant that some renewable generation projects have been unable to proceed on financial viability grounds; whilst other schemes have gone ahead but at huge cost to the project:

"I actually got diverted into installing wind turbines. I had 150 people who wanted wind turbines. I only ever managed to get 30 in, mainly because of Western Power's, not refusal, but intransigence with helping people get connected. There were people waiting to spend a million pounds on the turbine, but Western Power wanted two or three million to connect."

"Every single person you speak to, one of the major constraints is grid connection. Even if it's a very small scheme, saying we'd like to do more but grid connection you see, it makes it unaffordable."

"If anybody wants more load, they want to expand, they can't. Because Western Power, the cost to upgrade, it isn't just a local upgrade, it goes all the way back. To put in the turbines, we put in 5km of cable … It was one and a quarter million pounds"

- ***Liaison with other energy actors***

"I mean liaison with Western Power Distribution to encourage community groups, small businesses to install storage, in particular, and renewable generation where appropriate, would be a very good thing. There's so many people in the community that would like to see that take place and yet it's a bit like trying to swim through treacle to try and get anything to happen."

"I think working with Western Power; working with national government and Cornwall Council, and saying "we've got to overcome this, it's crazy."

- ***Planning***

"Tangible help to get through the process of planning, for example, for siting storage and generation. That would be something which I think could be of a tangible benefit, so that would be good."

"Farmers around here are struggling to make ends meet, sometimes their wind turbines are the only things keeping them going…. But with planning you start off with a policy that basically supports wind turbines in Cornwall and then as they become installed the rules and guidance become stricter so that you have to have a bird report, a bat report, a historical environment report and a site specific sound report. You build a requirement for thousands of pounds worth of reporting, up to £20,000 worth of reports to go in with your application and there's no guarantee you're going to get a positive

answer. That knocks out any turbine, any small turbine and it's small turbines actually that can do a lot around here, in this sensitive landscape."

- ***Impartial energy advice***

"There's shocking advice out there, there still is shocking advice. I've just reviewed something for somebody and been on site, and the stuff they were told is just outrageous. So, yeah, a centre of reliable information coupled to whatever the LEM business model is."

"I've used a guy for independent advice on what service provider to use, but only to find out what the best deal from a service provider was. But apart from that, who else would you ask for advice? I don't know if anyone's out there really."

- ***Mistrust / Scepticism***

"I don't know what the stats are on what's the percentage of people that actually signed up to a 100% renewable supplier? I suspect it's very small. What's that about? Is that suspicion? Is that lack of confidence? I'm going to be safe if I sign up with E.ON or EDF? But I'm probably going to be ripped off by [small renewable energy supplier], so I can't go with them, never heard of them, blah, blah. I think a significant factor, and I don't know whether it's better or worse with domestic or non-domestic would be the confidence in who the LEM player is."

"I would look at a company and their portfolio, and so it's not that I don't trust a salesman, but if you've got somebody that's coming from an endorsed national or regional programme, then obviously you're hopefully not going to get into bed with a dodgy company. So, that's an additional endorsement, additional confidence and you think well actually … you're part of something which has got a bit more weight to it….It's better to be part of something that's got a bit more substance to it."

These two comments are in contrast to findings made through the Householder Survey, where we identified that some householders had a mistrust of large energy companies. These two interviewees however thought that there could be more consumer confidence in a large established company leading on the LEM rather than a smaller operator. It would therefore be an interesting piece of research to investigate whether domestic and non-domestic customers have differing views on which type of LEM provider would instil more confidence in trading.

What needs to change to encourage trading?

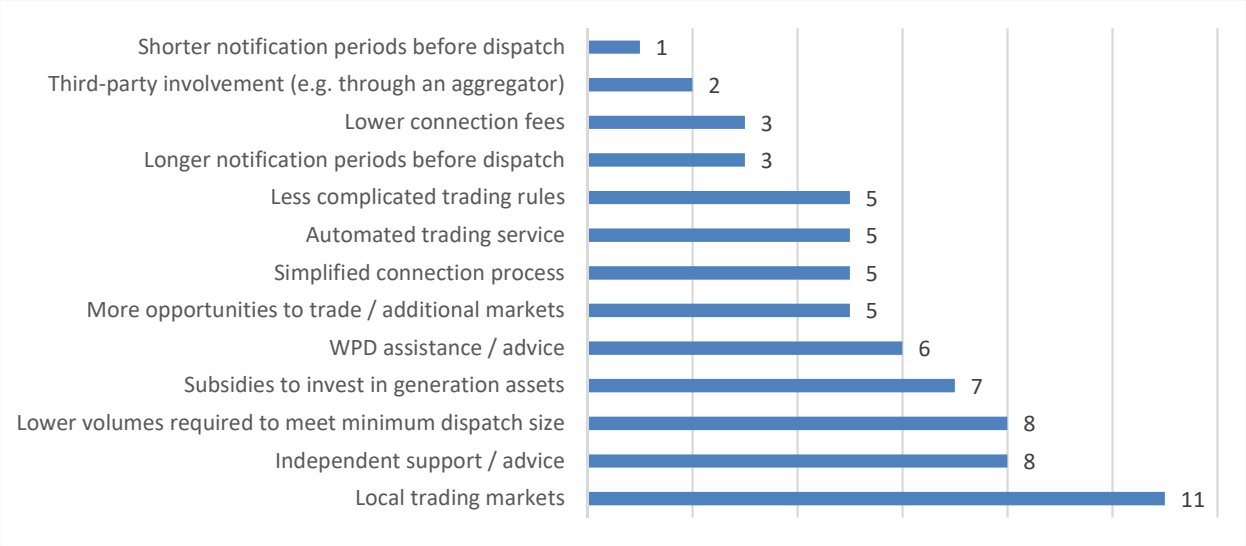
Q15 gave a range of 13 factors which could potentially make trading easier or more attractive for organisations. Respondents were able to select all factors which they thought relevant (see *Figure 18*). Respondents also had the option to select 'Other' or 'I have no interest in trading'; of which 2 respondents selected 'Other' and gave their reason as being that they considered their organisation to be too small to partake in trading; and 3 respondents selected 'I have no interest in trading'[8].

Interestingly the highest ranking score was for local trading markets (11 respondents) which shows that there is an interest among the organisations for local trading opportunities although they may not have

[8] For clarity this is a different question to that provided in 8c in Objective 2 where 4 organisations said that they had no interest in trading on the LEM platform; which is why there is a different result. This therefore indicates that although 4 organisations didn't wish to trade on the LEM platform (Q8c), 1 of these organisations could be interested in trading elsewhere.

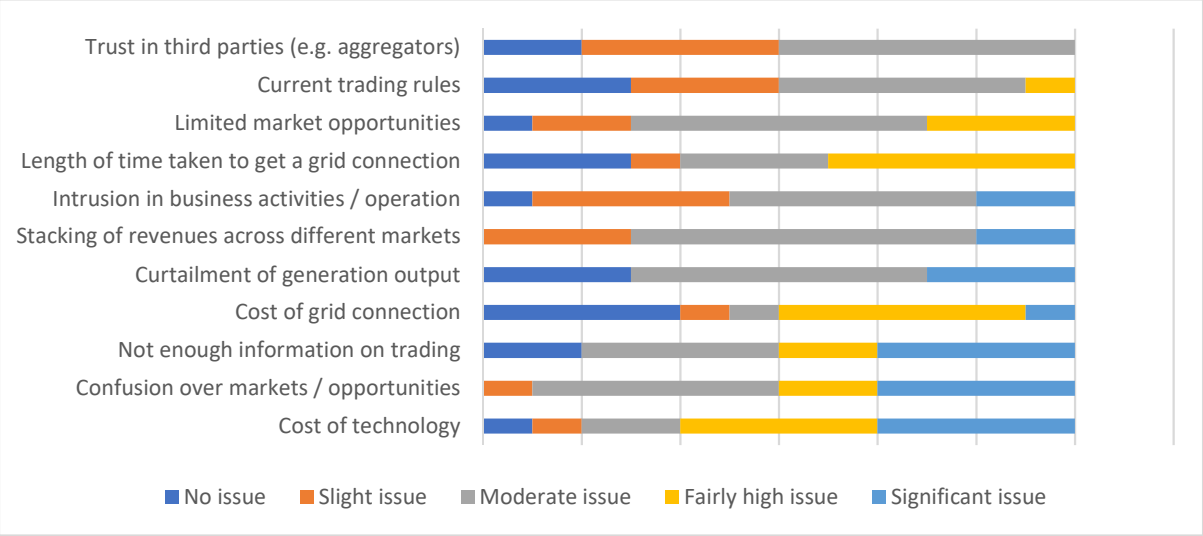
taken advantage of the LEM platform to date. This can also be shown by the selection of 'lower volumes' (8 respondents). Respondents also needed more advice and support, whether that be independent advice (8 respondents) or advice from WPD (6 respondents). In general respondents selected the factors which would make trading simpler for them and increase their understanding above the factors regarding the mechanics of trading such as notification periods etc., which we already know they had little knowledge about from Q8 in Objective 2.

Figure 18 Would any of the following factors make trading easier / more attractive for you? (Respondents could choose multiple factors)



Q16 asked respondents to rank on a scale of 1-5 (where 1 = no issue / 5 = significant issue) how significant they thought 11 given issues were to trading flexibility (see *Figure 19*). The highest scoring issues (with scores in the range of 4 to 5) were the cost of technology; confusion over markets & opportunities and not enough information on trading. Again this points to the need for additional guidance from a party such as an LEM. Although the Cornwall LEM held the biannual KEP seminars to help educate the organisations in these matters it is considered that individual, bespoke training at the organisation's premises would also be beneficial.

Figure 19 Trading issues



Q17 asked respondents if they had any additional comments they wished to make on trading. Five organisations provided a response; of which 4 stated that they needed more information and the fifth stated that:

> *"Needs to be plug and forget, we do not have time to get too heavily involved in day-to-day running of the LEM."*

Analysis of Objective 3

Twenty-three survey respondents (82%) thought that the LEM concept was a good idea, whilst the remainder were neutral or didn't know. Respondents considered that there were financial benefits for participating organisations, as well as wider environmental and network / system benefits through the uptake of renewable technologies and the more efficient usage of electricity on the network.

Respondents also considered that there were benefits to be made from businesses networking and sharing energy advice. Whilst the KEP seminars had been useful in bringing learning to the organisations many wanted to see additional promotion of both the LEM concept and of the potential benefits of being involved in the LEM, in order to draw in more organisations; along with more follow-up support for organisations once they were involved in the LEM. Given the responses to Q16 and Q17 we propose that alongside initiatives such as the KEP seminars, bespoke in-house training for participating organisations would also be beneficial.

However, there were also a range of factors which were external to the LEMs control which respondents thought needed to be addressed in order to make participation easier for organisations. Although these factors were external to the LEM's remit there was consideration that the LEM could be used as a conduit to either assist organisations in overcoming these barriers (e.g. by helping with planning applications or applying for funding), or as a conduit for alleviating the barriers (e.g. through lobbying).

One of the main barriers was the cost of gaining an export connection from WPD. This is an area which Ofgem are currently reviewing through their 'Electricity Network Access and Forward-Looking Charging Review' (Ofgem, 2020); although this isn't necessarily good news for renewable generators. Whilst options under consideration in the review could decease the cost of gaining an export connection (and also might allow payment over a set period of time rather than payment being made in advance) these options do come with additional penalties, such as Active Network Management (ANM[9]) which can see generation being automatically curtailed by the DNO in times of network constraint, thus reducing generation output potential.

It was clear from both the survey responses and the interviews that the organisations had very little knowledge regarding trading of flexibility, whether that be through established National Grid markets, WPD markets or through the LEM itself. As stated in Objective 2 the organisations didn't have the expertise required to either understand these markets or know whether trading was a realistic option for them to pursue, despite some interest in what a future local energy market could provide. This was

[9] Through ANM DNOs can curtail generation themselves, rather than procure market solutions for downwards flexibility. This can therefore undermine the value in market-based flexibility services, and lead to uncertainty for generators both in terms of operability and finance.

carried through into Objective 3 where we attempted to determine which barriers needed to be overcome in order for organisations to be able to trade more easily.

Looking at the responses given in *Figures 18 & 19* shows that respondents considered the main barriers to be cost and support. Cost covered both the purchase of technology and the cost of gaining export connections; whilst support was needed to understand and navigate the available market opportunities. Although respondents seemed to prefer local trading opportunities this could be due to an assumption on their part that trading at the local level would include more support from an organisation such as the LEM. Indeed, it is considered that such an organisation would be required to 'hand-hold' these businesses through the trading experience if we are to see more small businesses engage in flexibility trading.

Organisations Survey Conclusions

The results of the Organisations survey aimed to address the three research objectives:

- **Objective 1**: Evaluate organisations' experience of the LEM so far.
- **Objective 2:** Identify characteristics that might define who is likely to or unlikely to engage in the provision of flexibility, energy or other services via a local energy market.
- **Objective 3:** What might encourage organisations to participate? What needs to change to incentivise participation?

Although these were 3 discrete questions which have been analysed separately in the body of this report, there was some overlap between them which we will summarise here.

Through the data received from both the online survey and the interviews we discovered that most respondents wanted to better understand their organisation's energy usage and reduce their energy bills. However, we also found that every organisation interviewed were already somewhat aware of their energy usage and wider energy issues prior to their involvement with the LEM project, but were keen to expand their knowledge further. These organisations were therefore not complete novices in energy matters and several were already informally educating their peers and neighbours either through community forums or through hosting site visits to their premises; whilst some were in the business of selling and /or advising on the installation of renewable technologies. These organisations cannot be viewed therefore as typical of their peers and this survey work therefore comes with this caveat.

The organisations could see the environmental benefits of a LEM model in addressing grid flexibility needs. However, this level of energy awareness did not easily lead to organisations entering into flexibility trading through the LEM platform. It was clear from both the survey responses and the interviews that the organisations had very little knowledge regarding trading of flexibility, whether that be through established National Grid markets, WPD flexibility markets or through the LEM itself. As stated on Objective 2 the organisations didn't have the expertise required to either understand these markets or know whether trading was a realistic option for them to pursue, despite some interest in what a future local energy market could provide. This was carried through into Objective 3 where we discussed barriers to trading. It is therefore considered that increased upfront support and advice are needed to enable organisations to feel confident enough to explore trading their flexibility; which should be recognised in any future iterations of a LEM-type project.

We showed through the survey data that 23 out of 28 respondents had assets installed as a result of their contact with the LEM. In addition, all respondents who had contacted the LEM for energy advice received the advice which they sought. It is also apparent that a percentage of those whose original intent had only been to seek energy advice also went on to have assets installed as a result of their contact with the LEM.

Both the positive and the negative feedback on involvement with the LEM centred on the level of support received. Respondents who said they had a positive experience praised the Cornwall LEM team who were seen to be friendly, helpful and enthusiastic. This was echoed through the interviews. In addition interviewees commented on how the installation of equipment had made a difference to their awareness of day-to-day energy usage, enabling reductions to be made and assisting in business planning. However, those who reported a negative experience stated that they needed additional

support with their equipment, whether that be at the installation stage, setting up the IT and website capabilities, or just through training and clearer instructions.

Respondents also considered that there were benefits to be made from businesses networking and sharing energy advice. Whilst the KEP seminars had been useful in bringing learning to the organisations many wanted to see additional promotion of both the LEM concept and of the potential benefits of being involved in the LEM, in order to draw more organisations in.

23 out of 28 survey respondents thought that the LEM concept was a good idea. Respondents considered that there were financial benefits for participating organisations, as well as wider environmental and network / system benefits through the uptake of renewable technologies and the more efficient usage of electricity on the network. However, there were also a range of fundamental external barriers regarding government policy, planning restrictions, gaining export connections, associated cost and business support which respondents thought needed to be addressed in order to make participation easier for organisations.

Although these factors were external to the LEM's direct remit there was consideration that the LEM could be used as a conduit to either assist organisations in overcoming these barriers (e.g. by helping with planning applications or applying for funding), or as a conduit for alleviating the barriers (e.g. through lobbying government and / or Ofgem).

Interviewees also saw a need for central government to make climate change solutions a serious priority - adopting policies to actively support decarbonisation of the energy system, and making 'joined-up' decisions on how these policies would be enacted:

> *"I just think, you know, we have to be grown up about it. It would be nice if it wasn't true, if the climate emergency wasn't as serious as it is, but it is… I just don't think that our government have got the seriousness of it."*

> *"We can't expect to replicate a lifestyle as it is now, graft it onto 2050 and expect we're all going to be living exactly the same way because we won't. But it won't be any worse, it'll just be different."*

A LEM is one tool which could be used to enable the energy transition to a zero-carbon future through the provision of renewable and low carbon technologies, energy advice and the ability to provide local grid services through the trading of flexibility. However, a LEM could also be used to bring about wider social and economic benefits through providing a hub of education, support and guidance for organisations and community groups. In rolling out the LEM concept to a wider audience or to other regions questions which should be addressed include:

- What services should a LEM provide?
- How does a LEM help towards a smart, flexible energy system?
- How does flexibility trading work? Who can trade?
- Who does a LEM benefit? How?
- How does a LEM influence environmental change?

However, if the LEM concept is to be rolled out wider across the UK it may not be the case that each LEM has identical characteristics. It may be possible for LEMs to differ depending on geographical location (e.g. urban / rural settings); different network requirements (e.g. in areas of network

constraint) and different ownership types (e.g. whether run by the public sector / private sector). Lessons can be learnt for any future LEM on what worked well from this trial and what issues should be addressed to achieve greater engagement with organisations; particularly around levels of ongoing support. However, without change at the wider policy and regulatory level, including national energy policy, DNO regulation and local planning policy; many of the same difficulties will still arise regarding the external barriers.

Appendix 1 - Methodology

In 2019 the UoE undertook a survey with organisations that had been involved in the project between the project start in 2017 and the survey date in October 2019. The Organisations Survey included an online survey which was emailed to 160 participants, which was later followed up with 10 individual interviews which were conducted face-to-face. Although the questions were different between the online survey and the interviews; both were designed to evaluate responses to the three research objectives. In order to answer these objectives, the survey and interview questions covered both a quantitative and a qualitative nature.

It was made clear on the survey form that respondents didn't have to answer all of the questions if they felt uncomfortable or didn't want to. This was reiterated on the Participant Information Sheet which accompanied the survey. All online survey and responses were anonymous and interview responses were confidential. The survey was compliant with GDPR regulations. The survey was also approved by the University's Research Ethics Committee.

The online survey was written using JISC online surveys, which is the approved software used by the University of Exeter. Both the survey data and the interview data were later entered into NVivo 12 and coded against the three research objectives. In accordance with the University's GDPR commitments, all response data is held in password protected folders on UoE servers. These folders are only accessible to research staff within the Energy Policy Group at UoE. The raw data will be held for a maximum of 5 years before being destroyed.

Online Survey

The University of Exeter sent an online survey form to 160 organisations who had been in contact with the Cornwall LEM on 24 October 2019. There were several different forms of help available for organisations within the LEM project which ranged from energy advice; grants to install assets or monitoring equipment; and advice on trading flexibility on the LEM trading platform.

We received responses from 28 organisations (17.5%); of which 10 organisations (6%) also agreed to be interviewed. The organisations who responded were spread across the range of products available as discussed in Objective 1 Q6.

We also received 'out of office' emails from 13 businesses where the member of staff in discussion with the Cornwall LEM had since left the business. We followed up on each of these to attempt to identify someone else within the organisation who could complete the survey, but in each case we were told that there was no-one else who had the necessary experience to be able to respond. We also identified 2 businesses which had gone into liquidation.

The online survey consisted of 17 main questions split into 3 separate sections (see Appendix 3). Twelve of the questions were multiple choice questions which in some instances led on to follow up questions relating to the answer given or had follow up free text boxes for respondents to explain why a particular choice had been made.

It was made clear on the survey form that respondents didn't have to answer all of the questions if they felt uncomfortable or didn't want to. This was reiterated on the Participant Information Sheet which accompanied the survey. All responses were anonymous, and the survey was compliant with GDPR regulations. The survey was also approved by the University's Research Ethics Committee.

Interviews

In addition to the online survey, UoE undertook semi-structured interviews in January 2020 with the organisations relating to the 3 survey objectives. This enabled the interviewer to gain more insight into why the organisations had joined the Cornwall LEM and their experiences and thoughts of being part of the project including their future expectations of what a LEM could provide. The interviews enabled the interviewees to discuss their views and experiences in more detail than had been possible through the completion of the online form, and to relay any other factors which they felt hadn't been covered in the survey. As the interviews were anonymous this also enabled the interviewees to raise any concerns without prejudicing their relationship with the Householder team at Centrica.

The interviews were designed to last approximately 45 minutes and consisted of 6 questions. Written consent was taken from all participants, including consent to audio record. The audio recordings were then transcribed and entered into NVivo 12 where they were coded using the NVivo 12 qualitative analysis software to determine key themes.

Appendix 2 – Survey and Interview Questions

Survey Questions

Section 1 - About Your Organisation

Q1 Where is the location of your site that was under consideration in the Cornwall LEM?

Q2 How many employees work at this site / these sites?

Q3 What is your primary operation?

Q4 Did you have any generation assets, storage assets or energy monitoring equipment installed at this site / these sites prior to contact with the Cornwall LEM?

Q5 Please indicate on the grid below how important each factor was in your original decision to be involved in the Cornwall LEM project

Section 2 - Your Experience with the Cornwall LEM

Q6 What were you initially in discussion with the Cornwall LEM about?

Q7 Did you have any assets / monitoring equipment installed as a result of your contact with the Cornwall LEM?

Q8 The Cornwall LEM project has designed an online trading platform for Cornish organisations to be able to trade flexibility via generation, storage or demand. Have you used the platform?

Q9 Overall would you describe your contact with the Cornwall LEM as a positive or negative experience?

Q10 What are your key thoughts on the Cornwall LEM project?

Q11 What would need to change to encourage more organisations to participate in a local energy market such as the Cornwall LEM?

Q12 What do you think of the concept of a local energy market for the trading of flexibility via generation, storage or demand by local providers? (Whether or not you think the Cornwall LEM succeeds at this)

Section 3 - Experiences of trading electricity generation / storage / flexibility (not via the Cornwall LEM)

Q13 Has your organisation previously traded flexibility via generation, storage or demand in any National Grid or Western Power Distribution markets; or participated in Triad or Red Band avoidance?

Q14 Would you prefer to trade at the national level (National Grid), regional level (Western Power Distribution) or through more local opportunities?

Q15 Would any of the following factors make trading easier / more attractive for you?

Q16 Please indicate on a scale of 1-5 how significant you think each of the following issues are to trading flexibility via generation, storage or demand (where 1 = no issue / 5 = significant issue)

Q17 If you have any additional comments on trading (including what could make trading easier / more attractive for you) please add them here

Interview Questions

Q1 What were your reasons for being involved in the Cornwall LEM project?

Q2 Were you satisfied with the outcome of this [the above]?

- What difference has it made for your organisation?
- If not yet, do you think it might make a difference in the near future? When?
- What could have been done better?

Q3 Have you used the LEM platform to trade flexibility? **YES / NO**

If YES:

- [Independently or through an aggregator] [Reason why]
- [Was the platform easy to use]
- [Were you satisfied with price received] [Were you satisfied with notification / dispatch periods]
- [Were you happy with the communication you received from the LEM team regarding this?]
- [Would you want to use the platform again] [when, which markets] [why not] [can anything be done to help you]
- [Has your understanding of the LEM changed since your involvement?]

If NO:

- Why not?
- Would you be interested in using the LEM trading platform in the future? **YES/NO**

- Yes: [Independently or through aggregator / why] [What assets] [When] [What timeframe to dispatch] [Which markets are you most interested in – Grid/WPD/local P2P] [Price]
- No: [Why not] [Can anything be done to help you]

Q4 What services do you think a LEM should provide?

- **Q4a** – would those additional services make a LEM a more attractive proposition for your organisation?

Q5 What do you think needs to change to create a successful LEM? [O3]

- **Q5a** Have you encountered any barriers from external organisations?

Q6 Have there been any other positive or negative experiences of being involved with the Cornwall LEM project that haven't been discussed so far?

References

Bray, R. and Woodman, B. (2019) 'Barriers to Independent Aggregators in Europe', *EPG Working paper: EPG 1901*, pp. 1–41.

Bray, R., Woodman, B. and Connor, P. (2018) 'Policy and Regulatory Barriers to Local Energy Markets in Great Britain', pp. 1–103. Available at: http://geography.exeter.ac.uk/media/universityofexeter/schoolofgeography/images/researchgroups/epg/09.05.18_Policy_and_Regulatory_Barriers_to_LEMs_in_GB__BRAY._.pdf.

Ofgem (2020) 'Electricity Network Access and Forward-Looking Charging Review: Open Letter on our shortlisted policy options', (March).

Parish, D. (2020) 'Industrial and Commercial Workstream_Summary Report'.

Rhodes, C. (2019) 'Business Statistics', *UK Statistics: A guide for business users*, (06152), pp. 93–136. doi: 10.4324/9780429397967-7.

theenergyst (2016) *Reducing DUoS Red Band charges*. Available at: https://theenergyst.com/reducing-duos-red-band-charges/ (Accessed: 1 July 2020).

theenergyst (2017) *We need to talk about Triad*. Available at: https://theenergyst.com/we-need-to-talk-about-triad/ (Accessed: 1 July 2020).

WPD (2020) 'VISIBILITY PLUGS & SOCKETS WPD _ NIA _ 029 CLOSEDOWN REPORT VISIBILITY PLUGS & SOCKET'.

Acronyms

BEIS – Department for Business, Energy and Industrial Strategy

BTM – behind the meter

DE – distributed energy

DER – distributed energy resources

DNO – distribution network operator

ESO – electricity system operator (National Grid)

FiT – Feed in Tariff

LEC – local energy company

LEM – local energy market

MWh – megawatt hour

Ofgem – Office of Gas and Electricity Markets

P2P – peer to peer (trading)

SME – small and medium enterprise

UoE – University of Exeter

WPD – Western Power Distribution (the DNO which covers Cornwall)