



SMART STREET

Engaged Customer Panel Post-Trial Customer Impact Report

11 April 2018



CONTENTS

GLOSSARY	4
FOREWORD	5
1. EXECUTIVE SUMMARY	5
1.1 Background and business objective	5
1.2 Customer engagement objective	5
1.3 Research approach	6
1.4 Summary of key findings	6
1.5 Conclusions	8
2. BACKGROUND AND OBJECTIVES	8
2.1 Project background	8
2.2 Customer engagement objectives	9
2.3 Customer impact	9
2.4 Objectives met	10
2.5 Required modifications to the planned approach during the course of the project	11
3. CUSTOMER ENGAGEMENT METHODOLOGY	11
3.1 Objectives of the ECP meetings	12
3.2 Membership of the ECP	12
3.3 Frequency of meetings and attendance	13
3.4 Incentives	13
4. POST-TRIAL CUSTOMER PERCEPTIONS OF SMART STREET	13
4.1 Perceptions of power quality at the end of the trials	13
4.2 Experience of short duration interruptions	15
4.3 Assessing the likelihood of perceived changes to power quality (post- trial) being attributable to Smart Street	16
4.4 Awareness of installation works or street furniture associated with Smart Street	18
4.5 Perceived customer benefits of Smart Street	19
4.6 Future expectations as a result of Smart Street activity	20
4.7 Application of CLASS findings to Smart Street	21
5. CONCLUSION	22
6. NEXT STEPS	22
7. APPENDICES	23

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GLOSSARY

Abbreviation	Term
CEP	Customer engagement plan
CLASS	Customer Load Active System Services (Second Tier Low Carbon Networks Fund Electricity North West project)
DNO	Distribution network operator
ECP	Engaged customer panel
GB	Great Britain
HV	High voltage
LCN Fund	Low Carbon Networks Fund
LCT	Low carbon technology
LV	Low voltage
Ofgem	Office of Gas and Electricity Markets
SDI	Short duration interruption
SDRC	Successful delivery reward criteria

FOREWORD

This report is submitted as part of the Electricity North West Smart Street project, which is funded through Ofgem's Second Tier Low Carbon Networks Fund (LCN Fund) mechanism. The project received formal notification of selection for funding on 29 November 2013 and commenced in January 2014. Smart Street was undertaken by Electricity North West in collaboration with key project partners, and was completed in April 2018.

The Smart Street trials tested innovative technologies and sought to demonstrate how distribution network operators (DNOs) can augment the performance capabilities of existing networks by integrating these new technologies. This will prepare their networks to meet new requirements arising from the expected increase in the adoption of low carbon technologies (LCTs).

Smart Street combines the concepts of network interconnection (developed within the Capacity to Customers (C₂C) project) and voltage control (deployed as part of the Customer Load Active System Services (CLASS) project). New technologies and techniques were trialled to optimise network voltages and configuration in real time. The trials also demonstrated how these techniques might be incorporated with conservation voltage reduction (CVR) techniques, to enable networks and customers' appliances to operate as efficiently as possible. This solution will reduce reinforcement costs, improve carbon efficiency and reduce energy costs for customers.

This document and the analysis therein forms part of the project's dissemination. The research was undertaken with an engaged customer panel (ECP) to ascertain domestic customer reactions to the application of Smart Street techniques.

The research approach referenced within this document was submitted as part of Electricity North West's Smart Street customer engagement plan (CEP), which was approved by Ofgem on 16 July 2014.

Key customer documents relating to Smart Street are available on the [project website](#).

1. EXECUTIVE SUMMARY

1.1 Background and business objective

Electricity demand in Great Britain (GB) is expected to increase significantly as the adoption of low carbon technologies (LCTs) grows. This, combined with the increased uptake of renewable and low carbon energy generation, presents new challenges to operators of electricity networks. Traditionally, these trends would require major capital investment to meet the energy needs of GB. This would be expensive as well as carbon-intensive, and would lead to considerable customer impacts such as traffic disruption.

Innovative approaches to managing electricity networks are required to minimise disruption to customers, carbon emissions and financial costs, which would inevitably be passed to customers. Smart Street is one such approach that has the potential to minimise the need for expensive, asset-based interventions and to make a positive contribution to a low carbon future.

1.2 Customer engagement objective

The customer hypothesis for Smart Street is that:

Customers within the Smart Street trial areas will not perceive any changes in their electricity supply.

This hypothesis was tested through a range of customer engagement activities during the trials. Consultation with an engaged customer panel (ECP) formed one of the most important of these activities, and this research was conducted in two distinct stages to achieve separate customer engagement objectives:

- The first stage focused on developing effective communication to inform customers in the trial areas about Smart Street and its potential benefits/impacts. It also ensured that customers had a means of contacting Electricity North West with any enquiries about the project. This culminated in the distribution of a customer leaflet in October 2014. The key findings of this stage of research are summarised in the ECP interim report published on the Smart Street website in December 2014.
- The second stage of ECP consultation was designed to obtain feedback, from customers in the trial areas, about any perceived effects on the electricity supply, providing evidence to test the customer hypothesis. This involved two phases of customer research: the first conducted mid-trial, and the second following completion of the trials.

This report documents final ECP findings from focus group meetings conducted at the end of the trial period in early 2018.

1.3 Research approach

Recruitment of the ECP and moderation of the focus groups was conducted by Impact Research, an independent market research agency and project partner. All research was carried out in accordance with the professional standards set out in the Market Research Society Code of Conduct and in compliance with the International Standard for Market, Opinion and Social Research ISO 20252.

The ECP participants were selected to reflect an appropriate cross-section of customers in each of the trial areas of Egremont in Cumbria, Wigan in Lancashire and Manchester. The recruitment and selection process for ECP members is included in section 3.

The objectives of the ECP meetings are set out in section 3.1.

1.4 Summary of key findings

1.4.1 Perceptions of power quality at the end of the trials

In common with the mid-trial research, customer perception of power quality was most often associated with unplanned supply interruptions. Reliability of supply was also very high among the post-trial ECP members and consequently, they considered their power quality to be extremely high.

A small number of panellists recalled minor supply disturbances such as flickering or dimming of lights or changes in appliance performance. However, these events had no negative effect on the ECP's perception of power quality at their respective properties.

Participants had not detected any decline in power quality or service since the Smart Street trials began in January 2016. In some cases an improvement in power quality was perceived since the outset of the trials.

1.4.2 Experience of short duration interruptions

Using the same research approach as in the mid-trial research, the post-trial ECP was asked about their experience of short duration interruptions (SDIs) and how these affected their perception of power quality, if at all. In common with the mid-trial ECP, it was only when educated, and specifically prompted to consider SDIs, that some panellists could recall short or momentary disturbances to their supply during the trial period. SDIs were not generally considered to be a supply interruption, which the panel defined as a much longer and notable power cut that might last from one to several hours. Therefore the experience of SDIs did not affect overall perception of power quality.

1.4.3 Assessing the likelihood of perceived changes to power quality (post-trial) being attributable to Smart Street

A small number of panellists attending a focus group in early 2018 described particular events, such as changes to appliance performance or SDIs, which occurred during the trial period. The project team used the same investigative approach as conducted mid-trial, to establish if any of these changes could have been caused by Smart Street. This compared feedback with fault records and the technical data continuously recorded by Smart Street technologies. The post-trial investigation established that some events, specifically SDIs, could be linked to the operation of Smart Street apparatus. However, all of these were associated with early technical issues, which occurred for a short period after installation of the enabling technologies. As with the mid-trial findings, these events had no effect on customer perception of power quality or a decline in service. The technology issues were identified and resolved early in the project and therefore, would not affect customers if the Smart Street method was to be rolled out as a business as usual (BAU) technique.

1.4.4 Awareness of installation works or street furniture associated with Smart Street

The first ECP interim report, published in December 2014, documents the approach taken to ensure that customers in the Smart Street areas were informed about the project and associated trials. The resulting general awareness leaflet, distributed in October 2014, is available to view and download on the Smart Street website. The post-trial ECP, convened in early 2018, had almost no recollection of having received this leaflet, which was anticipated because of the time that had elapsed since its circulation. However, one panellist was aware of a cabinet installation outside their property and had incorrectly assumed that it was connected to the Smart Street trials, as a result of the leaflet campaign.

1.4.5 Perceived customer benefits of Smart Street

The views articulated by the post-trial ECP were consistent with that of the earlier panel in that they perceived Smart Street would have either a positive impact or no effect on network efficiency or energy efficiency for their individual households. Participants appreciated the idea that Smart Street would deliver shorter supply interruptions than under traditional operating arrangements, but understood that the frequency of SDIs could increase. The panellists also had a better understanding than at the mid-trial stage that Smart Street will save them money by curtailing future rises in bills, as a result of delayed or deferred infrastructure investment, rather than from a tangible reduction in bills. This may be attributable to increased public awareness and understanding of the decarbonisation agenda.

1.4.6 Future expectations as a result of Smart Street activity

Since the mid-trial ECP, future expectations have become more aligned with the overall objectives of Smart Street, in providing a credible solution to meet the future challenges of increased demand, in a smart and cost efficient manner. The announcement of changes to [UK legislation banning sales of new diesel and petrol vehicles by 2040](#) is likely to have influenced these views. Nevertheless, older panel members were more inclined to believe that technological advances will continue to deliver solutions to evolving problems, because they had experienced significant improvements in reliability of supply in recent decades and consequently expected incremental improvements to continue.

1.4.7 Application of CLASS findings to Smart Street

The CLASS project, also funded by the LCN Fund mechanism, was underpinned by statistically robust customer research that demonstrated that customers did not notice the application of voltage control techniques similar in magnitude to those being implemented as part of the Smart Street trials. Some areas of the network included in the CLASS trials were selected to form part of the Smart Street trial regions.

Overlapping trial areas in this manner made it possible to analyse customer feedback from networks served by three primary substations, and to assess the consistency of these results

with those obtained at an overall level for CLASS, which was applied at 60 primary substations, representing 17% of Electricity North West's network. While the customer research methodologies for both projects differed and were not directly comparable, the research approach used in Smart Street provided a means to demonstrate consistency in the overall results.

Only a small proportion of the sample were expected to notice a change in appliance performance or lighting as a result of the application of Smart Street, consistent with the negligible impacts attributable to CLASS voltage control techniques. The research conclusively demonstrated that, in common with CLASS, customers involved in the Smart Street trials, who claimed to have noticed a change in power quality, perceived no negative effect in terms of satisfaction with Electricity North West's service.

1.5 Conclusions

Consulting an ECP provided a suitable platform to explore customer perceptions about power quality at the mid and post-trial stage of the Smart Street trials, and demonstrated that the application of voltage optimisation techniques had no negative effect on perceptions. Where participants noticed any differences in power quality, it was largely the result of factors that were unrelated to Smart Street. On balance, even when events could potentially have been attributed to Smart Street, the ECP reported a slight improvement in power quality since the trial had commenced. However, it is important to note that these improvements could, in part, have been influenced by factors not attributable to Smart Street, such as disruption to service prior to the trials. Nevertheless, these improvements were noted in all groups, and not confined to the rural customer segment, that had been exposed to significant disruption, associated with extreme weather conditions, before the testing regime.

This customer research supports technical learning to validate the method and assess the suitability of extending the deployment of Smart Street across Electricity North West's network and more widely across GB. The closedown report documenting the key customer and technical learning is published on the Smart Street website.

2. BACKGROUND AND OBJECTIVES

2.1 Project background

The Smart Street project was funded through Ofgem's Second Tier LCN Fund mechanism and was undertaken by Electricity North West in collaboration with its key partners. The project commenced in December 2013 and reached completion on 30 April 2018.

Electricity demand is forecast to increase and potentially double by 2050 as GB transitions to a low carbon economy and reliance on fossil fuels for transport and heat diminishes, to be replaced by LCTs such as heat pumps and electric vehicles. This will create significant thermal and voltage challenges in the DNO's management of high voltage (HV) and low voltage (LV) networks, particularly when coupled with the anticipated increase in embedded low carbon and renewable generation sources. DNOs must connect new LCTs to facilitate customers' transition to a low carbon future, while maintaining statutory voltages, reducing network losses and managing power quality. This must be achieved while striving to reduce costs for customers.

To address the problems created by new LCTs, DNOs have historically employed traditional network reinforcement measures, which involve major capital investment. This option is no longer appropriate as a result of the high financial cost and carbon intensity of the works, as well as the associated customer disruption.

Smart Street is a novel solution that makes effective use of network interconnection combined with voltage control techniques. New technologies integrate with existing network assets to deliver benefits to customers by releasing latent capacity and voltage headroom,

which will accommodate the connection of LCT and low carbon generation more quickly and at less cost than traditional reinforcement methods.

By implementing innovative Smart Street techniques to maintain customer voltage close to the minimum for optimum CVR performance, the method will enable the network and customers' appliances to operate more efficiently, which may consequently reduce customers' energy consumption.

2.2 Customer engagement objectives

The key Smart Street customer hypothesis was that:

Customers within the Smart Street trial areas will not perceive any changes in their electricity supply.

This hypothesis was tested through a range of customer engagement activities during the trials. ECP consultation formed one of the most important elements of these activities and this research was conducted in two distinct stages to achieve separate customer engagement objectives:

- The first stage focused on developing effective communication to inform customers, stakeholders and the wider community in the trial regions about Smart Street. This culminated in the distribution of a customer leaflet in October 2014, which ensured that customers in all the trial regions were informed about the project and critically, the associated trials. The leaflet summarised the scope, size and regions included in the Smart Street trials. It also set out the objectives, potential customer benefits (within the context of GB's low carbon agenda) and indicated that the installation of enabling technology might, on occasion, require planned supply interruptions (PSIs). The leaflet provided reassurance that customers were unlikely to notice any impact of the trials in terms of supply quality or reliability and distinguished the project from the smart meter rollout. Importantly, it also provided contact details for Electricity North West, had customers required any additional information or had an enquiry about the project. The key findings of this initial stage of research are summarised in the ECP interim report, published on the Smart Street website in December 2014.
- The second stage of ECP consultation was designed to obtain customer feedback about any perceived effects of the live trials on the electricity supply, providing evidence to test the customer hypothesis. This comprised two phases of customer research – the first conducted mid-trial and the second taking place at the end of the trials. This report documents ECP findings from the final, post-trial phase of ECP consultation, conducted in early 2018.

The Smart Street project has generated outputs and learning in a number of key areas. These will be of particular interest to other DNOs, Ofgem, the Department for Business, Energy and Industrial Strategy and other stakeholders. Relevant learning from Smart Street has been shared with all of these stakeholders through various dissemination activities.

2.3 Customer impact

A range of Smart Street technologies were trialled on circuits fed by six primary substations and 38 related distribution substations across three counties in Electricity North West's operating region. The trial regions serve approximately 67,000 customers and were selected to demonstrate the application of the Smart Street approach across a representative spectrum of network types. The trials took place between January 2016 and January 2018.

Four overlapping groups of customers were engaged or affected as part of Smart Street; these are briefly outlined below.

Customers in the trial areas

A targeted awareness campaign (predominantly involving the distribution of an explanatory leaflet) informed customers in the trial areas about Smart Street, its benefits and the issues that the project sought to address. Regular updates about the project were published on the Smart Street website and through social media.

Customers on the trial networks who were expected to experience planned interruptions for the installation of the network equipment

It was originally anticipated that approximately 5% of customers on trial networks might have been affected by PSIs associated with installation of the enabling technology. However, this was avoided by utilising back-feeds, live line techniques and other temporary generation sources. Where supply was maintained by generation during technology installation, customers would have experienced an SDI of less than three minutes when the generator was connected, and again when it was subsequently disconnected on completion of the work.

Customers on the trial networks who were expected to experience SDIs

Due to the application of interconnected configurations to LV networks, there was a possibility that any normally occurring LV fault on a meshed feeder circuit would lead to a greater number of customers being affected than on a closed circuit. In these instances, the network was reconfigured remotely and customers who were not directly affected by the fault had supply restored within approximately three minutes. However, to balance this, it was expected that there would be an improvement in the overall reliability of circuits involved in the trials, resulting from the combination of advanced circuit breaker technology and automation software.

Customers on the trial networks who agreed to participate in customer focus groups (the ECP)

Customers who agreed to participate in the ECP were fully informed by the research partner, Impact Research, as to how their data would be utilised and shared before signing up. Customers were asked to sign a consent form and by doing so agreed to their information being used for research purposes.

More information about these customer groups and the potential impact of the project on each is provided in the CEP, which is published on the Smart Street website.

2.4 Objectives met

This ECP research has delivered a representative perspective of customers' power quality perceptions during the life of the trials. An ECP was convened at the end of the technological trials for Smart Street, and in common with the mid-trial panel, consisted of three groups of customers, representing the dense urban, urban and rural trial networks.

Figure 2.4 below shows how each of the project's successful delivery reward criteria (SDRC) was met. This report forms the evidence for Criterion 5: "Produce final report on all customer surveys."

Figure 2.4: SDRC for the customer engagement work stream of the Smart Street project

Criterion	Required evidence	Actual evidence
1. Develop customer engagement plan and data privacy statement	1. Send the CEP and data privacy statement to Ofgem for approval by June 2014	1a. Customer engagement plan 1b. Data privacy statement

Criterion	Required evidence	Actual evidence
2. Produce appropriate campaign materials to raise awareness about Smart Street	2. Deliver general awareness materials and publish on the Smart Street website by October 2014	2a. Customer leaflet 2b. Technology installation customer letter
3. Test the customer survey materials using the ECP	3. Deliver ECP workshop by September 2014. Publish lessons learned on the Smart Street website by October 2014	3. ECP lessons learned report
4. Customer contact centre briefing and training materials created and delivered	4. Deliver customer contact centre training and publish materials on the intranet by July 2015	4. Customer contact centre briefing
5. Produce final report on all customer surveys	5. Publish a final customer survey report on the Smart Street website by April 2018	5. ECP final report

2.5 Required modifications to the planned approach during the course of the project

No changes were required to the planned approach, other than the minor postponement of ECP consultation, which took place four months after the originally proposed timeframe. This delay was associated with an extension of the project as a whole because of technology installation challenges that set back the trials. This resulted in a four-month deferment, agreed by Ofgem, of all SDRCs due after September 2015. As a consequence, this final customer report, originally due in December 2017, has been published in April 2018.

In addition to the above, a number of small enhancements were made to the planned approach to ensure that the project team was as transparent as possible in all activities that had potential to cause any customer impact. These included testing the effectiveness of the customer leaflet and sending additional communication materials to customers likely to be most directly affected by the installation of new street furniture. These enhancements ensured the best possible service for customers on trial circuits and had no impact on the qualitative research described in this document.

3. CUSTOMER ENGAGEMENT METHODOLOGY

Within the scope of customer research agreed by Ofgem, the methodology required for this stage of engagement was designed to obtain an understanding of customers' perceptions of power quality during the Smart Street trials, their sensitivity to changes in voltage and whether perception differed in relation to normal operating conditions.

The level of voltage changes experienced by customers in Smart Street trial areas was expected to be very similar to that of customers involved in the CLASS trials and as such, the customer survey work funded through CLASS was used in this study to support the findings. The results of this analysis are discussed in further detail in Sections 3.1 and 4.7.

The qualitative research approach deployed in Smart Street involved consultation with an ECP in a focus group setting. These meetings were facilitated by a professional, independent moderator who asked the panel semi-structured questions relating to a predefined list of topics. This approach was consistent with that successfully adopted in previous customer engagement activities in other innovation projects and followed the same method used in

earlier Smart Street research (to develop communications materials). This gave the moderator the flexibility to question participants on issues arising through open discussion and fostered the natural evolution of the ECP's understanding of Smart Street and its likely implications for customers.

The remainder of this section briefly describes the method used for the post-trial phase of ECP consultation. The method employed in this phase of research was identical to that used in the mid-trial study. The approach taken in the initial stage of ECP consultation, associated with the Smart Street communications strategy, is documented in the ECP interim report, dated December 2014.

3.1 Objectives of the ECP meetings

Understanding whether customers perceived any adverse effect on power quality as a result of the application of Smart Street techniques was crucial to the viability of the solution. The aim of the mid and post-trial phase of customer consultation was to test whether an ECP had observed any change in their electricity supply as a result of the Smart Street trials. This report focuses on the research conducted at the end of the trial regime. While this approach was designed to obtain a detailed understanding of customer perception of changes in supply provision from a broad and representative sample across each of the trial regions, the research methodology was not directly comparable to, or as robust as, that of the CLASS study, which conducted detailed customer surveys that were aligned to coincide with specific trials (details of the method are available in the customer survey report on the [CLASS website](#)).

The techniques applied in the Smart Street trials ensured that LV supply voltage was maintained well within statutory limits, and the voltage effects were similar in magnitude to the CLASS study, which had definitely established no customer impact. Therefore, although a comparable research approach was proposed for Smart Street, it was not possible to justify the return on investment for such a rigorous piece of research. The more generalised sampling approach documented in this report was sanctioned by Ofgem and assessed to be sufficient to gauge customer perception of impact, when considered alongside the rigorous measures that the project team implemented (in collaboration with Electricity North West's customer contact centre) to ensure that enquiries and complaints associated with any aspect of Smart Street were captured, managed and appropriately documented.

The post-trial ECPs were convened in January and February 2018. The key objectives and learning outcomes agreed for the ECP meetings were:

- To understand whether customers within the Smart Street trial areas had perceived any changes in their electricity supply since the start of the trials
- To understand whether any perceived changes to customers' supplies were a result of the trials or due to external factors
- To establish if customers experienced SDIs during the trials that were directly associated with Smart Street and understand the impact of these
- To assess if perceived effects have detrimentally impacted overall satisfaction with service
- To understand likely changes in expectations of future power quality as a result of Smart Street.

3.2 Membership of the ECP

A maximum of ten customers were recruited in each of the three Smart Street trial areas of Cumbria, Lancashire and Manchester. Participants were geographically clustered to enable easy access to the meeting venues.

The recruited panellists were all domestic customers, on the basis that the trial circuits predominantly serve residential properties. The recruitment screening process ensured that a broad cross-section of customer demographics, reflective of each region, was included in the

ECP: age, gender and social grade. The selection process also ensured that a representative sample of customers served by the three primary substations that were common to both CLASS and Smart Street were included on the panel, to allow comparison of results.

3.3 Frequency of meetings and attendance

The ECP met on 30 and 31 January and 6 February 2018. The meetings each lasted approximately 90 minutes and were facilitated by an accredited Interviewer Quality Control Scheme qualitative moderator. Questions were framed around a qualitative discussion guide (Appendix A).

The attendance for each meeting is set out in Figure 3.1.

Figure 3.1: ECP meeting attendance

Trial area	Network type	Customer type	Gender	18–30	31–49	50+	Total
Cumbria	Rural	Domestic	Equal proportions of males and females	0	1	5	6
Lancashire	Urban	Domestic	Equal proportions of males and females	3	1	4	8
Manchester	Dense urban	Domestic	Equal proportions of males and females	2	3	4	9

3.4 Incentives

Customers were each offered a cash incentive of £60 for attending a focus group meeting in their respective region. This was recommended by Impact Research based on previous experience of recruiting customers to take part in similar panels. Customers were required to sign a claim form to document receipt of the payment or, if preferred, could elect to make an equivalent donation to a registered charity of their choice.

4. POST-TRIAL CUSTOMER PERCEPTIONS OF SMART STREET

4.1 Perceptions of power quality at the end of the trials

In order to evaluate the key objective of this phase of research (as outlined in Section 3.1), it was necessary to explore customers' perceptions of their power quality during the Smart Street trials from January 2016 to December 2017. This was subsequently compared to their experience before the trials started. This approach was identical to that adopted for the mid-trial research. The expectation, based on the Smart Street hypothesis, the mid-trial ECP feedback and previous CLASS research, was that the post-trial panel would have perceived little or no change in power quality since application of the Smart Street method.

The participants were first asked to consider their definition of power quality, and how an improvement or deterioration might manifest itself. The post-trial ECP defined power quality in terms of reliability and consistency of supply, which was closely aligned with the mid-trial ECP findings. However, in contrast to the mid-trial ECP, where appliance efficiency was not

mentioned, some members of the latter panel equated the efficiency of appliances with good power quality.

“I’d say if it can cope with your amount of appliances it would be quality power.”
Female, Manchester

When asked to define or provide an example of poor power quality, the ECP predominantly focused on unplanned interruptions. Customers generally regard these as the most extreme form of outages because they cannot be anticipated, and therefore usually cause some degree of inconvenience.

The dimming or flickering of lights and less efficient functioning of appliances were also considered by some to be indicators of a decline in power quality, whereas this was not spontaneously mentioned by the mid-trial panel. The perceived potential for a decline in power quality was also largely hypothesised rather than based on actual experience, as the vast majority of the panel had little or no experience of unplanned supply interruptions or voltage disturbances. Consequently, they considered their respective supply to be of good quality.

“The lights would go dimmer. You wouldn’t have as bright a light as what you would normally have. Your washing machine wouldn’t work the same. Maybe your cooker, if you had an electric cooker ... it would take longer to cook food. Maybe your fridge wouldn’t work ... it would come on more often because it needed to cool things down.” Female, Wigan

The extremely small number of customers who had experienced supply interruptions or had observed effects that might potentially be associated with voltage disturbance reported that these manifestations had not adversely influenced perceptions of power quality. As the impacts were negligible, customers were not unduly concerned about the cause and had not been sufficiently motivated to investigate the events further.

However, irrespective of the panellists’ individual exposure to power cuts, they collectively agreed that they would perceive a decline in power quality if the frequency of interruptions rose to more than one or two per year. Nevertheless, those who had experienced interruptions also tended to accept that they are largely unavoidable and outside the control of the DNO and as such, were prepared to accept a small number without any significant detrimental impact on their overall perception of power quality.

Panellists were also asked to consider how an *improvement* in power quality might be demonstrated. As could have been anticipated, they responded with examples representing the opposite of those previously used to describe a decline in standards ie. the absence of unplanned interruptions, improved efficiency of appliances and a reduction or elimination of dimming and flickering lights. In contrast to the mid-trial survey, a small number of participants mentioned that cost efficiency (revealed as lower customer bills) might be a consequence of improved power quality.

Having defined power quality, the panel was asked to consider their supply over three distinct periods:

- Current power quality
- Power quality over the previous 12 months (January 2017 to January 2018)
- Power quality in the preceding 12 months (January 2016 to January 2017).

Accurate recall of past events or behaviour tends to deteriorate over time, and it was recognised that panellists were likely to find it more difficult to reliably recount specifics about their electricity supply, as they were asked to reflect further into the past. To assist the ECP’s recollection and anchor events to a time of year, day of the week and time of day as accurately as possible, panellists were asked to think about the circumstances – for example the season, if it was light or dark, whether they were cooking or watching TV etc.

The Smart Street trials commenced in January 2016, two years before the post-trial research and therefore, it was assumed it would be most difficult for the ECP to recall power quality before the trial period. The overall research approach was designed to mitigate this by conducting mid-trial customer consultation, which would derive more accurate reflections over the first year of trials and the preceding period. Consequently, the post-trial research focused predominantly on current power quality perceptions and those over the final year of trials; however, panellists were also encouraged to reflect across the entire trial period, to the best of their ability.

The ECP was asked to consider whether they thought power quality had improved or declined during each time period in turn, starting with the current situation. In general, the panellists believed that their experience of power quality had been consistent, and in some instances had improved. When asked to rate their respective power quality, the majority of participants rated it as ten out of ten, where ten is 'completely satisfied'.

"I think it's exactly the same. It's always done what I needed it to do. I turn the kettle on, it comes on. That's my opinion. It does exactly the same." Female, Wigan

During the mid-trial ECP, panellists did not spontaneously mention any changes to power quality other than supply interruptions. However, a few members of the post-trial panel claimed to have noticed improvements during the two-year trial period, when compared with previous years:

"If you're having all them appliances on at different intervals, not all at the same time, your lights would flicker a lot more back then than they do now. They don't do that now." Female, Wigan

"Well, what's improved for me is the consistency of the current. Because it seems to me as though your appliances are lasting longer than what they used to ... The voltage was up and then it was down ... your television would fade or something like that." Male, Egremont

Panellists were finally asked to think about power quality before the trials commenced in January 2016. Despite some initial difficulty recalling distant past events, the technique of trying to anchor observations to a specific time and activity proved very effective and panellists frequently recounted issues with supply many years or even decades previously. They often drew comparisons with the reliable and consistent service that they now receive as the norm. As a consequence, they drew on past experience as a benchmark to articulate their perception of a significant improvement in electricity supply provision over time.

"We had the power cuts ... you don't go out buying candles just for the odd one or two occasions, do you? So, it's obviously quite frequent. So, I actually prepared for the cuts and putting the candles on." Male, Manchester

"A vast improvement from the years before." Male, Wigan

The mid-trial ECP was able to recall unplanned interruptions caused by severe weather conditions, which had resulted in significant customer disruption because of the lengthy nature of the outages. The post-trial panel had less recollection or understanding about the cause of supply interruptions experienced prior to the trial period.

4.2 Experience of short duration interruptions

The post-trial panel's overall perception of power quality during the trial regime was extremely encouraging and consistent with the results of the mid-trial research. These findings substantiate the hypothesis that customers would not notice any detrimental effect linked to the application of Smart Street techniques.

The ECP was informed as to how Smart Street technology interconnects neighbouring circuits, in the event of a fault, allowing electricity to be restored more quickly than is possible under normal operational conditions. The panel was then advised that connecting circuits in this manner theoretically introduces the risk of a slight increase in SDIs of less than three minutes.

The ECP had generally not considered SDIs up to that point in the discussion. However, when prompted to specifically think about SDIs, a number of panellists did recollect experiencing occasional short supply interruptions that were typically observed as a change in appliance functionality, for example a flashing digital clock. The majority of panellists reported that they had never previously associated a momentary loss of supply, or an incident lasting just a few minutes, to be a supply interruption. The general understanding was that supply interruptions last much longer. After giving the matter some considered thought, a small minority of panel members believed that their property might have been subject to an SDI. These panellists reported that such interruptions were often only apparent after the event – for example when waking or coming home to flashing digital displays on clocks and other electronic equipment.

After deliberating on the nature and impact of SDIs, the consensus was that they occur so infrequently, cause so little adverse intrusion on customers' lives and are so quickly forgotten that they have no negative effect on overall satisfaction with service or perception of power quality.

After being given the opportunity to read the Smart Street general awareness leaflet (originally distributed in 2014) and considering the moderator's explanation about the interconnectivity of LV networks, participants were generally able to understand the overall benefits of the solution provided by Smart Street. They also recognised the balance of the overall improvement in supply reliability afforded by the technique versus the theoretical risk of a slight increase in the frequency of SDIs.

In summary, although a number of panellists recalled having experienced SDIs, they were reported as infrequent, did not negatively affect perceptions of power quality and notably, panellists were unlikely to have remembered them without having been specifically prompted and sensitised.

4.3 Assessing the likelihood of perceived changes to power quality (post- trial) being attributable to Smart Street

The discussion guide used by the ECP moderator (Appendix A) allowed for unprompted debate. This was supported by subsequent probing questions which helped participants to anchor in time any supply issues they mentioned. While recollection was sometimes vague, this feedback allowed the project team to conduct further investigation into these events by scrutinising Electricity North West's historic fault records and the trial data, captured by Smart Street technologies. This investigation aimed to distinguish events that were directly associated with Smart Street from those that occurred as a result of other conditions. This technique was similar to that successfully used in customer research during Electricity North West's previous Second Tier LCN Fund project, CLASS.

Figure 4.3 summarises power quality issues reported by the ECP, after sensitisation and prompting, along with the results of investigations into the likely cause.

Figure 4.3: Power quality issues associated with Smart Street trials

Trial area	Description of fault/power quality issue	Investigation results	Attributable to Smart Street trial regime?
Cumbria	One panellist reported two power cuts in 2017	One was the result of an early technology issue affecting an LV capacitor in 2016; the other was caused by an overhead line fault, unrelated to Smart Street	No
Cumbria	One panellist reported multiple power cuts associated with new equipment near to her home	This customer was affected by a supply interruption in August 2016, associated with the replacement of a link box on the LV network, which was unrelated to Smart Street. They also experienced interruptions linked to a number of separate HV faults, two of which occurred during the trial period in February and October 2016, others occurred prior to the trials in 2015	No
Lancashire	Two panellists reported two separate supply interruptions during the trial period	These customers were found to have been affected by an HV fault occurring in February 2017 and an LV fault in July 2017	No
Lancashire	Two panelists recalled minor supply disturbance early in the trial period, which one described as momentary flickering of lights. The other panelist referred to two separate 'split second' interruptions	One customer was affected by the HV fault in February 2017, which could have resulted in the effects observed; however, both customers could potentially have been exposed to minor disturbances (SDIs) associated with early technology issues, unrelated to the trial regime	Not associated with application of Smart Street test regime
Manchester	One panellist reported two power cuts in 2017	Customer was affected by an HV fault in January 2016 and will have been affected by a supply interruption as a result of vandalism to a Smart Street LV capacitor	Not associated with application of Smart Street test regime
Manchester	One panellist reported two power cuts in the last year of the trials	This was the result of an underground mains fault that initially presented as a transient problem	No

Trial area	Description of fault/power quality issue	Investigation results	Attributable to Smart Street trial regime?
Manchester	One panel member reported four power cuts in the preceding twelve to eighteen months but nothing in the previous to six to eight months	One incident could possibly have been associated with early technology installation issues (this customer would have been affected by the trip and reclose of a Weezap on 10 March 2016). However, the reported power cuts were the result of an LV transient fault, unrelated to Smart Street, which occurred in late 2015	Not associated with application of Smart Street test regime
Manchester	One panellist reported intermittent flickering of lights	Problem on the customer's own side – confirmed when they subsequently explained that they continue to have the problem following completion of the trial regime and confirmed the issue was specific to one pedestal lamp in one room. No other appliance or lighting is affected	No

Only a small number of the panel had any supply problems during the trial period and of those reported, the majority were subsequently found to be the result of network faults unrelated to Smart Street.

During the mid-trial ECP, the majority of the panel had observed at least one SDI, subsequently found to be the result of a trip and reclose of a Weezap. However, all of these events were each found to have occurred early during the trials, around March 2016, coinciding with technical issues identified with the remote interface of this technology and the associated communications platforms. This resulted in integration issues with Electricity North West's network management system, and firmware updates were required to resolve the problem.

Similarly a small number of the post-trial ECP were able to recall an SDI or flicker during the same period. As with the earlier research, customers on trial circuits confirmed that they had not been subject to any problems of this nature since the early technical issues were remedied. Despite this experience, there was no impact on the panellists in terms of diminished perception of power quality or customer satisfaction. Participants confirmed that they paid little attention to the SDIs at the time, and would have given them no further thought without the specific exploration in the focus group meeting. The ECP generally reported an improvement in the quality of their supply during the trials compared with previous years.

Despite the technology problems in the early phase of the trials, customer impact was negligible. The refinements made by the project team during that period will negate similar issues if the Smart Street method were to be rolled out across Electricity North West's operating region and more widely across GB.

4.4 Awareness of installation works or street furniture associated with Smart Street

Customers on Smart Street circuits were sent a leaflet in October 2014 informing them of the likely impact of the trials, including the appearance of new street furniture required to house enabling technologies.

One member of the post-trial ECP had recollection of the leaflet; other panellists did not recognise it even when shown a copy. This supports the findings of a small-scale survey, conducted shortly after the leaflets were distributed, to assess the effectiveness of the leafleting campaign, specifically to ascertain customer reaction and gauge return on investment. This research demonstrated that only around a third of customers had any recollection of receiving the leaflet. This exercise highlighted the significant barriers of reaching customers through general communication campaigns, where materials are often perceived as junk or marketing mail.

It can also be assumed, as the ECP were generally unaware of the trials taking place, that the majority were not alerted to the installation of street furniture as part of Smart Street.

The one panellist who recalled seeing the leaflet had incorrectly assumed that distribution equipment, unrelated to Smart Street, which had been installed outside her property, was linked to the trial.

Smart networks of the future, particularly those involving the optimisation of LV networks, are likely to require investment in new local street furniture. As such the ECP was encouraged to express their views on the subject. While this line of questioning was outside the scope of research to test the main hypothesis, it was useful in the context of the discussion and enhanced learning about customer perception of DNOs installing more street furniture to facilitate improvements in service.

When questioned, only one panellist had noticed a new cabinet that they had associated with Smart Street, while a few had noticed increased engineering activity in their local area. However, the participants had not given particular thought to the reasons for this activity and certainly had not attributed it to Smart Street.

"I've noticed them as I look out my kitchen window. I can see a little power thing and I've seen a couple of vans there a few times through 2017, but I haven't had a power cut." Female, Manchester

This feedback was consistent with the mid-trial research and supports learning attained during the technology installation phase of the project, when it became apparent that objection to the presence of new equipment is only likely to arise when apparatus is located in the immediate vicinity of a customer's property. There is also evidence of a greater resistance among domestic customers than from businesses, and the likelihood of objections is higher in more affluent residential areas.

Concerns raised by customers during the technology installation phase largely related to aesthetics, specifically when cabinets were visible from their property. There was also some concern that the design of the street furniture, which was a convenient height for seating, could present a congregation point and thereby encourage antisocial behaviour.

However, these considerations were not raised by the ECP, even when it was apparent that some of the new street furniture they had noticed was likely to be associated with Smart Street.

4.5 Perceived customer benefits of Smart Street

The panel was asked what benefits, if any, they perceived as a result of the Smart Street trials and the potential wider rollout of the method. Overall, the project was seen as beneficial as it was designed to increase the efficiency of the existing network and lower bills for customers.

"You know how long it takes to get an engineer out, so I would suspect the way they're setting it up is it's a lot easier to manage and maintain if you do have an issue." Male, Manchester

During the mid-trial ECP, participants generally assumed that Smart Street would save them money by lowering bills, rather than curtailing increases in distribution costs, associated with delaying or deferring investment in infrastructure, which would ultimately cause bills to rise. However, the post-trial panellists recognised the overall financial benefit of keeping bills low rather than interpreting savings as a direct reduction in bills.

"We don't know what bills would have been ... but they will be lower than they would have been ... but they might still be higher than they are now." Female, Manchester

"The demand is obviously going to be up there, which means the cost is going to go up. They're trying to keep the cost down. So, it's not going to affect everybody as much as it would do if this wasn't in place." Female, Wigan

The post-trial ECP was more positive about the potential benefits of the project than at the mid-trial stage, where cynicism over whether cost savings would be passed back to customers proved a distraction for some. Customers were enthusiastic about cited direct benefits of Smart Street such as improved efficiency of the network and the reduced duration of faults.

"I get the impression that there may be more short-term faults ... but it will be a quick solution, because it's dealt with locally and maybe even remotely ... If you're going to be switched back on in three minutes, like you said before, it's going to be a remote thing when it's all done centrally rather than having a van turn up." Male, Manchester

4.6 Future expectations as a result of Smart Street activity

The post-trial ECP was more accepting than the mid-trial panel in their views that electricity demand will significantly increase in the future. It is possible to equate this shift in perception to the ubiquitous messages about climate change and their gradual educational effects on the general population. In July 2017 the ban in sales of any new diesel and petrol vehicles by 2040 was announced by the GB government. This could have had an impact on the perception of the post-trial ECP, members of which spontaneously mentioned a rise in demand from an increased number of electric vehicles. Panellists generally recognised the strain this would place on electricity networks in the future. However, in common with the mid-trial panel, younger members (those most likely to adopt LCTs in the future) had a greater understanding of the challenges of meeting demand in the future.

"There will only be electric cars made – everybody is going to have to charge from their house, so it will need power points to charge ... but like I said, there's a big difference between charging a car and running a Hoover. So, would it cope with that?" Female, Manchester

"If you're going to have more electrical appliance such as these electric cars? Could that not put a strain on it? Less effective." Female, Wigan

"Like your wi-fi when everybody comes home. That goes down, doesn't it? So that scenario, but with the car." Female, Manchester

Encouragingly, the panellists considered that projects such as Smart Street might contribute to a range of potential solutions to meeting increased demand. Customers were also impressed that innovative solutions were being investigated now. This had a positive impact on perceptions of the electricity industry as a whole, as it was acknowledged that pre-emptive action is being taken to prevent the negative customer impacts that could occur should demand outstrip supply in the future. When the ECP was presented with the alternative scenario of accepting the status quo, they considered that taking no action was unacceptable, recognising this would ultimately result in a decline in power quality and increased interruptions.

These findings demonstrate the importance of educating customers about evolving electricity needs and the benefits of new solutions to meet increases in future demand. When sufficiently educated about potential solutions such as Smart Street, the majority of the ECP were positively reassured. However, there remains some cynicism about the scale of future demand increase, particularly from older individuals, who generally require more education to persuade them about the need and benefits of new innovative techniques.

"I don't think these electric cars are going to take off anywhere near as much as what they think ... There's going to be lots of rows of terraced houses, people live in flats. Where are they going to put a charger? The trucks and the buses – they're never going to be electric in a million years." Male, Manchester

4.7 Application of CLASS findings to Smart Street

CLASS was a previous LCN Fund Electricity North West project that investigated the impact of voltage control on customer perceptions of power quality. CLASS affected 485,000 customers served by 60 primary substations. Trials were conducted on the HV network and reduced voltage in the range of 3% to 5%.

CLASS customer research involved robust quantitative surveys, which aligned with a rigorous testing regime and necessitated repeated engagement with 1,300 customers across the trial period. This research provided considerable customer insight and the data collected during the extensive surveys confirmed beyond reasonable doubt the hypothesis that *"customers within the CLASS trial areas will not see, observe or notice an impact on power quality when the techniques are applied"*. These results were supported by the absence of any customer enquiries or complaints in relation to power quality that could be attributed to the CLASS method. Full details of the research, method and findings can be found in the customer survey report published on the CLASS website.

The voltage control effects in Smart Street were expected to be similar in magnitude to CLASS and as such, it was possible to assume that customers in the Smart Street trial areas were also unlikely to notice an adverse effect on power quality or perceive a decline in service when the technique was applied.

Nevertheless, a project commitment was made to conduct more detailed analysis of the survey and technical data from the three substations common to both projects, to determine if customers involved in the Smart Street trials were more, less or representative of the survey population across the CLASS primary substations in terms of sensitivity.

Analysis was conducted mid and post-trial of the overlapping CLASS and Smart Street primary substations (Denton East - Manchester; Longsight - Manchester and Egremont - Cumbria). No customer sensitivity was noted on these or any other Smart Street circuits and as such the proposed detailed analysis, at primary substation level, was not required.

For the same reason, it was not necessary to examine possible variations relating to distance of households from the substations (which was originally identified as a potential issue specific to Smart Street).

While there were notable differences in the research methodology, the findings demonstrate that customers in Smart Street areas were representative of the CLASS trial population in having observed no detriment to power quality. On this basis, it can be concluded that, in common with the CLASS method, the application of Smart Street techniques is indiscernible to customers.

In parallel with this qualitative research, all power quality/voltage complaints/enquiries recorded by Electricity North West in the trial period were monitored and recorded, to ensure that if any such problems arose on a Smart Street circuit, they were quickly identified. During the trial period there were no reported issues that were linked to the application of the Smart Street method.

These findings indicate that Electricity North West can be confident that any future implementation of Smart Street across the wider GB network could be applied without detrimental customer impact.

Full detail on this analysis is available in the mid-trial ECP report.

5. CONCLUSION

Feedback from the ECP was valuable in gauging customer perception of power quality and how it might have changed since the Smart Street trial regime was implemented. The only perceived changes to power quality were positive, with a substantive number of the panel citing an improvement since the trials began. It was only after sensitising the panel with information about SDIs and prompting them with detailed questioning, to carefully reflect on changes, that participants were able to recall any changes in power quality. Panel members who, after prompting, reported a change stated that these were so insignificant and infrequent as to have had no impact on themselves or their household. Any such observations did not adversely affect perception of power quality (which was already very high before the Smart Street trial period). These findings, along with the absence of any enquiries or complaints directly associated with application of the trial regime, support the hypothesis “*Customers within the Smart Street trial areas will not perceive any changes in their electricity supply*” is upheld.

The SDIs that could potentially have been associated with Smart Street enabling technologies occurred early in the trial period when issues arising from the integration of enabling technologies and communications platform were identified. This regrettably resulted in some customers experiencing one or a small number of SDIs. The problem was quickly resolved by implementing firmware updates, and customers on trial circuits have experienced no further problems of this nature. The ECP’s accounts of SDIs early in the trial period combined with the failure of participants to recall more recent events substantiates the conclusion that any early impact was associated with technology refinement and interconnectivity issues, rather than application of the voltage optimisation trial regime. However, even when SDIs, more prolonged supply interruptions or power quality issues such as slight voltage dips were reported, they had no negative influence on participants’ satisfaction with supply.

Electricity North West can therefore be confident that implementing the Smart Street method across its distribution region would have no detrimental impact on perceived power quality. These findings support the transferability of the method and suggest that it can be applied across the wider GB network without customer impact.

6. NEXT STEPS

These findings represent the final phase of customer research of the Smart Street trials, to proactively assess perceived changes to power quality as a consequence of implementing voltage optimisation techniques.

In accordance with the vision of the LCN Fund mechanism, all outputs and learning acquired from Smart Street customer engagement activities will be made available to other DNOs. All communication and learning materials developed in the project have been published and can be downloaded from the [Smart Street website](#).

Previous learning from LCN Fund projects has been embedded into the design and implementation of further projects and the findings from Smart Street will be considered in the same way for future projects.

7. APPENDICES

Appendix A – Discussion guide



IMP256 ECP 4 Research Objectives

ECP Meeting 4	30th and 31st Jan and 6th Feb	Objective - to understand if customers within the Smart Street Trial areas (Manchester, Wigan and Egremont) perceive any changes in their electricity supply
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GROUP STRUCTURE (1½ HOURS):

AREA OF DISCUSSION	TIME ALLOCATION
(1) Introduction / Warm Up	5 minutes
(2) Smart Street Leaflet	15 minutes
(3) Current power quality perceptions	30 minutes
(4) Power quality perceptions BEFORE Smart Street Trials	20 minutes
(5) Short Duration Interruptions	10 minutes
(6) Future power quality	5 minutes
(7) Summary	5 minutes

1 Moderator Introduction (5 minutes):

- Introduce yourself
- Explain that the research is being conducted on behalf of Electricity North West
- Explain purpose of discussion (*"To understand overall perceptions of their electricity supply"*)
- Confidentiality is guaranteed, no right / wrong answers, interested in everybody's opinions, in as much detail as possible
- Explain moderator's role and set out 'rules' (speak loudly / clearly / not all together)
- Explain audio and video recording, one-way mirror and presence of observers
- Any questions?

Warm-up

EACH RESPONDENT WILL BE ASKED TO INTRODUCE THEMSELVES TO THE GROUP IN TERMS OF:

Impact Research Ltd, 3 The Quintet, Churchfield Road, Walton-on-Thames, Surrey, KT12 2TZ
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- First name, work and who lives in their household - were they aware of the Smart Street project before we approached them to take part in today's meeting?

2 SMART STREET Leaflet (15 minutes):

Moderator Info:

Leaflet to be emailed to group in advance, and copies given out upon arrival to read again before starting the group.

ASK THE GROUP

- This leaflet was sent to all customers within the Smart Street Trial areas in October 2014. Does anyone recall receiving it through the post at that time?

- Having been sent the leaflet prior to this meeting and reading it again today...what are your overall impressions and thoughts about it: **DEPENDENT ON RESPONSE, PROBE ON:**

If so...

- What did they think it was?
- What had they heard about it?
- What impact did they think it might have for them?

- Probe on:

- Likes and dislikes of the leaflet
- General impressions about being involved in the Smart Street trials
- Understanding and clarity of the subject matter **(CHECK**

UNDERSTANDING ON THESE POINTS BEFORE CONTINUING)

- Understanding of 'low carbon' terminology
- Interpretation and associations of the name '**SMART STREET**'

As you know from the information provided in the leaflet, Electricity North West are responsible for delivering electricity to your door.

We have a quick True or False game to go through to check your understanding of their role.

MODERATOR: Run through pack A (**true or false game**)

PAUSE / BREAK – WRITE DOWN ANYTHING NOT UNDERSTOOD – IF HAVE ANY QUESTIONS, THROW OPEN TO THE GROUP TO SEE WHAT THEY THINK AND CORRECT IF NECESSARY. ENSURE ALL ARE ANSWERED BEFORE MOVING ON.

3 Current power quality perceptions (25 mins)

- Ask the group to contemplate what **power quality** means to them

LIST DEFINITIONS ON A FLIP CHART

- What might you see/experience with an **improvement** in power quality? E.g. changes to the way appliances work? Lighting? Others?
- What might you see/experience with a **decrease** in power quality?

IF POWER CUTS ARE MENTIONED:

- Frequency of power cuts
- Duration of power cuts

- **Establish perception of the current quality of their electricity supply**

EXPLAIN: The Smart Street trials mentioned in the leaflet earlier, started in **January 2016**, however, I would like you to focus mainly on the last 12 months when answering my questions.

- Have the panel seen any evidence of on-site works over the **last 12 months** that they suspected might be associated with the trials (ie Electricity North West personnel working in the region, new cabinets? BRIEFLY elicit general impressions.
- Has quality **improved, stayed the same** or **deteriorated** over the **last 12 months?**
 - What, if anything, has changed? **PROBE** for perceptions, changes to appliances etc.

PROBE FOR EACH OF THESE IF NOT MENTIONED:

- More power cuts?
- Fewer power cuts?

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- Longer/shorter power cuts
 - Changes to way **appliances** work ie kettles boiling faster/slower
 - Probe for specific appliances where a change has been observed
 - Changes to charging rates for mobiles etc?
 - Flickering/dimming or brightening of lights?
 - Better power quality?
 - More consistent supply?
 - Explore the timing of any changes observed:
 - Do you remember what month/ day of the week/ time you noticed this?
 - It may help to think about what you were doing at the time? Listening to a radio show, getting ready for work/ school run etc.
-
- Why do you think this might be? (**PROBE** to check what is likely to have caused any changes e.g. storms, fault on the line, routine repairs (pre-notified) change in personal circumstances, societal changes such as population numbers etc. rather than Smart Street?)
 - Did you report or were you proactively given any explanation for the changes to power quality?
 - **IF RECALLED RECEIVING/READING THE LEAFLET IN OCT 14** - Do they think that receiving the leaflet might have sensitised them to look for changes?
 - **IF EXPERIENCED ANY CHANGES TO POWER QUALITY**: Have you made any adjustments to your behaviour, appliances or anything else as a result of the changes to your power quality experience over this time? If so, what?
-
- How might the trials have affected not just them, but other members of their household?
 - Or anyone else e.g. neighbours?
 - Local shops/businesses?
 - Any change to their satisfaction with power quality as a result of Smart Street trials? Has it improved or got worse? Why?

SUMMARISE: On a scale of 1-10 where 1 is completely unacceptable and 10 is completely acceptable, how would you rate your power quality **over the last 12 months?**

RECORD RESPONSES ON A FLIP CHART

4 Power quality perceptions BEFORE Smart Street Trials– (25 mins)

REMINDER: The Smart Street trials mentioned in the leaflet earlier, started in **January 2016**.

- Establish perception of the quality of their electricity supply **(before January 2016)**
 - Was quality **better, worse or the same** before January 2016 than it is now (thinking back only 1-2 years before, not decades!)?
 - **KEY OBJECTIVE TO EXPLORE ANYTHING NOTICED: What, if anything, was different? PROBE for perceptions, changes to appliances etc.**
 - Why do you think this might be? (**PROBE** to check what is likely to have caused any changes e.g. storms, fault on the line, routine repairs (pre-notified) change in personal circumstances, societal changes such as population numbers etc rather than Smart Street?)
 - Before **January 2016**, had you ever had cause to report / or were you proactively given any explanation about issues concerning power quality?

SUMMARISE: On a scale of 1-10 where 1 is completely unacceptable and 10 is completely acceptable, how would you rate your power quality **before January 2016?**

RECORD RESPONSES ON A FLIP CHART

5 Short Duration Interruptions (10 mins)

EXPLAIN – Smart Street technology interconnects neighbouring circuits and means that, if your property is affected by a local fault, your electricity will be restored much more quickly than before. However, connecting circuits in this way theoretically introduces the risk of a slight increase in short duration power cuts, which last less than 3 minutes.

- In the **last 12 months** have you experienced any short power cuts, lasting just a few minutes or less? **CLARIFY THAT THESE CAUSED A TOTAL LOSS OF SUPPLY, AFFECTING ALL APPLIANCES AND LIGHTING IE THEY WERE NOT JUST VOLTAGE DIPS**
- If so, can you recall, approximately, how many of these short interruptions you experienced in the **last 12 months**?
- How long, on average, did they tend to last?
PROBE: a few seconds/minutes/ranged between a few seconds and a few minutes
- Thinking about the **last 12 months**, do you recall any kind of pattern to the short interruptions?
 - sporadic and difficult to see a pattern?
 - tended to be in very wet or windy weather conditions?
 - all occurred within a short period?
 - –something else?
- Approximately, when did the last one occur?
- **To the best of your recollection, do you think that you experienced more short power cuts over the **last 12 months** than in previous years?**
 - Yes / no / about the same?
- Do they seem to have followed a similar pattern in terms to previous years

6 Future power quality – (5 mins)

- Do you expect your power quality to change in future (next 5 years say)?
 - If so how, and why?

Show concept board:

- *What do they think of the solution?*
- *Can they understand the “how”? What’s in it for them? Do they agree? Anything else? Is it credible?*

7 Summary (5 minutes)

- Does Smart Street seem like a benefit to you? Something worse? Or the same as the current situation? **RECORD ANSWERS ON FLIP CHART**
- Thank respondents & depart