



The future

The Value of Lost Load (VoLL)

Phase Two: Refining the Approach

Engaged customer panel – key findings report

23 August 2016



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GLOSSARY

Abbreviation	Term
CE	Choice experiment
DNO	Distribution network operator
ECP	Engaged customer panel
FAQ	Frequently asked question
GB	Great Britain
LCN Fund	Low Carbon Networks Fund
LCT	Low carbon technology
NIA	Network Innovation Allowance
Ofgem	Office of Gas and Electricity Markets
PSI	Planned service interruption
PSR	Priority services register
PV	Photovoltaic
Q&A	Question and answer
RIIO-ED1	Electricity distribution price control 2015 to 2023
SDI	Short duration interruption
SME	Small and medium enterprise
VoLL	Value of Lost Load
WTA	Willingness to accept
WTP	Willingness to pay

FOREWORD

The Value of Lost Load (VoLL) project will investigate if a single uniform VoLL, applied to all customer segments, remains appropriate as Great Britain (GB) moves towards an economy increasingly reliant on electricity, driven by the decarbonisation agenda. Extensive customer research will build on previous studies in this area to determine if a revised VoLL model would benefit customers.

The project is funded by the Network Innovation Allowance (NIA), introduced as part of the RII0-ED1 price control, which provides an allowance for RII0 network licensees to fund projects that have the potential to improve network operation and maintenance and to deliver financial benefits to the licensee and its customers.

The project commenced in October 2015 and will be conducted over a 28-month period. It will culminate in a comprehensive assessment of how VoLL should be defined across a range of customer segments and ultimately inform a potential revised model to help distribution network operators (DNOs) better plan their network investment and customer strategies.

This report and the analysis therein is one of a series of project dissemination documents, which will supplement the final VoLL conclusions and recommendations report, due to be published in January 2018.

This document specifically references the learning from phase 2 of the project, a strategic phase of qualitative market research, enabled through a series of meetings with an engaged customer panel (ECP). The method and findings from this phase of research are comprehensively documented in this report. The overall project research approach was derived from the VoLL methodology statement (version 1), which was designed by Electricity North West and its market research provider, Impact Research. The approach was also shaped following consultation with two key stakeholders: the Department of Energy and Climate Change (DECC) and Citizens Advice. The methodology statement and all associated documents have been published on the [VoLL webpage](#)

1 EXECUTIVE SUMMARY

1.1 Introduction

This report disseminates the learning associated with an initial, two-stage programme of customer engagement.

In stage one, an ECP consisting of domestic and small to medium enterprise (SME) customers was convened to establish customer perception and impact of VoLL on key customer segments:

- Urban domestic
- Rural domestic
- Worst-served customers
- SMEs.

In stage two, the ECP was re-convened to evaluate materials that would later form an integral component of a customer survey instrument.

Discussion guides supported by a suite of communication and customer survey materials were utilised to facilitate the group meetings, all of which are referenced in the appendices to this report, and are available to view and download on the [VoLL webpage](#).

The qualitative research findings and lessons learned are documented in the following sections of this report.

1.2 Summary of key findings

1.2.1 Customer perception and the impact of lost load on key customer segments

Perception of reliability

The definitive measure of reliability across all customer segments is the expectation of constant availability, ie a continuous, uninterrupted supply of electricity. Overall reliability is characterised by the frequency and duration of interruptions, with greater importance placed upon the frequency of supply interruptions than duration.

Expectations of reliability

Among the rural and worst-served segments, who suffer more frequent power cuts than the urban group, there is a perception that all customers should expect the same level of service and the DNO has an obligation to invest in underperforming networks to improve reliability in those areas, in line with the average service across the DNO's region.

Financial and social impact of lost load

Consumers are impacted by power cuts in different ways and object to the current single uniform VoLL applied to all customer segments.

Domestic customers place greater emphasis on the non-financial impacts of inconvenience and the associated emotional impact of potential distress. The greatest impact on commercial customers is direct or indirect financial costs associated with lost business. There are also non-financial impacts, such as the temporary loss of communication platforms that can lead to significant reputational damage.

Tolerance of supply interruptions

Tolerance of both planned and unplanned supply interruptions is highest among rural customers, who have greater experience of both types of outage.

Tolerance of unplanned interruptions can be enhanced by improving channels of communication. The causes of greatest dissatisfaction during power cuts are associated with knowing who to contact and difficulties in making contact, the lack of available information and poor quality information.

Continuity planning

Previous experience of supply interruptions is most likely to influence continuity planning. The importance of preparation and continuity planning is elevated further when a supply interruption is likely to have a very large impact and therefore, pose a substantial risk to an organisation's day-to-day activities and the customers it serves.

Expectations of support

DNOs are considered to have a social and moral obligation to provide a limited amount of support to the most vulnerable members of society. However, vulnerable customers who are reliant on electricity for essential medical equipment in the home are perceived to have a duty of care to ensure their own continuity plans are in place.

1.2.2 Evaluation of customer survey materials

Perception of reliability in a low carbon future

Most customers need to be educated about the low carbon agenda, to understand the challenges facing the energy sector, before they can begin to appreciate the anticipated increase in future demand for electricity arising from the widespread adoption of low carbon technologies (LCTs).

Even with education, customers find it difficult to equate the impact of supply interruptions in a future scenario with a greater reliance on electricity for heat and transportation. The challenge is greater for those accustomed to a very reliable supply, who are largely unable to grasp how the impact of interruptions will be greater in the future, having no existing experience to use as a frame of reference.

Priorities for investment

Most customers recognise that increased demand will require greater investment in infrastructure. However, customers with little experience of power cuts and consequently, high expectations of supply, are generally less willing to pay a premium to support investments that are perceived as having no direct benefit to them.

Panellists from rural and, more specifically, worst-served areas believed Electricity North West's priority should be to upgrade the infrastructure on underperforming networks. However, there is no appetite to pay more for this investment among this customer segment, who believe they are currently paying for a level of service they do not receive.

Testing the trade-off exercise

The survey will include a choice experiment (CE) to robustly measure VoLL. It is critical to the success of the VoLL research that the trade-off exercise is clearly understood and easy to administer.

To contextualise the CE it is important that appropriate educational material is utilised to ensure respondents initially understand why a financial element is included in the scenarios they will be asked to consider. Critically, the materials must clearly demonstrate that these payments/penalties are purely hypothetical and therefore, should not be interpreted literally. In order to make their choices, it is important that respondents recognise that any payments they are willing to make for improvements in reliability will increase bills, in a hypothetical context, which would result in them having less money to spend elsewhere and thereby have an impact on household or business expenditure.

Attributes and levels for the conjoint exercise

Identification of the key characteristics of supply interruptions has been fundamental to the success of this phase of the VoLL study and has been instrumental in the design of a robust, quantitative customer survey and specifically, the conjoint exercise. This will enable the evaluation of the complex decision-making processes by an extensive and representative group of customers. This understanding will ensure: the accuracy of data collection and an evaluation of how VoLL is defined in terms of reliability, support and expectations; how this varies in key customer segments; the support and communication strategies that might be deployed to mitigate these impacts and how VoLL might change in a low carbon future. This learning will be influential in the development of a revised model that will inform future DNO investment decisions.

1.3 Next steps

The quantitative surveys represent a significant proportion of the customer engagement activity associated with the VoLL project, and will commence with a winter season survey

during December 2016 to January 2017 and conclude with a summer season survey in August 2017.

A total of 6,000 surveys will be completed by customers from across the whole of GB, 3,000 of which will involve domestic and SME customers in Electricity North West's operating region. A total of 5,000 interviews will be conducted with domestic customers and 1,000 with SMEs who are heavily dependent on a continuous and reliable supply of electricity.

The ECP will be re-convened after the survey analysis has been completed to review and evaluate the research findings.

There will be on-going knowledge sharing and dissemination as the project progresses.

2 ANALYSES AND RESULTS

This section of the report disseminates the learning associated with a two-stage programme of customer engagement.

In stage one (Section 2.1), an ECP consisting of domestic and SME customers was convened to establish customer perception and impact of VoLL on the following key customer segments:

- Urban domestic
- Rural domestic
- Worst-served customers
- SMEs.

In stage two (Section 2.2), the ECP was re-convened to evaluate materials that would later form an integral component of a customer survey instrument.

2.1 Focus group meeting 1

The initial round of focus group meetings were structured to meet the first objective of the research, as outlined in Section 5.1 in the VoLL methodology statement (version 2):

'Establish perception and impact of VoLL on the key customer segments listed above.'

2.1.1 Experience of supply interruptions

The ECP were asked to introduce themselves to the group and share the number of outages they had experienced over the last few years.

Respondents were asked to consider planned and unplanned supply interruptions:

- Any supply interruption that is not pre-arranged is unplanned, could not have been anticipated and is typically the result of a fault, which causes the operation of the network's protection system.
- Unplanned interruptions that last for just a few seconds are referred to as momentary interruptions. Short duration interruptions (SDIs) last up to three minutes and more prolonged interruptions are classified as sustained.

All DNOs are bound by a legal requirement to report all interruptions lasting over three minutes to the regulatory authority, Ofgem.

There were differing experiences across the four ECP groups and customer experience also varied within the individual groups. Most participants in the urban domestic and SME groups had been subject to an unplanned outage but the occurrence was infrequent; other participants had no recollection of having ever experienced a power cut and some,

particularly in the rural and worst-served group, had experienced multiple interruptions and expected that this experience would continue.

Each group was asked to consider the last power cut that they had experienced and discuss their reaction to it. To encourage greater reflection on the experience and to contextualise the impact of the supply interruption upon them, they were asked to consider their initial thoughts, reaction and responses and communicate:

- How they realised the power supply had been interrupted?
- If the situation left them vulnerable or made them feel vulnerable in any way?
- If they had previously considered the possibility of an outage and made contingency plans?
- If the situation had prompted them to speak to or seek assistance from friends, neighbours or family members?
- If they had reported the outage and, if so, to which organisation?
- How long the power cut lasted?

2.1.2 Perception of reliability

The panellists were then asked to consider how they define supply reliability and state their expectations.

The panellists' perceptions of reliability were subject to some variation, dependent on personal circumstance. However, the majority defined reliability of their electricity supply primarily in terms of availability and continuity, characterised by the frequency and duration of interruptions to service:

"When you go to switch something on, it works." Rural, domestic

"Power supply staying on." Urban, domestic

Customer experience of momentary interruptions, SDIs of less than three minutes and outages of a sustained nature, influenced perception and was defined in terms of consistency, particularly by customers residing and operating businesses in rural areas that were more prone to SDIs.

Overall, less frequent, longer power cuts were reported to have less impact on customer perception of reliability than more frequent, shorter outages.

There was a notable difference in the perception of current supply reliability between urban, rural and worst-served customers and this had an impact of the collective group's sensitivity to interruptions. The issue of tolerance is discussed in greater detail in Section 2.1.6.

Planned interruptions also appear to have less impact than unplanned interruptions on customer perception of reliability. These findings are considered in greater detail in Section 2.1.6

Frequency and duration of supply interruptions

Participants were asked to consider the definition of reliability more thoroughly, in terms of frequency and duration, to establish whether they considered there were different levels of reliability, and how these might be defined. For example:

- Is a reliable service defined as one outage per year or is a maximum of three or even five a more appropriate threshold?
- Are there different expectations of reliability in rural locations versus densely populated urban areas and, if so, is it reasonable for customer expectations to differ?

The definitive measure of reliability across all customer segments was the expectation of constant availability, ie a continuous, uninterrupted supply of electricity and a guarantee that power is always available when customers 'flick a switch'.

The ECP participants were then asked to focus on what they construed as an acceptable duration for a power cut, in the context of reliability. They were again probed on potential different levels of acceptability and how these should be defined, eg a maximum of one hour; three hours or over twelve hours.

While individual viewpoints varied, there was generally greater emphasis on reliability being weighted towards the frequency of supply interruptions rather than their duration. The majority of the panellists regarded a high number of 'shorter' power cuts more annoying and inconvenient than fewer, 'longer' interruptions.

Panellists who had personal experience of frequent SDIs tended to have been recruited from rural areas, served predominantly by overhead networks. The protection systems on these networks can result in SDIs associated with the clearance of transient faults. This protection is designed to prevent more sustained supply interruptions, and operates when transient faults affect a circuit but cause no permanent damage to the infrastructure. These rural panellists commonly referred to short duration events as 'blips' and regarded them as more inconvenient than longer outages because they were greater in number and caused the supply to be off for long enough to require the resetting of electronic equipment in the property. Other members of the panel equated their experience of SDIs with damage to their equipment.

Other influences on perception of reliability

In addition to availability and continuity of supply, power quality, defined as the provision of a supply maintained within statutory voltage limits, was also considered an important factor in the understanding of reliability by customers who operate sensitive electronic equipment or motors. This enhanced definition was often characterised by personal experience of damage to equipment caused by reduced voltage:

"I'd rather just [be] cut off completely. It does no damage. If the power goes off, it doesn't damage things. It's inconvenient, but it doesn't damage things as such. It's the inconsistent supply that damages things." Rural, domestic

"No one's mentioned that there are times when you get a low power. On one particular time, on three phases, one phase went down to twenty seven volts and it burnt out every three-phase motor that I've got in place. All the motors that were running were burnt out. It cost hundreds of pounds." Worst-served

2.1.3 Expectations of reliability

The ECP participants were probed on their expectations regarding the frequency and duration of unplanned power cuts and if their perceived impact varied by season, day of week, time of day etc.

While the panellists' ideal was a completely reliable supply, free from interruptions of any kind, they generally recognised that this expectation is unrealistic. They accepted that unplanned interruptions were largely beyond the control of the DNO and subject to the vagaries of severe weather conditions, accidental damage etc.

After educating customers about planned supply interruptions (PSIs) most panellists also accepted that it was reasonable for the DNO to occasionally switch off parts of the network temporarily, to conduct planned work in the interests of maintaining a safe and reliable supply.

Among the rural and worst-served ECP members, who had suffered more frequent power cuts than the urban members, there was a perception that all customers should expect the same level of service and the DNO has an obligation to invest in underperforming networks to improve reliability in those areas, in line with the average service across the DNO's region. This expectation was underpinned by an understanding that all customers pay the same distribution charge as a proportion of their electricity bill, and they should therefore expect to receive the same standards of service, irrespective of location:

"We all pay the same company, and we all pay the same rate more or less. It's absolutely my choice to live where I live, but within that choice, you ought to have access to a reliable service." Worst-served

2.1.4 Financial and social impact of lost load

There was widespread agreement that customers are impacted by power cuts in different ways and there was an objection to the current industry measurement of VoLL, as outlined in the question and answer (Q&A) leaflet that had been distributed before the meeting. This explained that the current VoLL matrix values one customer's supply the same as another.

"When I read it, straight away, I thought that's not really right. That means that when the supply goes down in your home they value it the same as when it goes down in a residential home. I would expect them to be worried about a hospital more than they are a home." Urban, domestic

The ECP compiled a list of specific groups whom it felt were severely impacted by supply interruptions. These included customers with vulnerabilities, who might require additional support:

"I think the impact of a power cut on a couple that is out working all day is negligible. If you're a vulnerable adult at home and you can't put your heating or your fire on and you can die of hypothermia, the impact of that is far greater" Urban, domestic

Having defined reliability, the ECP was asked to consider the financial and non-financial (social) impacts that might be incurred as a consequence of an outage. The panellists were encouraged to share their personal experience of these impacts and contemplate whether these values might differ by customer segment.

To aid the discussion, the moderator shared a showcard with the participants (Appendix 5) which listed various categories of customer, ranging from a business to a vulnerable individual. They were also shown a table listing a number of attributes which might aggravate or mitigate the effect of an interruption, for example the duration of the outage, the season in which it occurred and the support available to customers.

The domestic panellists placed greater emphasis on the non-financial impacts of general nuisance and inconvenience and the associated emotional impact of annoyance and potential distress. These social impacts included:

- The absence of lighting, heating and cooking facilities, the effects of which are exacerbated in winter and introduce safety implications if customers resort to the use of candles
- Effects associated with maintaining personal hygiene from the absence of hot water, particularly when outages occur in the early morning and impact on the routine of preparing for work and school
- Distress caused to young children and vulnerable customers who are less equipped to cope
- Other impacts reported by the panel included general disturbance to family/relaxation time and the inability to watch TV or use games consoles etc.

All panellists suggested that the greatest impacts to commercial customers were either direct or indirect financial costs associated with lost business, including wastage, unproductive employees, penalties for failing service level agreements or getting orders out on time, and additional resourcing costs arising from making up lost time and production.

“It’s like if you’re running a business, like a public house. Your electric goes, you’ve got to shut. You’re losing money.” Urban, domestic

The panel’s SME representatives identified that perceived non-financial impacts, such as the temporary loss of communication platforms, resulting in the inability to make contact with their existing customer base, had a significant reputational impact, and this loss of confidence might affect future business with clients. Furthermore, in a competitive marketplace, the inability to communicate with potential customers might result in the loss of possible trading opportunities, as prospective customers simply go elsewhere.

“Because of the bad press in recent years for construction, if a company tries to ring you and they can’t get through, the first immediate thought is... ‘Oh well they’ve gone bust.’ Just from them having tried to ring a couple of times, no answer.” SME

More direct financial impacts associated with continuity planning (ie installing/hiring and running standby generators) were generally regarded as a cost borne by larger SME customers, where potential losses to the organisation are considered an unacceptable risk. However, domestic customers in poorly-served areas with an expectation of frequent power cuts also reported the financial impact of preventative expenditure from investments in generation to maintain supply.

There was an understanding among domestic customers that longer power cuts have greater potential to cause financial impacts such as the loss of fridge and freezer contents. They can also result in unforeseen expenditure associated with eating out and occupying children with alternative activities outside the home.

Short duration and momentary power cuts, while not without potential financial effects (reported by some panellists as being responsible for damaged equipment), were generally regarded more as an inconvenience, particularly among the worst-served and rural members of the panel who were more accustomed to frequent interruptions of this nature.

2.1.5 Planned supply interruptions

Under normal circumstances, PSIs are scheduled to take place at pre-defined times, primarily for the purpose of construction, preventative maintenance or repair.

These interruptions are assumed to be less inconvenient than unplanned outages because customers are notified beforehand. Typically, urban networks can be reconfigured more easily than more rural infrastructures, allowing preventative maintenance to be conducted without the need to remove supplies. As such, rural customers tend to have greater experience of PSIs than those in urban areas. Customers can claim a payment from the DNO if they fail to provide adequate notice of the outage, as defined by the industry regulator, Ofgem, in the [Guaranteed Standards of Service](#).

Panellists were presented with showcards (published on the VoLL website), which outlined the requirement for PSIs along with Electricity North West’s obligations and customer commitments when conducting them.

As anticipated, few urban domestic and SME panellists were aware that PSIs are occasionally required. This differed from the rural and worst-served customers, the majority of whom had experience of at least one such outage.

However, after sharing the information, all customers recognised that it was reasonable to expect that their supply might occasionally be affected by a PSI to enable the DNO to work

safely on the distribution network. Participants also understood that these works were likely to reduce the risk of unplanned supply interruptions at a later date.

2.1.6 Tolerance of supply interruptions

There was notably greater tolerance of planned and unplanned supply interruptions by rural customers, who had greater experience of both types of outage. While these customers expressed some grievance at paying the same as other customers for what they regarded as a diminished service; they tended to recognise that their supply was provided primarily by overhead lines, which are more susceptible to faults from weather and other external factors.

“I have overhead power lines going over my land and all my power comes overhead, so we’re always having problems.” Domestic, rural

They also considered the expectation of more frequent interruptions than town or city dwellers, as an accepted price customers choosing to live in rural areas had to pay.

Tolerance of interruptions was greater among rural customers than those recruited from worst-served networks who had experienced significantly more outages than the average rural customer. This sample generally attributed poor reliability in their regions to a lack of investment and to aging and poorly-maintained infrastructure.

The panellists with greater experience of supply interruptions also tended to be better prepared for these eventualities, as discussed in Section 2.1.8. This preparedness increases the individual’s ability to cope with power cuts and consequently appears to increase tolerance to unplanned outages.

The ECP implied that tolerance of unplanned interruptions could be enhanced by improving channels of communication. Most panellists had no prior knowledge of whom they should contact in the event of an interruption and incorrectly assumed they needed to approach their supplier. Because of this misconception, they suggested that the DNO had a responsibility to promote greater awareness. Many did not appreciate the importance of reporting an outage, assuming there was no personal requirement to do so, as others would take on this responsibility, or the DNO would automatically be aware of the problem. With the exception of worst-served and rural panellists, who were more accustomed to power cuts, customers were surprised to learn that the DNO might be unaware of the problem unless it was reported and thus would be unable to contact customers proactively even if they had their details, which DNOs generally do not, as the electricity supplier is the primary data holder.

The causes of greatest dissatisfaction during power cuts among the panel were issues associated with the lack of available information or poor quality information. These frustrations were characterised by difficulties in knowing who to contact and the ability to speak to a person, as opposed to receiving an automated response.

The panel reported that their minimum expectation of support during an outage was easily accessible and accurate information, which set expectations about the restoration/availability of supply. All suggested that they would theoretically be far more sympathetic and tolerant of the situation with accurate information, which was generally regarded as a basic coping mechanism, and one which allowed them to make considered decisions about how best to manage the situation for their specific household or business.

Tolerance – planned verses unplanned interruptions

Panellists who had experience of PSIs expressed far greater tolerance to them than to unplanned interruptions. Those who had no experience also indicated PSIs were preferable and this acceptance was rooted in the DNO’s obligation to provide prior notice, which allows customers to make alternate arrangements.

However, the acceptability of PSIs was subject to the caveat that sufficient notification was provided and the minimum, statutory, two day requirement was considered inadequate. There was also an expectation that, in addition to specifics such as the date and times of the outage, there should be an explanation of why it was required.

"I feel as though they say 'We're going to shut it off for a full day, these are the works that are being carried out', you'd think there was a bit of justification as to why this is happening. It's not just it's going off and that's it." Rural, domestic

As anticipated, customers are more inclined to tolerate PSIs which occur in spring and summer when the impact on heating and lighting is less significant. Among the domestic segment, there was also a greater tolerance for PSIs scheduled to take place mid-week, when a high proportion of customers were out and largely unaffected.

Overall, effective communication and sufficient notice were regarded as key to the acceptability of PSIs over unplanned interruptions. However, it was noted that tolerance for PSIs diminishes the greater the number experienced, as there is an expectation that the DNO's preventative and maintenance activities should be consolidated to minimise customer disruption.

There was also evidence of a decrease in the level of acceptability when planned supply interruptions overran. However, these were still seen as preferable to unplanned interruptions. Nevertheless, there was an expectation that, in these circumstances, the DNO should provide customers with clear information about when the supply would be restored and the reason for the delay in completing the work. Panellists failed to appreciate that it is energy suppliers and not DNOs who hold and maintain customer contact details and consequently, DNOs might be unable to proactively provide this information.

2.1.7 Changes in the perception of supply reliability

All groups, with the exception of the worst-served customers, considered their electricity supply to be reliable. The worst-served customers generally considered power quality had decreased, largely as a result of dips and spikes rather than any increase in longer outages, in the context of their personal experience. All other participants reported a perceived improvement in the reliability of their electricity supply in the last few years and certainly in comparison to their recollections from childhood, with many remembering the enforced power cuts associated with fuel shortages in the 1970s.

2.1.8 Preparation and continuity planning

The likelihood of having made contingency plans for dealing with supply interruptions was principally driven by the panellist's past experience. Typically, urban customers who had never experienced an outage, or had done so very infrequently, were far less likely to have considered preparing for these eventualities:

"I think people who don't have power cuts are not going to be as prepared, because it's never happened to them. It's not until it actually happens to you that you see the need." Urban, domestic

In contrast, customers residing or operating businesses in rural locations, particularly those identified as worst-served, were significantly more prepared and equipped with items such as camping stoves, candles and torches:

"It's common sense, isn't it? You have a torch or candles. You have an alternative means of heating water and cooking, so you just do that. I don't think anybody who lives in the county wouldn't be prepared somehow or other for that. It's our choice to live there." Rural, domestic

There was also a tendency for rural domestic customers to have retained old solid fuel fires or installed wood burners and Agas etc to ensure that they had heating and cooking facilities, such was their expectation of future interruptions.

For SMEs, the importance of preparation and continuity planning is elevated further when a supply interruption is likely to have a very large impact and therefore pose a substantial risk to its day to day activities and the customers it serves:

“I think it depends on the business you’re running, on the duration, and how many episodes you have. We can’t afford any because if Mrs Jones phones up and can’t get through to us, that’s an issue. If our carers don’t know where they’re going or there’s a problem, it’s an issue. So we have a continuity plan; we’ve gone to cloud-based rostering systems, we’ve got iPads, we’ve got laptops. We can go down the road to where electricity is working, sit in Costa Coffee. So we’ve had to do continuity planning because our old building let us down so many times. I can’t afford my staff to sit around for two hours while they fix the electricity, because we’re looking after vulnerable adults in the community.” SME

Generally, customers who were more prepared were more tolerant of unplanned interruptions than those who are not.

It was also apparent that even though rural communities were more sparsely distributed, there was a stronger sense of community and greater local support than some more densely populated urban areas:

“I think in some ways they’re [support from ENW] more essential in big town and cities because where we live, we have neighbours and we check up on our neighbours.”
Worst-served

2.1.9 Expectations of support

The ECP held broadly similar views concerning continuity planning and the DNO’s responsibility for the provision of support, generally perceiving that customers who are the most reliant on a continuously available power supply have a personal responsibility for their own back-up/contingency plan.

Both SME and domestic panellists conceded that DNOs have a social and moral obligation to provide a limited amount of support to the most vulnerable members of society. However, there was the suggestion that if vulnerable customers are reliant on electricity for essential medical equipment in the home, they or their families have a duty of care to ensure their own continuity plans are in place.

Most domestic panellists, irrespective of their experience of reliability or geographic location, generally believed that DNO support is not appropriate for commercial organisations. There was consensus among this group that businesses, which are most likely to be financially impacted by interruptions, have an obligation to ensure they have their own resilience plans or are appropriately insured to mitigate the risk of loss. There was an understanding that the cost of any support provided by a DNO is ultimately reflected in customers’ bills and while provision for vulnerable customers was accepted, the panel were unprepared to bear any additional costs for supporting business customers.

Conversely, among the SME panellists, there was a greater expectation of support, specific to commercial organisations. These included enhanced response/restoration provision, improved communications mechanisms and personal support from account managers. SME customers have a greater expectation of compensation for business losses and this expectation extended beyond tangible financial losses to the loss of potential trading opportunities and negative reputational impact.

2.2 Focus group meeting 2

The principal objective of the second round of focus group meetings was to evaluate materials that would form an integral component of the customer survey instrument, in particular, key attributes and levels associated with the impact of supply interruptions and the type of support that might be provided to mitigate these impacts. These attributes and levels would provide the basis for a trade-off exercise, specifically a choice-based conjoint, which would ensure the effectiveness and accuracy of data collected in the subsequent customer survey.

2.2.1 Current level of reliability

A number of showcards were presented to panellists to reintroduce the purpose of the discussion and contextualise the objectives of the meeting. These included Showcard A, which itemised the component parts of an electricity bill and replicated information contained in the Q&A document that had been distributed before the initial meeting. This was designed to focus the panel on the element of the bill comprised of network charges. The panel was informed that this funds a DNO's investments in the construction and maintenance of infrastructure to improve network performance and reliability. In the context of the subsequent discussion framework, the ECP was instructed to focus purely on network charges associated with the delivery of electricity to their homes and businesses, discounting all other components of the bill.

Panellists were then shown Showcard B which outlined the industry's two key measures of service performance: reliability, measured in customer interruptions and availability, measured in customer minutes lost. Showcard C provided Electricity North West's current performance figures. These were introduced to assess if the DNO's measure of reliability differed significantly from that of the panel.

The project team anticipated that introducing the current level of reliability, which was expressed as the average annual number of interruptions per 100 customers, was likely to cause some confusion. This was nevertheless tested with the urban domestic and SME groups and proved to be the case. Therefore, the reliability measure for frequency was redefined and illustrated over a three year period, which equated to one interruption every three years. Panellists found this measure easier to understand and therefore more meaningful.

The average annual reliability measure for duration was clear and required no further explanation.

2.2.2 Perception of reliability in a low carbon future

During the initial focus group meeting, panellists had been asked to contemplate how views might change with decarbonisation of heating and transportation. This concept had been introduced in the Q&A document they had been asked to read before attending. It was important for the panellists to contemplate the challenges of a low carbon future in order to contextualise the investment priorities that they would be asked to consider later in the session.

The majority of panellists were aware of innovations in LCTs and recognised, from their own observations, a significant increase in their adoption over recent years, in particular photovoltaic (PV) systems and electric or hybrid vehicles. Only three panellists fell into the category of early adopters, with two customers operating PV systems and one SME customer having installed electric vehicle charging points.

The challenges facing DNOs in a low carbon future and potential customer impacts were examined in greater detail during focus group meeting 2.

Showcard I, which briefly explained how demand is likely to increase in the future, was presented to the group. A similar information card had been effective in explaining the low carbon agenda in previous innovation projects. However, based on previous experience, it was expected that the topic would be divisive.

Panellists were asked to consider a future scenario where LCTs were in common usage and they generally recognised that there would be a need for DNOs to make significant investments to prepare networks to meet the widespread adoption of LCTs. However, they didn't necessarily make the connection between increased demand and a need to increase investment, simply to maintain existing reliability.

It was apparent from the reaction of the ECP that most customers need educating about the low carbon agenda to understand the challenges facing the energy sector, before they can begin to appreciate the anticipated increase in future demand for electricity arising from the widespread adoption of LCTs.

Even with this education, the ECP found it extremely difficult to imagine, and were sometimes unwilling to accept, the extent of anticipated future demand and consequent increased dependence on a reliable electricity supply. Early adopters of LCTs, particularly those who also had experienced power cuts, were more able to visualise their greater reliance on electricity and had a better appreciation of the impact of power cuts, than non-adopters. For example, customers with PV systems recognised the financial impact from a supply interruption, which prevents export. Panellists, who do not currently use LCTs, found it difficult to conceptualise life in the future and struggled to imagine the impact of outages in this scenario. The challenge was greater for those accustomed to a very reliable supply, who were largely unable to grasp how the impact of interruptions will be greater in the future, having no existing experience to use as a reference.

There was a general understanding that power cuts will have a greater impact in a low carbon future but observations were largely around current effects and financial impacts. For example, the panel recognised that customers who choose to drive electric vehicles will be unable to charge them during a power cut and understood the difficulties this could cause. However, this observation was abstract and rooted in the third person, with panellists struggling to relate this future impact to themselves.

While members of the panel fundamentally appreciated that there would be an increase in future demand, there was some scepticism and a perception that industry forecasts were substantially inflated. There was also an expectation that alternative, renewable electricity generation and the exploitation of new sources of fossil fuels such as shale oil and gas would meet energy demand well into the future.

Furthermore, panellists anticipated advancements in technology in the future which will facilitate greater energy efficiency in common electrical appliances:

“Not necessarily, we will use more electricity, but we will use it a lot more efficiently; for instance the lights are a lot more efficient.” Worst-served

This sentiment extended to the use of LCTs:

“In thirty five years' time, a car will do a lot more than eighty miles before charging. It will be completely different.” Rural, domestic

Both early adopters and non-LCT users generally exhibited little concern about the future impact of power cuts, with all panellists having a perception that efficiencies arising from new technologies and innovations in electricity storage will allow the energy sector to manage increased demand without any significant customer impact.

Overall, the ECP found it difficult to equate the impact of supply interruptions in a future scenario with a personal reliance on electricity for heat and transportation. Panellists were

also sceptical, suggesting that the industry is attempting to justify increased charges on the pretext of investment to meet decarbonisation targets.

2.2.3 Priorities for investment

After reflecting on possible future customer impacts, the ECP was presented with Showcard D and asked to consider which of the following investment decisions should be a priority for Electricity North West over the next few years:

- A Keep customer bills constant and maintain the current level of reliability
- B Ensure all customers receive the same level of reliability
- C Focus on the worst areas of the network to improve reliability for the customers they serve
- D Improve reliability where the benefits to customers outweigh the costs of the work involved.

Customer engagement in previous innovation projects has highlighted that individuals tend to have an egocentric view, particularly when financial considerations are introduced. They need to understand how changes, expenditure or savings affect them personally and tend not to be particularly altruistic.

Similarly in this study, customers with little experience of power cuts and consequently, high expectations of supply, were generally unwilling to pay a premium to support investments that they perceived had no direct benefit to them or tangible return on their investment. These customers were generally happy with the status quo and tended to select option A.

“If you're not having loads of power cuts, it's not even of interest.” SME

There was however, recognition among customers who currently have a reliable service, that not everyone experiences the same high standards of reliability.

Most panellists selected an option which recognises that increased demand will require greater investment in infrastructure. However, the panel had difficulty in effectively distinguishing between options B and C, stating that by focusing investments in the worst-served areas of the network, the DNO would ensure all customers receive the same level of service and vice versa.

After some discussion, those selecting option B felt the DNO had a responsibility to provide a dependable service for all customers but expressed concerns regarding the practicality of the option and that this might result in improved reliability for some and a decline for others.

“Well I don't think it's practical. I think there are some things that happen that mean you can't guarantee that everyone will get the same level of service.” Urban, domestic

Panellists selecting option C recognised the value of improving the worst-served areas of the network but had concerns that this investment strategy should not be at the expense of currently dependable networks.

“If they start focusing on the worst areas they could start neglecting other areas and you might have the same situation on your hands again. So I thought if they were to maintain the same level of reliability throughout the country, it would make everybody happy.”
Rural, domestic

Unsurprisingly, panellists from rural and, more specifically, worst-served areas believed Electricity North West's priority should be option C. These customers attribute what they regard as a diminished service with aging assets and consider that investment is required to upgrade the infrastructure on underperforming networks. However, there is no appetite to pay more for this investment among this customer segment, who believe they are currently

paying for a level of service they do not receive and expect reliability standards to improve before their contribution to distribution charges increases.

Investment decision D was the least-selected option and appeared to cause some confusion. It provoked some debate about customer density and whether it was reasonable to expect low density populations in rural locations to expect a diminished service because of disproportionate investment. Panellists with a very reliable supply who were resolute in their reluctance to pay more towards network investment did, however, concede that all customers pay the same and should consequently expect to receive the same high standards of service. Therefore, certain investments to improve reliability, where customer benefit outweighs the cost, can be justified. However, in these instances customers expect the reason for these investment decisions and the benefits to be clearly communicated:

“You'd need facts and figures about the improvement put in front of you straightaway, that's the first thing and then how much in addition you would be paying.” Urban, domestic

Panellists were then asked to contemplate investment against benefits, in the context of option D. This debate suggested there was some appetite for more detailed information about planned capital work in the region, on the basis that this information would allow customers to establish the extent to which investment plans might secure or improve existing reliability standards; thereby, making it easier to weigh up the priorities for investment going forward.

Collectively, the ECP was unwavering in its view that it was not the customers' responsibility to pay for further investment in infrastructure to maintain or improve supply reliability, which they believed should be funded by “company profits” and not from increases in customers' bills.

2.3 Attributes and levels for the conjoint exercise

The final and most critical element of this phase of research was to understand how the panel appraised a list of pre-determined attributes of a supply interruption eg duration of power cuts and associated levels of service (eg up to three minutes, up to one hour). This feedback was fundamental in informing the most appropriate attributes and levels for scenario testing during the third quantitative phase of research.

The moderator presented each panellist with a grid of key characteristics of a power cut, made up of nine key service attributes, each of which was represented by up to seven possible underlying levels (refer to Showcard E). These characteristics had been selected as most likely to influence customers' perceptions of the reliability of supply and how the impact might be mitigated, based on analysis identified in the literature review; the support already provided by Electricity North West; and ECP feedback in the previous sessions.

Panellists were asked to contemplate each of the service attributes in the grid and evaluate whether the difference between the various levels was clear or needed further explanation, and whether they considered any levels were inappropriate or missing. Panellists were then asked to reflect on their individual experience and highlight the level of service they believed Electricity North West currently delivers to them. The principal characteristics of supply defined by customers as measures of reliability, impact or mitigation were as follows:

- The frequency of interruptions is more important than duration. A large number of shorter interruptions is regarded a more intrusive than fewer longer power cuts.
- Good channels of communication and the availability of accurate information is central to customers' ability to manage unplanned supply interruptions and mitigate their impact.
- Customers are more accepting of planned interruptions with sufficient notice, which allows them to make alternate arrangements.

The ECP's evaluation of the individual attributes and the appropriateness of the associated levels as a customer measure of VoLL are examined further below:

Attribute 1: Type of interruption

Levels:

- Planned
- Unplanned.

When probed about the language used to describe electricity supply interruptions, panellists recognised and understood the term 'interruption' but tended to relate the word to PSIs or short duration events. They believed that using 'interruption' was preferable to the word 'outage', which they felt many customers would not recognise. Some suggested the use of 'failure' or 'blackout' but unanimously agreed that the most appropriate and universally accepted terminology is 'power cut', particularly when referring to sustained incidents.

Attribute 2: Advance warning of a supply interruption

Levels:

- 14 days' notice (planned)
- 7 days' notice (planned)
- 48 hours' notice (planned)
- Less than 24 hours' notice (unplanned) urgent situations where limited notice is possible
- No notice (unplanned) faults and emergency situations.

Panellists considered the attribute levels were appropriate but regarded the statutory two day notice period as inadequate. They also had an expectation that DNOs could improve their PSI communication strategies by providing customers with notification a week or fortnight before the event, along with a follow up notice around two days before the outage. The ECP suggested this would act as both a reminder and a failsafe mechanism for customers who had either not received or had discarded the original communication.

Attribute 3: Frequency of interruptions

Levels:

- No interruptions in a three year period
- One interruption in a three year period
- 2-3 interruptions in a three year period
- 4-6 interruptions in a three year period
- 7-14 interruptions in a three year period
- 15 or more interruptions in a three year period.

As outlined in Section 2.2.1 there was some confusion about the presentation of customer interruptions per 100 customers (refer to Showcard C) and therefore, panellists were asked to consider frequency as an acceptable measure of supply interruptions over a three year period.

Some panellists were puzzled by the depiction of frequency over three years, suggesting that events over 12 months were easier to recall and therefore a more appropriate measure.

"I can't remember what happened three years ago." SME

However, when the rationale for the three year measure was explained, ie defining interruptions over 12 months would involve presenting the number of interruptions as a

fraction, the ECP was more accepting of the approach, recognising that providing percentage figures could cause greater confusion.

Attribute 4: Duration of interruption

Levels:

- Up to three minutes
- 1 hour
- 4 hours
- 6 hours
- 12 hours.

The ECP found the reliability measure for duration far simpler to understand than that for frequency. However, they collectively agreed that it would be easier to understand the presented levels if they were all prefixed with the words “up to”.

Before the second group discussion commenced, the ECP were presented with a copy of the [Guaranteed Standards of Service](#), specific to reliability of supply. After reading these materials, some panellists incorrectly believed that a payment was available after a three hour interruption, having misinterpreted the multiple standard (EGS2a), which entitles a customer to a payment after experiencing four interruptions lasting three hours or more in a 12 month period.

However, in light of this interpretation, it was suggested that a level of up to three hours, would be a more appropriate level to measure than the original level of up to four hours.

An additional level of over 12 hours was also considered prudent, after which a Guaranteed Standard payment is available to customers.

Panellists who had experienced PSIs reported that these were usually scheduled to last approximately eight hours, with prior written notice normally quoting outage times from between 9am to 5pm, but in reality, the duration was generally less. As such, the panel felt a level of up to eight hours was more suitable than six.

Attribute 5: Time of day

Levels:

- Early morning peak (6:30am to 9:00am)
- Day time (9:00am to 4:00pm)
- Peak (4:00pm to 9:00pm)
- Late evening (9:00pm to midnight)
- Off-peak (midnight to 6:30am).

The ECP understood the terminology ‘peak’ which was used in the grid to define the periods of heaviest domestic consumption during early morning and evening, characterised by the GB electricity demand profile. However, most participants agreed that the word peak was unnecessary and should be removed on the basis that peak differs for business and domestic customers:

“Some businesses operate 24 hours a day. Could you not just put a time, why do you have to give it a name (peak)?” SME

Each customer’s perception of peak could also vary dependent upon their unique circumstances.

It was suggested that 6:00am was a more appropriate timestamp than 6:30am, as many customers rise at or before this time to get ready for work.

Attribute 6: Day of week

Levels:

- Weekday (work day)
- Weekend (non-work day)
- Bank holiday.

Panelists agreed that a weekday should not be defined as a work-day and similarly, weekends should not be classified as a non-work day because this distinction is outdated:

“Get rid of the word (workday) and put Monday to Friday, assuming that’s what they mean by that, because I work weekends.” Urban, domestic

However, most participants agreed that while the majority of bank holidays are now normal trading days, bank holidays are still distinct for many. As such, a power cut on the most significant of these ie Christmas day, is likely to have a considerably greater financial and social impact on domestic customers than an interruption occurring on a normal week day or weekend.

Attribute 7: Additional assistance for vulnerable customers

Levels:

- Home visits from 'customer champions'
- Welfare packs
- Mobile generation
- Provision of hot food and drinks
- Mobile device charging facility
- No support.

Despite Electricity North West currently providing the majority of these support mechanisms to vulnerable customers in certain circumstances, and its extension of this provision during large scale events to the wider populace, the general sentiment was that it is impractical for the DNO to provide these enhanced services as a standard response.

Panelists generally considered that DNOs have a social responsibility to provide enhanced support to the elderly, infirm and those customers with complex medical needs:

“I feel they’re morally obliged to provide services for the most vulnerable people.”

Worst-served

However, they were unclear about the wider definition of vulnerability, which had intentionally not been defined in the ECP materials to test perception.

The issue of support was somewhat divisive with some considering the option of no support was acceptable, either because provision of assistance is impractical for the DNO, or that individuals have a responsibility to make their own arrangements:

“I think that people who rely on medical equipment should have their own generator.”

Urban, domestic

Others suggested that they were uncomfortable with Electricity North West diverting limited resources into providing support and that investment should be focused purely on the infrastructure and engineering personnel, to minimise interruptions and to ensure supply is restored quickly when faults occur.

Other panellists indicated additional support mechanisms should be available for vulnerable customers and the wider population under certain circumstances, to include the provision of, or payment for, accommodation.

Panellists were confused by the term 'customer champion' and requested clarification about whether these individuals were likely to be employees of the DNO or external representatives such as charitable organisations.

Attribute 8: Communication

This service attribute investigated a range of proactive communication channels via which notification of, and information about, an interruption could theoretically be provided.

Levels:

- Nominated contact to receive updates on your behalf/in addition to you
- Phone call(s) made directly to you by the contact centre
- Short message service (SMS) sent to your mobile phone
- Automated text-to-speech updates sent to your phone
- Social media updates (Twitter, Facebook etc)
- Public address/tannoy system update on site
- No proactive updates.

The ECP resolutely agreed that managing expectation by providing accurate information about the cause of a power cut and, critically, when supply will be restored was the most important factor in a customer's ability to manage the situation and where necessary, make alternate arrangement for their household or organisation. Panellists collectively agreed that easily-accessible communication platforms, by which clear and accurate information can be delivered, is the service attribute that most fundamentally mitigates the impact of an interruption.

The ECP agreed that all the communication channels presented in this service attribute were retained but proposed that email updates should also be added. Emails were considered a better means of sending customer updates than SMS. Others suggested this channel of communication might be used by Electricity North West to provide a link to the website, where regular updates are posted.

The use of a public address system was considered an appropriate means of providing proactive customer updates in densely populated urban areas and has been used successfully by other utilities. However, this was recognised as less appropriate in rural locations.

The panel also debated the merits of using letters and road signs to provide advanced notice of, and information about, power cuts, similar to the way in which utility companies communicate localised road works; however, it was agreed that these measures were more suited to planned supply interruptions.

SME customers indicated that they expected more tailored support, implying there was a need for a DNO to provide business account managers to proactively support commercial organisations during a power cut.

Attribute 9: Quality of information

Levels:

- A justified reason for the interruption
- Accurate restoration time
- Number of properties affected by the fault

- Advice on what to do during a power cut
- Confirmation that power has been restored
- No information provided.

Some panellists considered that there was no requirement to proactively advise customers when supply is restored; however, members with greater experience of sustained interruptions, who had vacated their property during past outages, placed greater emphasis on the requirement of this level and the importance of its retention as a test attribute.

The ECP recognised that stating the number of properties affected by a fault demonstrates the extent of the problem; however, they believed that providing the geographical region has greater resonance with customers.

The panel recognised that effective proactive communication strategies during power cuts also affords the DNO the opportunity of raising awareness about the additional assistance available to its vulnerable customers, specifically, how to register on the priority services register (PSR).

2.3.1 Suggested additional supply characteristics to measure VoLL

The ECP was finally asked to consider if there were any key impacts or expectations relating to service that had been missed from the list of attributes and levels in the grid. The issue of compensation was raised by all ECP sub-groups with the notable exception of the worst-served customers.

A monetary payment attribute was not included in the grid presented to the ECP. This was deliberately omitted on the basis of previous experience in research of this kind, as it can result in lengthy and unhelpful debate about appropriate levels of compensation. In the customer survey, VoLL will be measured in terms of customers' willingness to accept (WTA) compensation for lost load and willingness to pay (WTP) for avoidance of lost load. The inclusion of these measures satisfies the ECP's requirement to include financial compensation. Therefore, the hypothetical financial incentives and penalties that will be included in the survey instrument will be pre-determined and consistent with those tested by London Economics in a similar study for Ofgem and the Department of Energy and Climate Change as referenced in the VoLL methodology.

2.4 Testing the trade-off exercise

The survey will include a choice experiment (CE) to robustly measure VoLL. This will involve asking customers to trade off different levels of supply reliability in exchange for an incentive. This will be measured in terms of customer WTA compensation and WTP for avoidance of lost load. (This approach is briefly described in Section 5.1 of this document; Section 2.3 of the VoLL methodology statement (version 2) and is explained comprehensively in the literature review, all of which are published on the [VoLL webpage](#)).

The ECP was presented with a pair of scenarios containing a range of variables relating to a power cut (Showcards G and G1). The variables in these scenarios were selected from the attributes and levels in Showcard E.

Participants were asked to select the most appealing of each pair to understand whether they were able to easily complete the task, given the varied range of attributes presented.

It is critical to the success of the VoLL research that the trade-off (conjoint) exercise is clearly understood and easy to administer, to ensure the accuracy of the data collected in the customer survey. The analysis of responses to these scenarios in the survey will demonstrate complex decision-making processes that will be used to determine which characteristics of supply interruptions have the greatest financial or social impact on customers, based on a hypothetical price that respondents are willing to pay to accept or

avoid interruptions with certain characteristics. This data will also identify how these impacts might be mitigated by improved communication and support strategies.

To introduce and contextualise the exercise, the panel was first presented with Showcard F which linked any payment that customers were willing to incur for improvements in reliability with increased bills. This would result in them having less money to spend elsewhere and thereby have an impact on household or business expenditure.

Many appreciated and understood the sentiment behind this showcard; however, it also confused the ECP who then had difficulty thinking about the subsequent trade-off in general or hypothetical terms:

“Well it tells you it’s a real situation that we’re in, that they’re actually having to make these decisions so it’s not just talking hypothetically. It’s giving you a reality check about the fact that this is your money.” Urban, domestic

Consequently, it was difficult to regain the group’s focus and despite providing a thorough explanation of the objectives of the trade-off and reiterating that the payments involved were purely hypothetical; most panellists were then unable to generalise the concept and struggled to complete the task.

Participants understood that they were required to choose the most preferable scenario, made up of a combination of variables. However, the payments they were offered to accept a situation or pay to avoid it were interpreted literally and generated unhelpful debate. Participants also failed to realise that the questions were being asked of them individually and not collectively as a group.

The literal interpretation of the price adjustments presented in the trade-off exercise generated enquiries about reimbursement of a payment, if there was subsequent regression in the reliability of supply. SME panellists’ also found the domestic, one-off payment disproportionate to the commercial payment presented in the conjoint exercise which, rather than expressed as a monetary value, was represented as a percentage of the respondents’ annual bill.

The discussion about price adjustments naturally led to further debate concerning the extent to which improvements could or should be funded out of company profits, as opposed to increasing bills. This was a particularly strong sentiment for worst-served customers who reached a consensus that they should not have to pay more for the privilege of receiving the same level of service as other customers in the region:

“They’re charging us enough for electricity anyway, and they’re making a vast amount of money. Why can’t they just improve the services full stop?” Worst-served

Some participants found it difficult to make a choice when there was too much variation in the trade-offs. The variables were easier for the ECP to assimilate when more of the levels in the two scenarios were the same. There was also a suggestion that there might be too many attributes for respondents to make a clear and informed choice:

“There are five things that are different. So there’s too many differences between the two. So it’s making a more complicated choice. You’re asking the customer to pick between five options.” Worst-served

3 LESSONS LEARNED FOR FUTURE INNOVATION PROJECTS

3.1 The relationship between DNO and supplier is still confusing for customers

When introducing research and development projects to customers, it is imperative that the relationship between the DNO and electricity suppliers is explained and understood. This should be reinforced with an explanation that the DNO is responsible for a regionally based infrastructure; does not have any involvement in the calculation or production of customers' bills; and that customers are unable change their DNO, whereas they can change their supplier.

3.2 Customers find it extremely difficult to imagine, or are unwilling to accept, the extent of future electricity demand

Based on learning from previous Low Carbon Networks (LCN) Fund projects, the background and context of information introducing the low carbon agenda and a DNO's potential responses to the challenge should be concise, focused and specific to the project.

The Q&A document was effective as an introduction to Electricity North West and the challenges facing DNOs in a low carbon future. However, in line with findings from previous projects, this research highlighted that an ECP which is predominantly comprised of domestic customers needs to be educated about the low carbon agenda and the anticipated increase in future demand for electricity before its members are able to understand the challenges facing the energy sector.

Customers appear to find it extremely difficult to imagine, or are unwilling to accept, the extent of future demand and consequently, increased dependence on a reliable electricity supply.

However, the context of educational materials should be targeted to limit the tendency to start a wider debate on tenuous issues. It should be anticipated that, in the present economic climate, discussions around the electricity needs of customers could stimulate comment on topics such as rising energy prices, fuel poverty and cost implications for taxpayers. These valid concerns might resonate with participants but be irrelevant to the ECP's objectives. Any deviation from the key focus of discussion requires careful management to avoid distraction, confusion and the waste of valuable time.

Early adopters of LCTs, particularly those who have experienced power cuts, are more able to visualise increased reliance on electricity in the future. However, both early adopters and non-LCT users perceive that new technologies and innovations in electricity storage will allow the energy sector to manage increased demand without any significant customer impact. As such, customers find it difficult to link the impact of supply interruptions in a future scenario with their personal reliance on electricity for heat and transportation.

The survey instrument will be carefully designed to mitigate any difficulties respondents may have in imagining increased dependence on a reliable supply in the future. To increase the likelihood that respondents will seriously consider the future LCT scenario and the impact on their household/business, tailored education materials will be placed at the start of each section of the survey. These materials will include references to specific LCTs and how their increased uptake will significantly affect future reliance on a secure electricity supply.

In view of some panellists' difficulty or reluctance to imagine/accept the future scenario, it is prudent to conduct a pilot survey with a previously unengaged group of customers, to assess their ability to imagine electricity usage in a future context with sufficient clarity.

The final survey instrument will be refined as necessary, after analysis of the pilot responses, to ensure it is able to effectively capture the views of early adopters of LCTs and those customers who are presently unfamiliar or have little awareness of current innovations in these technologies.

3.3 Any activities that might be interpreted by customers as involving a direct financial cost need to be carefully introduced and thoroughly explained

The approach to this research had always intended to explain the stated preference exercise much more comprehensively in the main survey than to the ECP, whose primary task was to identify appropriate characteristics to include in the conjoint exercise. ECP engagement was not designed to shape this element of the research. However, the panellists' constructive feedback highlighted the importance of being very clear when introducing CE exercises that contain a financial element. Any inference of an incurred cost requires an explanation that adequately describes why respondents are being asked to consider a hypothetical sum in the presented scenarios to reassure them that a WTA/WTP figure is merely a means of customers attributing a value to a combination of different service elements.

The ECP was asked to evaluate the proposed conjoint exercise to ensure that the task was understood, could be completed with comparative ease and establish the decision making process the participants verbalised when making their choices. Lessons learned from this feedback will have a significant impact on the design of the survey, specifically the CE to ensure it is appropriately introduced, correctly understood and accessible to respondents. The final survey instrument will reiterate that any payments are purely hypothetical and will not be made to, or requested from, the respondent. The survey will include sufficient educational content to ensure that respondents recognise the importance of considering the scenarios in an informed and realistic manner, based on their own or their organisation's circumstances and perspective.

To ensure that survey respondents, who are largely unsupported when completing the pilot survey online, are comfortable with the conjoint exercise, the payment element of the exercise will be firmly anchored to the proportion of the bill that covers electricity distribution.

Customers are extremely sensitive to the element of profit on their electricity bill and were surprised that network costs account for approximately 17% of a typical electricity bill.

Educational materials for projects that infer any association between network investment and customer bills should provide a clear explanation about the component parts of electricity bills. This should be contextualised by defining how the DNO invests the distribution element of the bill in maintaining and improving the network to provide customers with a safe and reliable electricity supply.

3.4 It is important to pilot draft survey instruments with a range of customers who have no prior knowledge of the project

A previously unengaged group of customers will complete a pilot of the survey instrument either online or face-to-face with the assistance of a professional interviewer. Their feedback will be influential in ensuring that the final survey instrument is suitable and that any technical difficulties in accessing, navigating or being unable to complete the pilot survey are identified.

Following misconception about the stated preference CE exercise, specifically the WTA/WTP element, and the difficulties encountered by the ECP in interpreting this task, additional educational and briefing materials designed to introduce the CE will be embedded into the survey instrument and tested in the pilot.

Previous innovation projects have consistently demonstrated the importance of piloting a draft survey instrument with a range of customers who have no prior knowledge of the project or its research objectives. Administering a survey in this manner is the most effective means of ensuring that the content of the final instrument is optimally refined before the launch.

The findings of the pilot survey will be documented separately in November 2016 and this report will form one of a series of project dissemination documents supplementing the main conclusions and recommendations, due to be published in January 2018.

3.5 Do not have pre-conceived ideas about customer tolerance

Individual customer expectations of supply reliability vary significantly depending on their circumstances. However, there is a relationship between high expectation of reliability and infrequent exposure to supply interruptions. Rural domestic customers and SMEs, such as farms, which tend to have greater experience of supply interruptions, are largely more pragmatic, with a higher tolerance of unplanned interruptions. They are also much more resilient than customers residing or operating businesses in urban areas. Notably urban customers, who report a higher than average number of power cuts, also appear to lower their expectations of reliability and exhibit greater tolerance than those who have little or no experience of outages.

This finding emphasises that customer perspectives do not necessarily conform to what might be anticipated. Future research of this type should anticipate counterintuitive opinions and capture the views of diverse customer segments, supplied from different rural and urban networks.

3.6 Customer perception of vulnerability can be narrow

The ECP generally accepted that DNOs have an obligation to provide enhanced support to vulnerable customers. However, the definition of vulnerability was subject to different interpretations with few panellists being aware of the PSR or eligibility to register.

To ensure that the wider definition of vulnerability was understood and reflected in the survey responses, educational materials were provided referencing [Ofgem's definition of vulnerability](#), which gives appropriate guidance on the characteristics of customers who may find themselves in vulnerable circumstances.

3.7 Customer engagement materials should be tailored to the specific audience

Panellists in the SME group were resistant to some of the more generic engagement materials, which they felt were more appropriate to domestic customers. For example, SMEs had a raised expectation for a personalised service ie key account managers in the provision of proactive communication during an unplanned supply interruption. SMEs also differed from domestic customers in their reaction to the levels provided in the conjoint grid for the time of day in which supply is interrupted. This was linked to obvious differences in the typical demand curve for each customer segment.

This feedback highlights the need to appropriately tailor the survey and associated educational materials to distinct customer groups, namely domestic customers and SMEs.

3.8 Exercise caution with the volume of reading participants are required to undertake

Panellists were emailed a four-page frequently asked questions (FAQs) document entitled 'The cost of power cuts to customers' before the first ECP meeting and were asked to read it before attending. The FAQs contained information about the structure of the electricity industry; the role of Electricity North West; the composition of charges on a typical electricity bill; the financial and social impacts of power cuts to customers and a description of the VoLL project.

On arriving for the first ECP meeting, panellists were provided with an additional, six-page leaflet to read. This contained information about the problem that the VoLL project seeks to solve, the nature of the customer engagement being undertaken and a Q&A section on power cuts.

Although all of the information provided was useful, not all of it was essential to achieve the learning outcomes of the first meeting. Therefore, the amount of directed reading was

reduced for the remaining ECP subgroups to mitigate the risk of not being able to evaluate the most important information and messages.

Providing additional reading before, during or after an ECP meeting is an effective way of optimising the education process and the learning it generates. However, where the volume of reading or activity required of the ECP, beyond simply attending a focus group meeting is high, the following measures should be considered:

- Enhance the incentive provided to panellists for participation
- Increase the number of meetings that are convened
- Arrange meetings over a longer time period.

Caution should be exercised where participants are expected to read a relatively large volume of supplementary information. In these circumstances, the above measures are likely to ensure that an ECP remains sufficiently engaged in the process.

3.9 Enhanced recruitment criteria should be considered for SME participation

A recruitment screening process was used to ensure a broad range of SMEs and industry sectors were represented within the ECP, irrespective of their dependency on a continuously available supply and/or supply interruption history. SME participants all held sole or joint responsibility for supply contracts within their respective organisations.

When recruiting SMEs into future projects, greater granularity in the recruitment criteria may be beneficial, depending on the specific subject matter. In the context of VoLL, this may include, but should not be limited to, targeting specific industrial sectors, such as those that have a critical dependency on continuous electricity provision.

The way in which dependency on the continuous availability is defined in the customer survey instrument will primarily be informed by an understanding of the impact of interruptions on these customers. A methodology for defining dependency is provided in the VoLL methodology statement (version 2).

Additional criteria could have been applied by targeting specific job titles, such as individuals in senior leadership and technical roles, who are likely to have had a greater appreciation of the financial and social impacts of supply interruptions on their organisations.

3.10 Online streaming is an effective solution for administering rural ECP meetings

It was important to engage with representatives of a range of customer segments in the ECP to fully establish customer perceptions about supply interruptions and their impact. To maximise participation, venues selected to host focus group meetings should be in close proximity to relevant participants. When this involves engaging with customers from rural regions, venues designed specifically for client-viewed focus groups are rarely available. In these circumstances, facilities able to accommodate live web streaming, rather than a one-way mirror arrangement should be considered. This approach was adopted by the VoLL project team and the ECP was effectively administered by organising an accessible, well-known local hotel with free parking and conference/meeting facilities comprising:

- A 'meet and greet' area where a hostess could sign in participants and provide them with refreshments and any reading materials
- A meeting room easily accessed from the meet and greet area for the focus group to take place with a camera and microphone set up for live streaming
- An adjoining meeting room for the project team to view live footage of the meeting through live web streaming.

For future projects, depending on the streaming technology utilised, the venue's WiFi connection need not be relied upon to facilitate the live streaming. The implication of this is

that coverage of the meeting is not interrupted, making online streaming an effective solution for administering ECP meetings.

3.11 Outcome

Recruitment of the ECP across the four key segments was a proactive approach to effectively engaging customers. It was also successful in identifying key characteristics (attributes and levels) of supply interruptions that are most appropriate to measure VoLL across a broad customer base in a conjoint exercise embedded within a customer survey.

4 CONCLUSIONS

This report sets out the key findings from one phase of strategic qualitative market research conducted with the VoLL ECP. The findings of the depth interviews and pilot survey will be documented separately and form a series of project dissemination documents, supplementing the final conclusions and recommendations report, due to be published in January 2018.

This customer research has provided Electricity North West with an enhanced understanding of customer perception of VoLL, how value is defined and how this might be influenced. The study has identified common and significant impacts of supply interruptions and expectations around the support mechanisms that a DNO might provide to mitigate these impacts eg better communications.

This research was successful in identifying the most appropriate characteristics of supply interruptions to incorporate into the choice experiment exercise, in order to guarantee the robust and accurate measurement of VoLL by customer segment in the final phase of the project. These key attributes and levels provide a suitable framework to accurately examine all of the main factors that adversely impact customers as direct and indirect results of lost supply and model the likely changes to VoLL as LCTs are increasingly adopted onto the network.

The customer engagement methodology deployed in this phase of the project was effective and demonstrated the importance of a robust and appropriate research approach to achieve the objectives of phase three, namely the accurate and granular measurement of VoLL.

The engagement was also successful in developing a range of suitable communication materials and themes to introduce Electricity North West, the project, the problem and the research objectives to survey respondents during phase three.

The main quantitative survey will be piloted in phase two with a statistically robust and previously unengaged audience of domestic and SMEs customers.

The large-scale customer survey will be conducted in two stages starting in December 2016 followed by a second phase of fieldwork in summer 2017, to establish seasonal variations in responses.

5 NEXT STEPS

5.1 Refining VoLL

The next stage in phase 2 of the VoLL research will comprise depth interviews with a cross-section of customers, and with stakeholders likely to be in contact with customers during a supply interruption. This includes, but is not limited to, vulnerable customers, hospitals, care homes, British Red Cross, Age UK and communications companies. Customers interviewed will also include those that have recently endured high impact, low probability events such as the storms and floods affecting North West England during the winter of 2015/16.

Following the completion of the qualitative phase of the research, the survey will be piloted with the ECP and a wider audience of previously unengaged domestic and SME customers.

5.2 Measuring VoLL

The final stage of VoLL customer engagement will be conducted during the third phase of the project and will involve a large-scale quantitative survey.

A total of 6,000 surveys will be completed by customers from across the whole of GB, 3,000 of which will involve domestic and SME customers in Electricity North West's operating region. A total of 5,000 interviews will be conducted with domestic customers and 1,000 interviews with SMEs who are heavily dependent on a continuous and reliable supply of electricity. The survey will include a stated preference CE that was identified in the literature review as being the most robust technique for measuring VoLL. This will involve asking customers to trade off different levels of supply reliability and support in exchange for a hypothetical financial incentive (WTA) or payment (WTP). This method is based on previous research which has demonstrated quite different results from these two approaches, with WTP values being notably lower than WTA values.

5.3 Dissemination of findings

In line with the vision of the NIA funding mechanism and the project commitments documented in the method, all outputs and learning acquired from VoLL customer engagement activities will be made available to other DNOs. Specifically, all communication and survey materials developed as part of this project will be publicised on the VoLL webpage. There will be ongoing learning and dissemination via an annual NIA project progress report, quarterly stakeholder updates and other appropriate forums. The project findings, lessons learned and implementation recommendations will be documented in a final report which will be submitted to Ofgem for publication on the ENA's [smarter networks portal](#) by January 2018.

As part of the recruitment process, ECP panellists were required to sign a consent form, the details of which are provided in the VoLL data privacy statement. Panellists' explicit permission was sought and granted for the use of soundbites and video footage from the group discussions at industry learning events. The use of such recordings has been found to provide an engaging means of demonstrating the outcomes and intrinsic value of the ECP, and will be utilised as part of the project's dissemination.

6 APPENDICES

APPENDIX 1: KEY LEARNING OUTCOMES INCORPORATED FROM PREVIOUS LCN FUND PROJECTS

Figure 6.1 lists the learning from previous LCN Fund projects – C₂C, CLASS, Smart Street and Respond – that were subsequently applied to the VoLL customer engagement methodology:

Figure 6.1: Applied learning

Learning from C ₂ C, CLASS, Smart Street and Respond	Application to VoLL
<p>The ECPs for both projects demonstrated that customers had little or no understanding of Electricity North West’s identity and were unable to differentiate the role of DNOs from suppliers. They also lacked awareness of the decarbonisation agenda, the increasing demand for electricity and the potential need to expand the electricity network. Customers needed to be educated about these matters before new concepts could be introduced.</p>	<p>Draft communication materials were presented at the first ECP meeting to introduce participants to Electricity North West, the DNO’s role and responsibilities and how they differ from those of suppliers and National Grid Electricity Transmission. Details of the composition of an average domestic electricity bill were also shared, highlighting the proportion representing distribution charges. Once the position of the DNO was understood, ECP panellists were more able to engage in informed discussions about their experience of power cuts, and the concepts introduced to elicit customer perception of VoLL.</p>
<p>ECPs had previously valued a simple ‘Who’s who in the electricity industry?’ Q&A factsheet and showcards highlighting key information. Videos were found to be particularly effective in explaining the complex concepts and how customers might be affected.</p>	<p>The role of the DNO was explained in a simple manner through a mixture of audio and visual methods that had been effective in the previous projects (FAQs, showcards and video).</p>
<p>Customers’ main concern was consistently the likely impact or benefit, if any, of the project on them. They were also concerned about whether there would be any change or disruption in service, or increase to their bills.</p>	<p>Customers will not experience any changes to their power quality or reliability as a result of this project. The focus of the research was to assess the key factors socially and financially impacting individual customers and any parity of impact within the wider ECP group.</p>

APPENDIX 2: TERMS OF REFERENCE

Overall objectives of phase two ECPs

The key research objectives of phase two ECPs were to:

- Establish customer perception and impact of VoLL on key customer segments
- Evaluate materials that will be integral to a customer survey instrument, in particular key attributes and levels associated with the impact of supply interruptions and the type of support that might be provided to mitigate these impacts. These attributes and levels will form the basis of a trade-off exercise, specifically a choice-based conjoint.

The customer engagement method designed to meet the research objectives for phase two of this project is set out in Section 5.1 of the VoLL methodology statement (version 2).

Addressing the objectives with an ECP

The research objectives were exploratory by nature and required a methodology that elicited deeper understanding of customers’ experience of supply interruptions, expectations around reliability and if this might be perceived differently by different customer segments. Focus groups are proven to be a suitable platform to explore complex concepts and encourage informed discussions and were seen as an appropriate mechanism for this research activity.

An ECP comprised of four distinct customer groups, likely to have shared experiences, was convened and met on two separate occasions in April and May 2016. The ECP was represented by domestic customers and SMEs from a range of commercial sectors.

During the ECP, a professional, independent moderator asked participants semi-structured questions relating to a predefined list of topics. During these meetings, information was shared and evaluated by the participants who were encouraged to provide feedback and share their unique experience in relation to the discussion topics. This format allowed the moderator the flexibility to question participants further on issues arising through open discussion. It also fostered the natural evolution of the ECP’s understanding of the role and responsibility of Electricity North West, the causes of power cuts and customers’ perception about different impacts on different customer groups.

The iterative approach adopted allowed the project team to develop, test and evaluate communication materials to support the development of the customer survey instrument. This customer engagement approach follows the successful deployment of similar techniques by Electricity North West in its previous LCN Fund projects, C₂C, CLASS, Smart Street and Respond.

Re-convened ECP meetings

The focus areas of the two meetings are outlined in Figure 6.2.

Figure 6.2: ECP meetings

ECP meeting	Research objective
ECP meeting 1	<ul style="list-style-type: none"> • Introduce Electricity North West, its role as a DNO in the electricity industry and its relationship to National Grid and suppliers • Establish customer perception and impact of VoLL on their household/business
ECP meeting 2	<ul style="list-style-type: none"> • Evaluate draft survey instrument, in particular the attributes and levels to be used in the choice based conjoint, with regards to effectiveness and accuracy of data collection

The initial round of ECP meetings for each of the customer groups included an introduction to Electricity North West, ensuring the role of the DNO within the electricity sector was understood. It then introduced relevant concepts that led to the examination of customer perception of supply reliability. These discussions fostered debate about personal experience and were designed to generate feedback on: expectations around support and communication during a supply interruption; the DNOs responsibility for the provision of support; and opinions on the obligation of individual customers to have their own continuity and resilience measures in place.

The second round of focus group meetings was designed to elicit more detailed understanding of customers’ perceptions and the characteristics they believe are most appropriate in calculating the value of lost load.

In the time between the two ECP meetings a table of attributes and levels was developed, based on feedback in the previous session (refer to Showcard E). This table incorporated the factors identified as most adversely affecting customers during a power cut and those likely to mitigate the effects.

Supplementary educational materials to inform the focus group debate were also produced. These materials were evaluated by the ECP during the second meeting and are intended to support the customer survey. The materials will be further refined before a pilot survey. This approach will facilitate final enhancements before the launch of the final survey instrument in phase three of the project.

The learning outcomes from the re-convened ECP meetings are documented in Section 0.

Membership of the ECP

The ECP was comprised of four separate focus groups, each one representing a key customer segment. A maximum of ten individuals were recruited to participate in each of the four key customer ECP subgroups.

Recruitment was on the basis that participants would attend both scheduled meetings. Participants were geographically clustered to enable easy access to the meeting venues.

The ECP was recruited to reflect a broad customer demographic reflective of age, gender, social grade, region and household composition, as demonstrated in Figure 6.3.

Figure 6.3: ECP subgroup definitions

Key customer segment	Region	Customer type	Gender	Age
Domestic urban	Manchester	Domestic	Equal proportion of males and females	5 <45 years old and 6 >45 years old
SME	Manchester	SME	Equal proportion of males and females	No quota on age Quota on business size
Domestic rural	West Lancashire	Domestic	Equal proportion of males and females	6 <45 years old and 5 >45 years old
Worst-served	West Lancashire	Mixed (mainly domestic)	Equal proportion of males and females	5 <45 years old and 6 >45 years old

APPENDIX 3: FREQUENCY OF MEETINGS AND ATTENDANCE

Each ECP met on two separate occasions (see Figure 6.4). The meetings lasted approximately 90 minutes each and were facilitated by an accredited Interviewer Quality Control Scheme qualitative moderator.

Figure 6.4: ECP meeting dates

Meeting	Date
ECP meeting 1	April 2016
ECP meeting 2	May 2016

The ECP members were expected to attend both meetings and to secure this, were advised of the dates before committing to take part.

A target attendance level of at least eight customers was set for each meeting. Based on previous customer engagement, it was anticipated that the attrition rate of customers who no longer wished to participate would be approximately 10%, or one person, between the two meetings. Recruiting ten customers allowed sufficient mitigation for non-attendance.

The minimum attendance of eight people per group was achieved on all occasions as set out in Figure 6.5:

Figure 6.5: ECP attendance

ECP Meeting	Domestic urban	SME	Domestic rural	Worst-served
ECP meeting 1	10	10	8	9
ECP meeting 2	9	9	8	9

Administrative support and facilitation

The ECP research was conducted by Impact Research, an independent market research agency, on behalf of Electricity North West. All research was carried out in accordance with the professional standards set out in the Market Research Society Code of Conduct.

Impact Research were responsible for the day-to-day management of the ECP, booking of venues, associated arrangements and moderating the group discussions. They were also responsible for the provision of analysis and documentation of the findings.

Incentives

Domestic participants were offered a cash payment of £60 for attending each of the two meetings. SME representatives were offered a higher cash payment of £80 for attending each of the two meetings. This tiered payment was recommended by Impact Research based on previous experience of recruiting customers to take part in similar multi-session panels, where specific recruitment quotas are required, such as a range of business sizes. Customers were required to sign a claim form to document receipt of the payments and could elect to make an equivalent donation to a registered charity of their choice if they preferred.

Meeting the requirements of the customer engagement plan

The customer engagement plan placed a commitment on Electricity North West to engage appropriately with relevant customers taking part of this study. This was achieved by:

- Providing customers with appropriate communication materials from the outset. This included general information about the project objectives, the existing industry model of VoLL and why research is necessary to understand the true value of interruptions to different customer groups
- Effective communication strategies in focus group meetings and interviews using tailored communication channels, including written, audio and visual media
- Delivering these materials in such a way that VoLL is not confused with engagement associated with the smart meter rollout
- Being guided by feedback from the ECP in refining the customer communication approach.

APPENDIX 4: PROJECT REPLICATION

The list of physical components required to replicate this activity is shown below:

- Database of customers in the geographical area of interest
- Recruitment screener
- Recruitment quotas
- Discussion guide
- Stimulus materials
 - FAQs document explaining the role of a DNO and industry structure; composition of charges in a typical electricity bill; the problem the project seeks to address and customer engagement being undertaken
 - Q&A document with information relating to the common causes of supply interruptions and how they are typically managed
 - Audio communication materials eg a video including an introduction to the DNO and the lifecycle of a supply interruption
 - Visual communication materials eg industry definition of supply reliability; current level of DNO supply reliability; Guaranteed Standards of Performance; a list of potential DNO investment priorities; an explanation and mock-up of the stated preference exercise and information regarding the impact of a low carbon future
 - A grid of key characteristics of a power cut and underlying levels of service likely to cause the greatest financial/social costs to customers.
- Focus group venue
- Web streaming technology
- Transcripts and audio recordings.

The knowledge required to replicate the outcome of this activity is as follows:

- Knowledge of the geographical area of interest
- Knowledge of customer profile
- Knowledge of various methods of recruiting customers for an ECP
- Knowledge of qualitative research methods required to produce the physical components listed above for recruitment, design, moderation, analysis and reporting
- Knowledge of quantitative research methods required to produce the survey instrument and FAQs.

The anticipated project replication costs are in the region of:

- Conducting an ECP (40 customers taking part in two phases of focus groups across two different locations) – £39k, of which incentivisation – £5k.

APPENDIX 5: ENGAGED CUSTOMER PANEL SHOWCARD

Customer	Season	Time of day	Duration of power cut	Frequency	Quality of information	Availability of support
Domestic households	Spring	Early morning 6am-9am	1-3 hours	1 per year	Ease of communication	Welfare packs
Commercial organisations	Summer	Daytime 9am -5pm	3-6 hours	2-3 per year	Availability of regular updates	Home visitors
Organisations providing care/support to other customers (eg hospitals, care homes)	Autumn	Evening 5-10pm	6-12 hours	4-5 per year		Hot drinks
Customers experiencing a form of vulnerability	Winter	Night-time 10pm-6am	12+ hours	5-10 per year		
Customers with no gas supply and/or above average electricity usage				10+ per year		
Customers living in remote rural locations						
Customers living in city/densely urban areas						
Customers living in flood plains						
Customers with low carbon technologies such as electric vehicles, solar panels						