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The future

The Value of Lost Load (VoLL)

Phase Two: Refining the approach

Depth interviews – key findings report

31 August 2016

CONTENTS

VERSION HISTORY

Version	Date	Author	Status	Comments
1	15 August 2016	Impact Research	Draft	
2	23 August 2016	T. Kennelly/ K. Quigley	Version 1	
3	31 August 2016	T. Kennelly/ K. Quigley	Version 2	

APPROVAL

Name	Role	Date
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GLOSSARY

Abbreviation	Term
ASD	Autism spectrum disorder
DNO	Distribution network operator
ECP	Engaged customer panel
EV	Electric vehicle
GB	Great Britain
LCN Fund	Low Carbon Networks Fund
LCT	Low carbon technology
NEA	National Energy Action
NIA	Network Innovation Allowance
Ofgem	Office of Gas and Electricity Markets
PSI	Planned supply interruption
PV	Photovoltaic
Q&A	Question and answer
RIIO-ED1	Electricity distribution price control 2015 to 2023
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 is investigating whether 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 a decarbonisation agenda. Extensive customer research builds on previous studies in this area to determine whether a revised VoLL model would benefit customers.

The project is funded by the Network Innovation Allowance (NIA), introduced as part of the RIIO-ED1 price control, which provides an allowance for RIIO 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 will 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 two of the project, a strategic phase of qualitative market research, enabled through a series of depth interviews conducted with specific customer segments and key stakeholders about their understanding of VoLL. The depth interviews were designed to provide supplementary findings to those obtained during meetings with an engaged customer panel (ECP) conducted earlier in this phase of the research. This report should be considered in conjunction with the key findings from the ECP, which are published separately.

The overall project research approach was derived from the VoLL methodology statement, 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 17 depth interviews conducted with difficult-to-reach domestic customers, small and medium enterprise (SME) customers, opinion leaders and relevant stakeholders. The full list of customers interviewed is included in Section 6.2.3 and included the following customer segments:

- Vulnerable customers
- Off-gas customers
- Customers affected by large scale supply interruptions
- Low carbon technology (LCT) users
- SME customers heavily reliant on electricity
- Opinion leaders with a unique perspective in the field of customer VoLL
- Key stakeholders who are in contact with, and/or are actively involved in supporting customers in the event of a supply interruption, eg hospitals, care homes, local authorities and charities.

The topics covered in the depth interviews were similar to those discussed in the ECP meetings and, therefore, this report should be interpreted in conjunction with the ECP key findings report, published on the VoLL webpage.

The interviews were conducted by telephone as this was convenient for the individuals involved, who were either unable to travel long distances or too geographically dispersed to attend a focus group meeting.

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

Details of the approach used to administer the depth interviews are set out in the VoLL methodology statement (version 2), which also comprehensively explains the background of the VoLL project and the analysis protocols utilised.

A discussion guide was utilised to facilitate the interviews. This was supported by an information leaflet which was sent to interviewees by email in advance of the interview. These documents are referenced in the project replication appendix (Section 6.3) to this report, with copies available to view and download on the VoLL webpage.

1.2 Summary of key findings

1.2.1 Perception of reliability

Supply reliability was defined by the interviewees in a similar manner to that of the ECP. They considered reliability to be the continuous availability of an electricity supply with no interruptions. Customer perception of reliability is unlikely to be detrimentally affected where they are only subject to infrequent interruptions and the reason for these is clearly communicated; in particular, when the cause is understood and accepted by the customer as being due to factors outside the control of the DNO, eg extreme weather. In these circumstances, even a relatively long interruption is unlikely to affect customer perception of reliability.

In common with the ECP findings, tolerance of interruptions was generally high among the interviewees.

It was important to the study to establish the views of customers with differing experience of interruptions in order to understand whether this influenced VoLL and expectations, irrespective of the customer segment represented. The depth interviews enabled these views to be elicited as participants had a range of experiences of outages.

The ECP findings provided evidence that, for most customers, tolerance and overall perception of reliability correlates directly with an increase in the frequency of supply interruptions. In common with the ECP, interviewees generally placed greater importance on the frequency of supply interruptions than on duration as a measure of reliability, with most stating that two or three interruptions a year would be the threshold at which they begin to question the reliability of supply.

Expectations of reliability

Planned supply interruptions (PSIs) were more acceptable to the interviewees than unplanned interruptions because PSIs were easier to prepare for in advance. There was an expectation that PSIs were likely to be shorter in duration than unplanned outages, and communication about their duration was perceived to be clearer and more easily available. Prior notification allows customers to plan around PSIs and enables supporting stakeholders to provide information to their own customers, thereby reducing associated disruption.

1.2.2 Perception of reliability in a low carbon future

In common with the ECP research, domestic customers were sceptical about the widespread adoption of LCTs in the future and the associated challenges facing the energy sector from the anticipated increase in demand for electricity. Even a customer already using an LCT could not clearly envisage what the implications might be when GB is more reliant on electricity for heat and transportation.

1.2.3 Financial and social impact of lost load

Interviewees recognised that different consumers are impacted by supply interruptions in different ways and were able to articulate various financial and social impacts of interruptions on themselves and on other customer segments, in particular, those with vulnerabilities. The majority considered that vulnerable customers, those supporting vulnerable customers and, in some cases, businesses should be prioritised in terms of:

- Supply provision
- Restoration following an interruption
- Those most urgently in need of support during an interruption.

This collective assessment was made on the basis that the impact of lost load was likely to be considerably more acute and disruptive to these customer segments. Interviewees expressed disbelief that a single, uniform VoLL is currently applied to all customer segments and were supportive of research into a more granular matrix.

In common with the domestic ECP members, interviewees identified more non-financial impacts of lost supply than financial. Loss of communication, potentially resulting in isolation for those unable to leave their homes, was repeatedly cited as a concern for both customers and stakeholders. Although the duration of an interruption was considered a key factor in determining the magnitude of its disruption, the timing was also important. Interviewees often considered disruption was likely to be markedly increased if the interruption interfered with the preparation and consumption of hot meals. This was considered to be a critical point at which alternative arrangements would need to be made for vulnerable customers, including possible vacation of premises. A number of safety concerns were also raised, including: risks associated with the deactivation of security systems, particularly after sustained interruptions when backup batteries are exhausted; and the increased risk of fires where customers resort to the use of naked flames as an alternative to electrical heat and light.

Continuity planning

A few supporting stakeholders had continuity planning measures in place but some had not tested these plans because of the high reliability of their respective supplies in recent years. Stakeholders who had experienced an interruption were more likely to have an all-encompassing and more thorough contingency plan that included alternative communication methods, which some had not anticipated being required in their original resilience strategy. Most of the domestic customers interviewed did not have any kind of plan to manage the effects of a supply interruption; however, the majority considered that they could easily vacate their homes or make alternative arrangements if necessary, in contrast with supporting stakeholders for whom this was generally not a viable option.

Expectations of support

The most requested type of support from DNOs during an interruption was for accurate, up-to-date and regular communication about the likely restoration time. The availability of clear and easily accessible information was considered to be a fundamental requirement and the minimum expectation of all respondents. Some interviewees, particularly older customers and those with, or supporting others with, vulnerabilities expected to be able to speak to a DNO representative by telephone. These customers were prepared to accept recorded messages conveying information about an interruption and, critically, anticipated restoration

times, provided these messages were regularly updated and accurate. Others considered that DNOs should better exploit new technologies and social media platforms to ensure that customers can access or receive regular and accurate updates on their smart devices.

The opinions of interviewees generally reflected those of the ECP, in that issues associated with knowing who to contact, making contact and the availability of accurate information were some of the most frustrating impacts of supply interruptions.

Some supporting stakeholders and opinion leaders were keen to see a more coordinated community response, where responsibility does not lie solely with the DNO but involves the adoption of a multidisciplinary approach instead. This would ideally integrate local community groups, charities, medical professionals and the DNO, working together and sharing information to identify those most in need and to provide the necessary support as quickly as possible. Such partnerships already exist in certain circumstances and, therefore, raising awareness of these existing arrangements, the circumstances under which this type of approach is permitted and restrictions could enhance perceptions of DNOs among stakeholders and customers alike.

1.2.4 Current levels of reliability

Interviewees generally wanted to see equal standards of reliability for all customers irrespective of the geographic region in which they reside or operate their business. Therefore, they considered that DNOs should prioritise investment on improving reliability for customers in the worst-served areas of the network. However, the interviewees with little experience of supply interruptions were unwilling for a premium to be added to all customer bills to support investments that are perceived as benefiting only a small number of customers. Theoretically, some customers were willing to accept a compensatory payment for a lower level of reliability; however, others considered that available funds would be better invested in improving the service rather than spent on compensating customers.

1.3 Next steps

Quantitative surveys will 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. This will 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 heavily dependent on a continuous and reliable supply of electricity.

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

There will be ongoing knowledge sharing and dissemination as the project progresses.

2 ANALYSES AND RESULTS

The depth interviews were conducted to supplement the learning elicited from ECP meetings, convened earlier in phase two of this research, and were designed to meet the first objective of the study, as outlined in Section 4.1 of the VoLL methodology statement (version 2):

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

The depth interviews were conducted across three main groups, the findings of which are summarised within each section below:

- **Difficult-to-reach domestic customers:** certain customer groups were more difficult to engage through the ECP than others because focus group meetings were geographically clustered and required individuals to attend a central venue on two separate occasions. Attendance was therefore difficult for certain customers, such as those with mobility problems. It was also problematic where the target segment was represented by only a small number of widely distributed customers, such as LCT users living a long distance from a central venue. Depth interviews offered an opportunity to engage with these customers.

- **Opinion leaders in the area of VoLL**: key individuals with detailed knowledge of specific subject areas covered by the research were targeted and interviewed. These individuals offered an informed perspective on the impact and implications of VoLL on customers and the community, which could be used to inform the design and analysis of the quantitative survey in phase three of this VoLL research.

- **Stakeholders with responsibility for supporting customers during an interruption**: a range of organisations within the community are likely to be in contact with, or have responsibility for, supporting Electricity North West customers during a supply interruption. These include charities, local authorities, the NHS, schools and other community groups. Representatives from a selection of these organisations were interviewed to provide their specific perspectives on how supply interruptions affected their operations and, ultimately, the customers they support.

All interviewees were sent an engaged customer panel/depth question and answer (Q&A) document entitled 'The cost of power cuts to customers' by email before the interview, which is available to view on the VoLL webpage. The leaflet outlined the role of DNOs and gave some context to the interview topics to ensure that respondents fully understood Electricity North West's responsibilities and how they were distinct from those of electricity suppliers.

The key findings from the depth interviews are summarised below.

2.1 Experience of supply interruptions

Interviewees were initially asked to recall the number of power cuts they had experienced over the previous several years to establish the context for their responses.

One of the domestic customers interviewed had been specifically selected on the basis of having been affected by a sustained interruption caused by severe weather conditions, affecting North West England over the winter of 2015. Her experience was the most recent and most extreme, although this was the only interruption she could recall. None of the other domestic customers had experienced a sustained interruption of this magnitude in the previous five years.

The experience of interruptions also varied among the stakeholders and opinion leaders: some had not experienced any interruptions in recent years; some had limited exposure and several had been affected by lengthy interruptions associated with storms and flooding in late 2015. These extreme events had resulted in deploying measures to provide varying degrees of support to the customers and communities they serve. These respondents were unable to recall other notable supply interruptions in recent years that had caused this degree of disruption.

2.2 Perception of reliability

Interviewees were then asked to define reliability in the context of their own electricity supply. Domestic customers' perceptions of reliability aligned closely with those of the ECP, with an expectation of a continuously available supply, at the "flick of a switch".

"I would switch on my lights and the light was there, and I would use the cooker and the electricity was there to use the cooker, so it's really come down to one of those things that you take for granted." Photovoltaic (PV) system user, domestic

"Reliable means working 24/7, without any fault at all... We've got used to 24/7 power in my generation." Off-gas customer, domestic

Notably, even the domestic interviewee who had been subject to a lengthy, weather-related interruption considered her supply to be reliable and did not perceive reliability to have changed as a result of that event.

"I'm very confident (about reliability of electricity)… It was an unseen situation, so the reliability's still there, and I haven't got an issue with it." Major interruption customer, domestic

A small number of stakeholders with responsibility for supporting customers in a variety of capacities recognised that reliability is likely to vary by geographic region. These stakeholders agreed that supply in urban locations tended to be more reliable than in rural areas fed by long, exposed, overhead networks; however, they also considered that customers in both urban and rural areas found their current level of reliability acceptable.

"I think in cities I would suspect that the number (of interruptions) is closer to zero maybe, but I think in rural areas I suppose it might depend largely on the weather. I think there is an expectation when the weather's really bad, so this winter we had two or three bad storms, so electricity was out in places like Lancashire and Cumbria, so I think two or three times a year during an event I think is reasonable, I think they may find this reasonable." British Red Cross

2.2.1 Frequency and duration of supply interruptions

The interviewees were next asked to contemplate whether their perception of reliability was more likely to be affected by an increase in frequency or an increase in duration of supply interruptions.

In common with ECP findings, the domestic customers interviewed were more inclined to regard reliability in terms of the frequency of interruptions, rather than their duration. All of the domestic customers interviewed regarded a high number of 'shorter' supply interruptions as more concerning than fewer, 'longer' interruptions.

"If it was a one off, and it was off for five hours for reasons beyond people's control, I wouldn't call that unreliable. But, it would be more unreliable if it went off for five minutes four times a day than it would be going off once." Vulnerable customer, domestic

"If there were a couple of long power cuts in a year then I would think about it, but if there were half a dozen, seven, eight, then that would really concern me… I would start to think 'why all of a sudden are we having power cuts?' even though they are only five minutes." PV system user, domestic

Although most stakeholders and opinion leaders tended to agree that a higher incidence in frequency was more disruptive than the overall duration, for some, a longer interruption would cause more disruption than a greater number of shorter ones. For example, a school representative recalled a supply interruption when it was necessary to close and send children home because it prevented the provision of lunch. Customer engagement on other projects has provided similar examples of disruption, such as when heating levels dropped below the permitted temperature threshold in winter and when classrooms could not be sufficiently lit. These events were extremely disruptive both to the school and to parents who were forced to leave work to collect their children or make alternative, emergency childcare arrangements. Even relatively short duration interruptions were extremely disruptive to

schools, with their increasing reliance on technologies as both teaching resources and an essential administration tool.

The storm-related interruptions of 2015 were particularly problematic to stakeholders and their ability to support their own customers because of the extreme length and sustained nature of the disruption. In common with the ECP findings, customers' ability to cope with supply interruptions diminishes progressively when they extend over more prolonged periods. Correspondingly, customers' expectations of support from both the DNO and supporting stakeholders increases relative to the duration of the outage.

"It was absolutely the length of time…I can't remember the exact amount of hours, but people went days without hot water, hot food, heating and lighting. We have a big community of very vulnerable people as all communities have. Elderly people, people with mental health problems, people who live in isolation." Citizens Advice

Customers were also asked to identify the point at which this perception of reliability would be challenged, ie after how many supply interruptions per year or after what length of a single interruption, or a combination of these factors.

Most of the interviewees agreed that three or more interruptions per year represented the threshold at which reliability would be called into question; some had a lower threshold, stating that even a single interruption would erode their perception of reliability. One opinion leader raised an acceptability threshold to five or more interruptions per year.

Crucially, the number and duration of interruptions that respondents would accept depended on the reason for the interruption. In common with the ECP, interviewees were generally prepared to excuse the DNO for interruptions caused by factors beyond its control, particularly if they were otherwise accustomed to a reliable supply.

There was more variation in responses concerning acceptability, relative to the duration of an interruption, which ranged from 30 minutes to several hours. This variation largely depended on the type of customer experiencing the interruption, and whether those customers relied on equipment that could not be operated or might start to fail after a certain period without power. The general consensus of all interviewees was that, irrespective of their personal acceptability measure, interruptions lasting more than seven hours would probably be considered highly disruptive by most individuals and organisations. It was also expected that the majority of customers would make arrangements to vacate their property, seek alternative means of generation or ask for other forms of support after this time.

2.3 Changes in the perception of supply reliability

Customers, stakeholders and opinion leaders generally agreed that reliability had improved over recent years and was now significantly better than the service they could recall in the more distant past, particularly in the 1970s, with many recounting the frequent interruptions associated with the fuel crisis.

Customers were also asked to reflect on a wider definition of reliability, which led one respondent to highlight the importance of power quality in the perception of a good service. However, this interviewee was the only one to refer to any aspect of supply reliability other than the frequency or duration of an interruption.

Despite having what they considered was a reliable supply, this respondent believed there had been a decline in standards and reported receiving a 'lower level of power' than in previous years. This was articulated as a perception of a depression in the luminosity of lighting in the home.

"What I have noticed that, in recent years... lights don't seem as bright as they used to be. I don't know if it's to do with the new light bulbs… there doesn't seem to be as much power

anymore. So, in the evening, once it starts to get dark… it's hard to read indoors." Vulnerable customer, domestic

2.4 Expectations of reliability

Findings relating to expectations of reliability were also similar to those obtained from the ECP. While customers' ideal was the guarantee of a completely uninterrupted supply, most recognised that this was impractical and were prepared to accept a certain level of disruption associated with planned or unplanned interruptions.

"Until then I hadn't a problem at all… it wasn't their fault. It was extreme weather, etc, but that was the only time we ever had an issue. I've never had a problem before." Major interruption customer, domestic

"If, say, somebody… cut through a cable, and it was off for a while, that I would consider a one-off accident, I wouldn't think, 'right, that's not reliable'. But, if it started happening every week, then the cable's obviously not deep enough, then it would become unreliable." Vulnerable customer, domestic

2.5 Planned supply interruptions

A PSI is an unavoidable supply interruption that is scheduled to take place between predefined times, primarily for the purpose of construction, preventative maintenance or repair. These interruptions are assumed to be less inconvenient for customers than unplanned interruptions because they are always notified beforehand. Customers can claim a compensation payment from their DNO if it fails to provide adequate notice of the PSI, as defined by Ofgem in the Guaranteed Standards of Service.

Interviewees were provided with examples of why DNOs are sometimes required to arrange a PSI, eg maintenance. Most considered that outages of this type were acceptable as they acknowledged that there was a need for DNOs to maintain a safe and reliable network and that, in some cases, this work could not be conducted safely or practically without first removing supply. However, interviewees indicated that they would start to question supply reliability unless the frequency and duration of PSIs was limited and there was reasonable justification for the outage.

"Obviously a planned cut off, you're going to know that it's going to happen, so you'd be prepared, and you'd think, 'at least they've let us know', but if it starts happening often, you'd think 'for goodness sake, get your act together and get it sorted out'… because my son's autistic, he needs the electricity, he needs to turn the light on and it comes on." Vulnerable customer, domestic

Businesses and stakeholders responsible for their own customers reported that the notice period associated with a PSI allowed them to make arrangements to manage the impact of the interruption, thereby significantly reducing its potential for disruption. The respondents' ability to proactively communicate with their own customers about what was going to occur, and to set accurate expectations about how long the situation would last, was highlighted as the key mitigating feature of PSIs when compared to unplanned interruptions.

2.6 Tolerance of supply interruptions

Tolerance of supply interruptions was relatively high among all interviewees, even those who had experienced lengthy interruptions associated with severe weather conditions, as this was universally perceived to be "outside the control" of the DNO. It is important, however, that this expression of tolerance is considered in the context of the respondents' extremely high perception of supply reliability, irrespective of the number of interruptions they had experienced.

The ECP had implied that tolerance of unplanned interruptions could be enhanced by improving channels of communication and this view was supported by the domestic customer who had had experience of a lengthy interruption.

"If it's out of the blue and you don't know about it, I think that's when communication is vital for anything like that." Major interruption customer

In this customer's case, the main source of information during the interruption had been via local radio, which had worked collaboratively with the DNO to provide affected communities with updates. This involved relaying details of the times that a temporary electricity supply would be provided, by means of a generator, while repairs to the network were in progress. The customer had no direct contact with Electricity North West.

Consistent with the findings of the ECP, interviewees were more inclined to tolerate PSIs in spring and summer when the impact on heating and lighting is less significant.

2.7 Perception of reliability in a low carbon future

Domestic customers were asked to consider how their views of supply reliability might change with the future decarbonisation of heating and transportation. This required respondents to imagine a future where electric vehicles (EVs) have largely replaced petrol- or diesel-fuelled transport; solar panels are commonplace and electric heat pumps have replaced traditional gas central heating systems as the primary source of heating homes. One customer was specifically selected to take part in this phase of research, on the basis that they already have a PV system installed that generates power for their home.

The low carbon future concept had been introduced in the Q&A leaflet, which was e-mailed to the interviewees prior to a prearranged telephone interview. It was essential that they were familiar with the challenges of a low carbon future in order for them to be able to contextualise statements about possible DNO investment priorities that they would be asked to consider during the interview.

The customer with the PV system had already considered the 'energy gap' and how this might be met in the future. He questioned why there had not already been investment in more renewable and alternative energy generation.

"We've known that… an energy gap is on the cards. It makes me wonder why the government hasn't been more enthusiastic about fitting solar panels to all south east-, south- and south west-facing roofs. That includes all domestic and commercial... I would have expected them to have invested more money into tidal power. Tidal power and solar power combined… would go a long way to solving any energy crisis." PV system user, domestic

Despite the customer's reliance on their PV system to reduce their energy costs, they were unable to clearly identify ways in which supply reliability might be affected in the future, with significantly increased demand and generation being introduced onto the network. However, they did recognise that consumer reliance on fossil fuels would need to decrease.

The views of other customers were consistent with those of the ECP, who had difficulty in accepting that EVs would completely replace those with petrol or diesel engines. The respondents generally suggested that they would be unlikely to adopt EVs, citing the potential adverse impact of supply interruptions, which would impede their ability to charge them, as one of the primary factors in their reluctance to consider this form of transport as a viable alternative.

"They're (electric vehicles) expensive to buy. So I don't see a flood of people going out to buy them all of sudden." Off-gas customer, domestic

"I think that's where you would try and not put yourself in a vulnerable position like that, and not have a reliance on it, and look at potential alternatives… I wouldn't like it to be a given,

that you have to have an electric car; you have to have electricity, because we won't be able to sustain it. I think more people will probably put wind turbines in their back garden to generate an energy source, rather than being reliant on a national grid system." Major interruption customer, domestic

"I don't know if electric heat pumps will replace conventional gas central heating in homes... To be honest, it sounds more expensive to me… If they're using solar panels, are they electric powered?… Do they store it, and is it released using electricity? I don't know how it works." Vulnerable customer, domestic

Consistent with the ECP findings, interviewees, including the current PV user, struggled to imagine a future scenario where reliance on LCTs will require DNOs to invest in solutions to meet increased electricity demand and higher customer expectations.

One opinion leader predicted increased disruption to supply in the future, directly resulting from the increased adoption of LCTs, specifically in relation to cold load pickup when power is restored after an interruption.

"If you look at the impact of switching to electric vehicles, or electric plug-in hybrids, particularly electric vehicles, switching to the heat-type pump systems, there are going to be very much larger peak loads, which is going to make a lot of problems for companies like ENW, because once the power comes on again, then all the heat pumps will come on immediately and you won't have any electricity at all, and peak loads on the grid will be much higher than they would otherwise be." University professor

2.8 Understanding the real cost of supply interruptions to customers

The domestic interviewees all agreed with the ECP's opinion that customers are impacted by supply interruptions in different ways. The current industry measurement of VoLL, as explained in the Q&A leaflet, was not considered appropriate as it failed to prioritise those most in need.

"They need to understand who their customers are, and they need to understand what the risk assessment is to each one. Each and every customer needs to be valued… this is really simple stuff. You can't give everybody the same weighting. That's stupid." Off-gas customer, domestic

Stakeholders and opinion leaders also tended to disagree with the existing principle defining the current measure of VoLL. The language used by interviewees was often emotive, and some expressed surprise at the existing approach.

"I think it's ludicrous. You can't equate the two at all. A working couple have got the capacity to manage their situation much better than a home with a hundred residents with ten or fifteen care staff. You can't just quantify it in terms of the cost to the care home. What happens to the costs of the hospital when they're dealing with the three or four people who have fallen over and hurt their hip? The care home that has to draft in a whole load more of staff and pay taxis for them because the buses aren't running." Citizens Advice

"It's pretty shocking, to be honest. I think there should be a clear priority list really. I know that obviously when homes go down without power, it's bad… there really should be more of a priority to get businesses and definitely nursing homes and medical side of things up and running as soon as possible. So I disagree with that model completely." Small hotel proprietor

Two stakeholders appreciated the democratic approach of current VoLL, as each customer pays the same and therefore should receive the same service. However, even these stakeholders considered that there needed to be some prioritisation in terms of availability of support for customers who might need assistance during an interruption, particularly vulnerable customers.

The definitions provided by interviewees of customers who should be prioritised varied, but included: businesses; customers whose health or wellbeing might be detrimentally impacted by an interruption and those caring for vulnerable customers. The vulnerable customer interviewed cared for a son with an autism spectrum disorder (ASD) and while the impact of a supply interruption would not be critical to his health, it would, most likely, have a severe impact on his wellbeing from heightened anxiety and thereby cause distress to the wider household.

"Thinking back to us in the seventies, we were a fairly normal family. No one had any special needs. The power went off regularly then, and we just used to light a couple of candles and play a family game whatever, and that was alright. It wasn't really acceptable, but we dealt with it… it didn't cause a major upset. If the light goes off here, then my son… would be panicking about when the light was coming back on again. So it clearly affects him in a much more adverse way than it affected us… obviously, if you're on some sort of nebuliser, dialysis, or something like that, it could be life-threatening if their power went off, so I would expect them to be prioritised above my son… definitely, I would say a hierarchy of who needs it first. Maybe elderly people in winter, it could be life-threatening if they have no form of heat." Vulnerable customer, domestic

2.9 Financial and social impact of lost load

Interviewees were asked to consider both the financial and non-financial (social) impacts that had been experienced or might be incurred as a consequence of an outage.

Stakeholders and opinion leaders tended to identify non-financial impacts as being of greater concern than financial. This was frequently expressed as a general concern about the health and wellbeing of the customers for whom they were directly responsible. Vulnerable customers were frequently referred to as likely to be the most adversely affected due to: limited mobility; healthcare needs; inability to communicate or call for help; lower tolerance for a drop in temperature and complications associated with vacating the home. These comments were consistent with the ECP's feedback.

"Not being able to feed themselves. Not being able to move about their own house safely. Not having access to telephones and communication methods. So unable to ring ambulances, doctors, the police. All that big safety net that is available because of electricity had disappeared." Citizens Advice

"It would have an effect in a number of ways. I mean, it would have a direct effect in terms of how we administer help, practical help, and whether that be showers, food, medical services, etc. It would also have the effect of slowing the whole process down. It would probably stop people getting into beds… so we're working with referral agencies and other agencies, so the chances are it would have an impact there. Chances are that it would have an impact in residential settings, because people would have an expectancy that they were going to do something at a certain time of the day and then we would have to respond, or make up the shortfall, or find alternative arrangements. So it would be inconvenient to be honest." Homeless shelter

Supply interruptions that have an impact on mealtimes, specifically the ability to provide a hot meal, were considered likely to be particularly challenging by most respondents. Those with responsibility for feeding vulnerable adults or children often referenced this as a concern that might be the deciding factor in whether or not to leave the premises. Similarly, the inability to warm an infant's bottles was thought to be a significant factor in decisions to vacate the home until the restoration of supply.

From the sample of customers interviewed, those most likely to be financially affected were a hotel proprietor and a care home manager. The care home manager stated that interruptions have a range of financial and non-financial impacts on their operation. Relatively short duration interruptions were very disruptive; however, any lasting over an hour would involve the deployment of extra staff, including nurses to safeguard residents who struggle with the

effects associated with the loss of essential medical equipment, such as nebulisers and airbeds. These situations have a detrimental impact on budgets as qualified nurses cost more than regular care staff. Notably, the care home manager had an expectation that a generator should be provided as a temporary means of supply to support medical needs when an interruption lasts more than one to two hours. The manager had not formed an opinion on whether this support should be expected from the DNO or whether it should be funded and sourced by the care home.

The hotel proprietor reported multiple financial impacts of supply interruptions, including the loss of walk-in bookings; existing bookings cancelled on the day of an interruption; loss of future bookings and a detrimental impact on reputation, particularly where potential customers are unable to make contact by phone. He also cited additional financial impacts arising from mitigation activities undertaken to improve the experience of guests, such as reducing prices or supplying hot meals from alternative sources, when they have been unable to prepare food in their own establishment.

The financial impact on educational establishments was cited as less disruptive than the social effects of an interruption. In the case of the residential school, the social impact of a supply interruption would be so great that the school had installed a generator. However, other customer research relating to power quality has provided examples of unforeseen and unrecoverable financial impacts on schools, which include the cost of technical support to resolve server problems and calling out security services to reset intruder alarms outside normal hours.

All domestic customers reported that they generally found it necessary to leave the property for the duration of an interruption if it occurred during the day. This behaviour had financial implications when it involved eating out or additional transportation costs. A number also mentioned the cost of replacing refrigerated or frozen food; however, there were differing opinions about the duration of interruptions that might cause food to perish and the impact of such losses would inevitably vary by customer segment.

"Some of our poorer communities, if it's going to be a considerable amount of time and their fridge has defrosted, they can't afford to refill their fridge… if you've got more disposable income you're equipped to deal with certain kinds of emergency crisis situations." NHS

"I think people lose little bits of food… We find that a lot of the people we deal with on the vulnerable side are… fuel poor as well, so they can't afford that little bit and that can have an impact later for them if they have to replace that food, or replace that item. So it may not seem like a lot in terms of a big budget spreadsheet, but in terms of impact, it's high." British Red Cross

Interviewees also cited specific impacts that would be disruptive for those in particular circumstances, for example, the vulnerable customer's son with an ASD found the disruption to his routine very difficult to manage.

"For a lot of people on the autistic spectrum, they're used to watching such and such a programme at such and such a time. You can't even say to them 'Don't worry you can watch it later', because if it's not on the catch-up, you've had it… it sounds very trivial, in the grand scheme of things it is, but it can be hugely important for families with autistic people in them." Vulnerable customer, domestic

The NHS public health practitioner was also concerned about the potential dangers for vulnerable customers after dark during a supply interruption.

"For elderly people who have trip hazards anyway, falls and fractured hips, it could be detrimental to someone's life." NHS

The domestic customer who had experienced a lengthy interruption as a result of severe flooding was best able to articulate the effect of outages caused by high impact, weather-

related events on domestic households. She lost mains supply for approximately one week in November 2015 and had only an intermittent electricity supply, provided by a generator, during this time. This short-term, temporary supply was limited to 'essential' use and the expected provision timetable, communicated by local radio, was not always accurate. The impacts on her household were significant, both socially and financially. This customer worked from home and her ability to do so was considerably constrained without telephone and internet communications. The family's ability to prepare meals, maintain personal hygiene, keep warm and simply entertain themselves was also significantly disrupted and became more difficult the longer they were without a consistent mains supply.

"It was winter, so it was very difficult because it went dark very early. So you've no light, you had no electricity, so you've got torches, candles. Now we're lucky, we have a hob that is gas, we can cook on the hob, but cooking a meal with gas using a head torch isn't great. Then of course we had no mobile signal either, and we had no telephones, so we had no communication. I think that was probably our worst point, because I work from home. So I had no internet access, I had no mobile, no telephone, no computer, no nothing, so that's where it's hard." Major interruption customer, domestic

The loss of communication platforms during an outage was not explored specifically with most interviewees; however, the customer who had experienced a prolonged interruption, caused by an extreme weather event, reported that this was the most challenging aspect of the situation with which her household had to contend.

"I was away with work, and I'd come back, and of course I couldn't ring anybody to tell them to come and pick me up. I was having to ring somebody out of the area, to then drive to our house and then physically go and knock on the door and say to my husband can you go and pick xxx up at the station… I couldn't communicate directly with them, there was no line… it was an inability to function as you would normally function, telephones, computers, internet, etc." Major interruption customer, domestic

The loss of major communication channels was also mentioned by several stakeholders.

The overall disruptive impact for the family suffering the lengthy outage was initially not as negative as anticipated; however, the effect became increasingly frustrating and inconvenient for the whole household, including the young children, relative to the duration of the interruption.

"Initially, they thought it was great fun. Then when it carried on, and of course you've got no hot water, you've got no heating, they were cold, and there are only so many times you can play charades in the dark with your head torches on. So yes, after a day or so, 24, 48 hours, they were getting a little bit miffed." Major interruption customer, domestic

This customer even described adopting behaviours that she was fully aware posed a safety risk to the home and its occupants, in an attempt to keep warm.

"We used to keep the gas stove on, on one of the rings at the back, just to try and gently heat. It was quite difficult and of course that is so dangerous." Major interruption customer, domestic

This respondent considered that the social impacts, in terms of the effects on wellbeing, outweighed the financial impacts in her particular circumstances, despite having incurred some loss of earnings from the inability to work from home and other financial outgoings, some of which had not been fully calculated at the time of the interview.

"Financially I think we will probably have a horrendous gas bill… Other than that just the cost of batteries, candles, torches, things like that that are incidentals now… it wasn't a huge cost to us because we didn't eat out... we didn't go to a hotel, that would have been a major finance." Major interruption customer, domestic

2.10 Expectations of support

The responses of the domestic customers were consistent with those of the ECP, in that DNOs should have a responsibility to prioritise the most vulnerable members of society for provision of available support. This might include provision of torches, batteries, corded phones (which, unlike cordless phones, can be used during an outage), hot food and drinks, blankets and generators for the most vulnerable customers and care homes. It was expected that hospitals would have their own back-up generation.

Most interviewees expected DNOs to provide accurate information about when customers' power might be restored and regular updates on the progress of fault repairs, as both a minimum requirement and a priority over other support mechanisms mentioned in the interview.

"I'd still have power to my phone and laptop, so I would expect to log on and find out what was going on. It's good communications really. Again, this is business basics really. Even in an unplanned situation, I would expect to be reassured why it had happened and what they were doing to correct it. Then I would be less inclined to panic or worry." Off-gas customer, domestic

"It's when people provide you information like 'It's expected to be on within the next 24 hours', something like that. I think it needs to be more precise. If it isn't going to be on in the next two to three hours then let us know that… It has to be as accurate as it can be." Small hotel proprietor

One customer conceded that without means of accessing communication, this could represent a challenge.

"It's very difficult because you could say I think they should contact everybody, but if you've got no telephone, it's very, very difficult. A letter? Even a lot of the post people couldn't deliver mail… Then you have to go to a local radio station or something like that." Major interruption customer, domestic

One supporting stakeholder had, in the past, told customers who did not know who to contact in such situations that they should contact Electricity North West.

"I think they've tried really hard to let people know that they're the people to go to, but a lot of the time when I speak to people when there's been a power cut or something like that, I've had to tell friends to go to Electricity North West, that's who you speak to and how you find out. I've recommended the Twitter, because I know their Twitter is really well managed." NHS

Several supporting stakeholders highlighted actions that DNOs could take to help customers receive information and to support more vulnerable customers.

"One of the things is the communication. There is most probably a financial impact of Electricity North West providing the analogue phones that people can plug right in so that they can communicate with the outside world. If all they've got is a mobile phone and it's gone dead, a digital phone in the house that they can't use… so it does provide some link to the outside world." British Red Cross

"Obviously there's the priority service register, and there are people who really do need that bit more one-to-one help. They've got certain addresses where they know they need to go for people with certain vulnerabilities. Again, they've done a lot of brilliant work with that. There's probably some more to be done with that and making sure that those who [are] really vulnerable are on the priority service register." NHS

Several interviewees considered that DNOs should engage with the wider community and community groups to support customers during an outage.

"There should be means of ensuring that householders that are on priority service registers are identified… certain individuals living in circumstances might be in need of a call, might be in need of food, might be in need of warm blankets, might be in need of some other heating source being supplied to them for the period of time that they'll be out of electricity… I obviously get that DNOs can only do so much, but there are other organisations that they could probably liaise with that could be part of a solution to those kinds of problems for those householders identified as being the most vulnerable, and then completely there is another whole category of householders for whom electricity is an absolute requirement. I mean by that, people that are on dialysis and so forth." National Energy Action (NEA)

One domestic customer suggested that community members should be mutually self-supporting.

"This is where society comes in, isn't it? If people are better able to cope, perhaps they could invite people in who are less able to cope… there are certainly things that could be done in the community to help each other." PV system user, domestic

2.11 Continuity planning

A few of the stakeholders interviewed had continuity plans in place for supply interruptions; however, some of these plans had not been tested under actual outage conditions, as they had not been subject to recent power cuts that had required the deployment of these measures. Continuity strategies included alternative communication plans; managing security where doors were electronically operated; temporarily relocating personnel; deploying alternatives for preserving refrigerated and frozen food and customer complaint handling. For those respondents who confirmed their continuity plans had been tested, a working telephone was mentioned as a vital missing resource.

"The last one we had made us think that actually what's missing from our emergency plan is a telephone that doesn't rely on being plugged in… my mobile phone was on its last legs. And then obviously I couldn't plug it in to charge it. So I ended up sitting in the car with the engine running with my phone plugged into the car socket so that I could continue phoning the people I needed to phone." Primary school

Certain stakeholders were responsible for continuity planning in the community and this extended to encouraging businesses and local groups to devise their own resilience plans.

"It's up to people to be more resilient themselves, whether they're an individual or an organisation, to make themselves more resilient and not be reliant on the local council." Stockport Council emergency response

"A lot of local communities here in Cumbria, they have a good community focus, and a good base. So they have their own sort of almost like community emergency plan or flood plan or whatever it is… we would try and get people to be prepared and have that kind of thing ready in each of the communities, so that we could kind of say... 'You've got this there, go and open up that church hall, you know where your box is with all your goodies in, go and get it opened.' So we try very hard to work to have people more prepared and more planned. But when that doesn't work then we have what we call a voluntary organisation network… We'd work with the local volunteers and local voluntary organisations." Cumbria County Council

None of the domestic customers interviewed had clear contingency plans for a supply interruption. However, the customers with greater experience of outages were more inclined to have considered resilience measures than those with limited exposure. Even the customer who had been subject to a lengthy interruption had not subsequently taken any pre-emptive steps to better prepare their household for future interruptions.

2.12 Current levels of reliability

A learning point from the ECP was that panellists had difficulty in understanding the way in which the electricity industry's measure of reliability is currently presented. The average number of supply interruptions experienced per 100 customers each year was too confusing for most ECP members to assimilate. The interviewees agreed that this measure of frequency is difficult for customers to interpret and that it is more meaningful to present reliability as the number of interruptions over a three-year period. This currently equates to one interruption every three years for customers in the Electricity North West region.

This value was used to give some context to current reliability standards, enabling interviewees to compare these to their personal expectations. Although customers' ideal would be fewer interruptions of shorter durations, they agreed that the current level of reliability was acceptable and realistic.

2.13 Priorities for investment

Information was presented to the interviewees to provide them with an understanding of the investment decisions that DNOs will have to consider in a low carbon future. Most of them failed to understand that significant investment will be required just to maintain current performance standards, a finding that was consistent with that of the ECP. Most appreciated that investment strategies will be required to improve overall reliability, to meet customers' future increased reliance on a secure electricity supply and, inevitably, the higher expectations they will have.

Four possible DNO investment strategies (options A-D) were shared with the interviewees. These had previously been considered by the ECP and are as follows:

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.

Respondents were asked to contemplate each option individually and select the investment strategy that they believed should be the priority for Electricity North West over the next few years.

Contrary to ECP feedback, where most participants had selected either options A or B, the domestic customers and most supporting stakeholders chose option C. When asked to justify this choice, they explained that they considered it important that all customers could reasonably expect to receive the same standard, recognising that the majority of Electricity North West customers already received a very good service.

"I would go with the worst areas and then try and improve that area… and then publicise all the good figures that you've just told us about and say, you know, 'Across the piece we've got really good outcomes, really good figures'." Cumbria County Council

One customer was hesitant before finally selecting option C, as they perceived that by prioritising one area, another might suffer and, therefore, maintaining current levels of service might be a better use of investment.

"I think driving up standards is a good idea, but I think, with limited amounts of money, if they focus on one area then I think it's fairly inevitable that another area is going to lose out. So I'm sort of torn between that and the status quo a bit." Vulnerable customer, domestic

Both opinion leaders selected option A, as they had concerns about any investment expenditure that might potentially result in increased energy prices for consumers. They therefore considered that the priority should be to maintain bills at their current level.

"I'd be worried about any action that increased costs to customers unnecessarily through providing those kinds of services. I might be inclined to suggest that leaving things as they are might be sensible." NEA

Interviewees were asked whether they would be willing to pay a one-off charge on their bill to improve reliability of service. In common with the ECP's response to this question, views were mixed. One domestic customer and two supporting stakeholders dismissed the notion out of hand, as they considered that investment to maintain and improve current reliability standards should be funded by efficiencies from the DNO, rather than from additional contributions from customers. Some stakeholders and opinion leaders were adamant that there should be no extra financial demands placed on customers, as many already struggle to afford their electricity bills.

"I don't think households would be very open to that one-off payment. I think there's a consensus that bills are already at an extreme high from past times and I don't think there are any people in a household that would go with that." Small hotel proprietor

"My fundamental feeling is that it would be unreasonable to start landing additional costs on consumers that seemed out of proportion with the benefits they would bring." NEA

Other customers and stakeholders were more open to the idea, but worried about the scale of the payment and also how those on lower incomes than themselves might meet any additional levied charge.

"It depends how much it was, and I know people on very low incomes can't afford a one-off payment. It would make a huge difference to them." Vulnerable customer, domestic

Similarly, interviewees were asked if, theoretically, they would be willing to accept a reduction in reliability of service in exchange for the receipt of a one-off payment. Customers seemed to be unclear about the benefits of this approach. One customer, who did think it would be acceptable, imagined an interruption during the night, when it would have little impact on their household. Some other customers and stakeholders considered that this would result in an increased likelihood of a service interruption, which for them was not the priority.

"I don't see the logic of that… A reduction in the service implies that at some point I am going to have to do without electricity. The money's all very nice, but electricity is the main thing we're paying for, the main thing that we're reliant on, and not the money." PV system user, domestic

"I would prefer not to be given it and to improve the service, but then I'm sure lots of people would be like 'Yes, I'll have the money'." Cumbria County Council

In order for customers to make an informed decision about either their willingness to make a payment to avoid a supply interruption or their willingness to accept a payment in recompense for a supply interruption, they first needed a clearer indication of the value of payments involved. They also required more granular detail about the changes that any payment received or made would have on the reliability of their supply.

Furthermore, many respondents failed to recognise that option B, C and D would inevitably involve an increase in bills to support the additional investment required to meet future demand.

Asking customers to consider a complex trade-off involving an extra payment, levied on all customers with benefit to only a small number, is clearly an area that needs to be carefully

explained and contextualised with real examples, in order for customers to make informed and considered decisions. The approach outlined for phase three of the VoLL research is described in the following section of this report and will provide customers with the level of detail required to make these complex decisions.

A pilot of the survey instrument that will be utilised to acquire an accurate view of customers' willingness to make or accept a payment for changes in reliability of service will ensure the exercise is understood by the research participants.

3 LESSONS LEARNED FOR FUTURE INNOVATION PROJECTS

3.1 Depth interviews are a useful way of gathering feedback from difficult-to-reach customers and stakeholders for whom group discussions in central locations are not appropriate

It was anticipated from the outset of this customer research project that it would not be practical for customers with mobility issues or other vulnerabilities, or for those who lived in remote areas, to attend the ECP focus group meetings in central locations, which were often far from their homes. Therefore, depth interviews conducted by phone provided an effective and alternative method of obtaining views from these important customer segments with minimal disruption for them.

Depth interviews also provided a confidential environment for individuals to share their opinions and unique views in detail, which might not have been possible because of the time restrictions in an ECP group environment. Group discussions work best where participants are likely to have common, shared experiences. In the case of stakeholders, the variety of challenges and experiences was too varied to be covered efficiently in a focus group environment. Interviewing this sample on a one-to-one basis, by telephone, allowed the research to benefit from the unique experiences of more difficult-to-reach customers, stakeholders and opinion leaders, in a cost-effective manner and at a time and place convenient for the research participant. It also allowed them to share information that they may have been uncomfortable divulging in front of a wider audience.

3.2 Customers often refer to perceived impacts on others, but the most reliable data will relate to their own situation and experience

When questioning interviewees about their experiences of interruptions and their willingness to make or accept a payment for changes in service reliability, many were inclined to think not only about their personal situation, but also about the likely impact on, and opinion of, other customer groups. For example, when asked about willingness to pay, customers would often claim to be comfortable with paying extra themselves, but express doubts or concerns that other customers, such as those on low incomes, would feel the same way.

This type of projected perspective is valid when expressed by opinion leaders or stakeholders with responsibility for safeguarding other customers because their view is based on professional experience and expertise and they can provide considerable empirical evidence to support their opinions. However, for those who are not in this position, projected opinions suggesting the viewpoint of another can only be regarded as speculative. It is therefore best practice to refocus interviewees on their own situation, unless they have been expressly consulted to represent a specific customer segment. The actual opinions of particular customer groups, such as low income and vulnerable customers, will be obtained through surveys, which will include statistically robust samples of these customer segments during the quantitative phase of research.

3.3 Other lessons learned

Several other learning outcomes from the depth interviews were consistent with those emerging from the ECP. These are briefly documented below; full details may be found in Section 3 of the ECP key findings report published on the VoLL webpage:

- The relationship between DNOs and suppliers is still confusing for customers.
- Customers find it extremely difficult to imagine, or are unwilling to accept, the extent of future electricity demand.
- Any activities that might be interpreted by customers as involving a direct financial cost need to be carefully introduced and thoroughly explained.
- Customer engagement materials should be tailored to the specific audience they serve.

4 CONCLUSIONS

This customer research has provided further evidence to support that obtained from the ECP, enabling Electricity North West to better understand customer and stakeholder perception of VoLL; how this value is defined and varies by stakeholders, opinion leaders and different customer segments and how VoLL might be influenced by DNO interventions.

The ECP and the depth interviews identified the impacts of supply interruptions on specific customer groups and their particular expectations around various support mechanisms that a DNO might provide to mitigate these impacts, eg better communications.

The customer engagement methodology deployed in this second phase of the project was effective in collecting a wide range of customer views, including those of difficult-to-reach customers. It was also effective in engaging with stakeholders to elicit their specific opinions on VoLL and the impact of supply interruptions on the customers they serve and support. The findings from the ECP and depth interviews provide a mechanism for developing an effective survey instrument to test this granular measure of VoLL more robustly and will contribute to achieving the objectives of phase three of VoLL research.

The quantitative survey instrument will be piloted as part of phase two, with a statistically robust and previously unengaged audience of domestic and SME customers.

The large-scale customer survey will be conducted in two stages: the first stage will start in January 2017, and is to be followed by a second phase of fieldwork in summer 2017. This approach will establish seasonal variations in responses.

5 NEXT STEPS

5.1 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 will be conducted with domestic customers and 1,000 with SMEs heavily dependent on a continuous and reliable supply of electricity.

The survey will include a stated preference exercise, which was the method 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 making a hypothetical payment (willingness to pay or WTP) or receiving a financial incentive (willingness to accept or WTA). This method has been utilised in previous research when it

demonstrated quite different results from these two approaches, with WTP values being notably lower than WTA values.

5.2 Dissemination of findings

In line with the vision of the NIA funding mechanism and the project commitments documented in the VoLL methodology statement, 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 Energy Networks Association's smarter networks portal by January 2018.

6 APPENDICES

6.1 Key learning outcomes incorporated from previous Low Carbon Networks Fund (LCN Fund) projects

Section 6.1 in the ECP key findings report lists the learning outcomes from Electricity North West's previous LCN Fund projects (Capacity to Customers or C_2C, Customer Load Active System Services or CLASS, Smart Street and Respond) that were subsequently applied to the VoLL customer engagement methodology.

6.2 Terms of reference

6.2.1 Overall objectives of phase two of the project

The key research objectives of phase two 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 exercise.

The customer engagement method designed to meet the research objectives for phase two of this project is set out in Section 5 of the VoLL methodology statement (version 2).

6.2.2 Addressing the objectives with interviewees

The depth interviews were specifically designed to address the first research objective set out in Section 6.2.1. The purpose of the ECP involved more detailed exploration, to address both objectives in full.

This phase of VoLL research was exploratory in nature and required a methodology that elicited a deeper understanding of customers' experiences of supply interruptions, expectations around reliability and whether these might be perceived differently by diverse customer segments. Depth interviews provided a platform to explore complex concepts and encourage informed discussions with domestic customers where it was impractical for them to attend a group discussion. This was also an effective platform to engage with stakeholders likely to be in contact with, or support, customers during a supply interruption. This was also a fitting approach to engage with opinion leaders, for whom discussion in a group environment was not appropriate, to elicit their specific and varied experiences.

The interviewees included representatives from a variety of customer and stakeholder groups, as outlined in Section 6.2.3.

Respondents were interviewed by a professional, independent moderator who asked them semi-structured questions relating to a predefined list of topics. Prior to the interview, respondents were sent contextual information to read. During the interview, examples of hypothetical situations were introduced to respondents. These involved supply interruption scenarios, with different characteristics, ie duration and time of day. This exercise was designed to evaluate the response of different customer types to particular situations, with potentially different impacts. This format allowed the moderator the flexibility to question participants further on issues arising through the open discussion.

6.2.3 Depth interviews conducted

Individuals representing a variety of customer segments and commercial sectors, stakeholders with a responsibility for supporting customers and opinion leaders were each interviewed for approximately 45 minutes. A total of 17 interviews were conducted between

May and July 2016, by telephone, at a time and date convenient for the respondent. Face-to-face interviews were offered to each respondent as an alternative, but all elected to participate by phone.

Respondents who were approached to participate in an interview were those who were more difficult to engage in a focus group environment, either due to physical access problems or because a group environment was not a suitable platform to share the unique perspective of particular contributors. The respondents engaged were:

- One vulnerable customer (resident child with ASD)
- One off-gas customer
- One customer who had experienced a prolonged interruption lasting several days, due to extreme weather
- One LCT user (photovoltaic panels)
- Two schools (one specialist residential school for pupils with profound and multiple learning difficulties and one primary school)
- One university professor specialising in energy and the environment and electrical engineering
- One representative from NEA
- One homeless charity representative
- One small hotel proprietor
- One residential care home manager
- One representative from Citizens Advice
- One representative from British Red Cross
- Two representatives from Stockport Council (community engagement and 'Gold Command' emergency response)
- One representative from NHS
- One representative from Cumbria County Council Resilience Unit.

6.2.4 Administrative support and facilitation

The depth interviews were conducted by Impact Research, an independent market research specialist, 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 was responsible for the recruitment of respondents, interviewing respondents, the provision of analysis and reporting findings.

6.2.5 Incentives

Domestic participants were offered a cash payment of £60 for completing an interview. Stakeholder representatives, commercial customers and opinion leaders were offered a higher cash payment of £100 for completing the interview. This tiered payment mechanism was recommended by Impact Research, based on previous experience of recruiting customers to take part in similar depth interviews, reflecting the higher value that commercial representatives place on their time. Interviewees were paid by cheque and could elect to make an equivalent donation to a registered charity of their choice if they preferred.

6.2.6 Meeting the requirements of the customer engagement plan

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

- Providing customers with appropriate communication materials from the outset. This involved sending general information about the project objectives before the interview. This included an explanation of 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 depth interviews using tailored communication channels, including written, audio and visual mediums.
- Delivering these materials in such a way that VoLL was not confused with engagement associated with the smart meter rollout.
- Being guided by customer feedback to refine the communication and research approach.

6.3 Project replication

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

- Database of customers in the geographic area of interest
- Recommended list of appropriate stakeholders within the geographic area of interest
- Recruitment screener
- Recruitment quotas
- Discussion guide
- Stimulus materials:
  - Q&A document entitled 'The cost of power cuts to customers' explaining: the role of DNOs and industry structure; the composition of charges in a typical electricity bill; the problem the project seeks to address; information relating to the common causes of supply interruptions and how they are typically managed and the nature of the customer engagement being undertaken
  - Summary of industry definition of supply reliability; current level of DNO supply reliability and information regarding the impact of a low carbon future
- Transcripts and audio recordings.

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

- Knowledge of the geographic area of interest
- Knowledge of customer profiles
- Knowledge of key stakeholders who support customers during interruptions
- Knowledge of commercial customers most likely to be impacted by an interruption
- Knowledge of various methods of recruiting customers and stakeholders for interview
- 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 discussion guide and Q&A document.

The anticipated project replication costs are in the region of:

- Conducting 17 depth interviews by phone – £9,700, of which:
  - Incentivisation – £1,500.