QUEST
An overarching control system

SP Electricity North West

Project Partners

nationalgridESO FUNDAMENTALS Schneider Electric

smarter grid solutions IMPACT FROM INSIGHT TO INFLUENCE

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Name	Role	Signature & date
Andrew Howard	QUEST Project Manager	*A J Howard* 24/09/25
Ben Ingham	Innovation Technical Manager	*B Ingham* 25/09/25
Dr Geraldine Paterson	Innovation Development Manager	*G Paterson* 25/09/25

Approval

Name	Role	Signature & date
Andrew Howard	QUEST Project Manager	*A J Howard* 26/09/25
Neil McClymont	Head of Network Innovation	*N McClymont* 26/09/25

SP Electricity North West

QUEST Deliverable 6

Customer Research Findings Report

Customer Research Report

Produced by Impact Research

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01.
Introduction

1. SP Electricity North West Introduction

This report is the sixth deliverable for the QUEST Network Innovation Competition (NIC) project which is being rolled out by Electricity North West Limited (ENWL) and its partners. The aim of this report is to document the detailed outputs from the customer research conducted during the project.

The content of the report is focussed on the findings of the Customer Engagement project partner IMPACT. Where required, SP ENW have provided support and information for the engagement process, but have had no direct customer involvement, except observing some of the most technical sessions, and responding to any technical questions as required.

It builds upon the previously published reports for the QUEST project:

1	QUEST Initial Report - Use Cases	31/07/21
2	QUEST System Design and Architecture Lessons Learned	31/12/21
3	QUEST Trials, Design and Specification Report	30/06/22
4	QUEST Interim Report – System Design and Technology Build Lessons Learned 30/06/23	
5.	QUEST System Integration Lessons Learned Report	30/04/24

The main objective of the QUEST project is to introduce a distribution network-wide, fully coordinated, overarching control system to manage and optimise voltages, with an appropriate balance between centralised and decentralised control hierarchy. In recent years, and in common with all UK Distribution Network Operators (DNOs), SP ENW has introduced innovative voltage optimisation and voltage control techniques.

The project has suffered delays arising from issues and additional requirements stemming from the heightened cyber security threat to the UK Critical National Infrastructure, and how that threat is being managed across all industries. As a result, a delay in full system availability has occurred, resulting in a delayed trial and analysis phase. As an element of the customer engagement was to access the impact of trial operation, elements of customer engagement have been slipped with the original deliverable date for this document changing from 31/10/24 to 26/09/25

02. Executive Summary

2. Executive Summary

The QUEST project, led by SP Electricity North West, is an innovation project designed to optimise voltage control across the distribution network, supporting efficiency and reliability as the system adapts to a lower carbon future. As part of the customer workstream, research was carried out across three areas: Area 1 explored the experience of domestic and SME (Small to Medium Enterprise) customers in trial zones, Area 2 engaged industrial and commercial (I&C) organisations with voltage-sensitive operations, and Area 3 examined the opportunity for voltage managed connections amongst generators, developers, and large demand customers.

Area 1 research among domestic and SME customers confirmed that the introduction of QUEST voltage control had no notable impact on electricity supply. Across both trial and control groups, there were no findings that suggested a decline in appliance performance. Satisfaction with supply remained consistently high, with no evidence that QUEST had influenced attitudes or increased contact with SP Electricity North West. Even among SMEs with specialist equipment, none reported any negative effects during the trial period. Power cuts were infrequent, generally short in duration, and unrelated to the trials, while behaviours and levels of satisfaction in trial areas closely mirrored those in the control areas. It therefore appears that QUEST operated as intended: delivering network efficiencies while remaining effectively invisible to end users.

Area 2 explored the views of I&C organisations, many of whom operate equipment highly sensitive to voltage fluctuations. Interviews and focus groups revealed the critical importance of a stable and reliable electricity supply, with over half of participants stating that even small deviations could shut down operations entirely, causing financial losses. Businesses described the severe operational, safety and reputational risks posed by interruptions, particularly in healthcare, manufacturing, and energy generation, where downtime or equipment damage could have financial and safety consequences. Despite this sensitivity, most organisations had little awareness of how network pressures are changing, and few had plans to manage future supply challenges. Once QUEST was explained, however, participants were able to recognise its potential to reduce risks and improve reliability. Feedback gathered across focus groups and follow-up depth interviews directly informed the development of new communication materials, which were generally well received for their tone, clarity and accessibility. Businesses emphasised the need for transparent information, practical examples, and sector-specific tailoring, alongside a preference for direct communication from named contacts, whether through in-person engagement, email or digital formats. Printed leaflets were considered less effective. Overall, the Area 2 research demonstrated both the vulnerability of this group to voltage issues and the importance of clear, proactive communication in ensuring positive engagement with QUEST.

Area 3 research engaged generators, developers, and large demand customers to explore their attitudes towards and experiences of connection agreements and the potential for bespoke managed voltage connections under QUEST. Across the in-depth interviews, most participants were familiar with the connections process but had limited direct experience with constrained or flexible agreements. Appetite for bespoke arrangements was mixed and often cautious. While some recognised the potential to secure connections that might otherwise be unavailable, others expressed concern about compliance requirements, monitoring, and the impact on long-term investment value or resale of sites. Capacity was the only constraint consistently seen as a clear benefit, with voltage management and fault level constraints less well understood. Businesses emphasised that any new model would need to be financially viable, transparent, and flexible enough to fit their existing operational patterns. Interest was strongest among generation developers and those with fluctuating import and export needs, particularly where QUEST could support expansion plans or hybrid solutions combining solar, wind and storage. Overall, while QUEST was viewed positively as a credible innovation that could enhance network efficiency, the

case for widespread uptake of bespoke connection agreements remains uncertain, underlining the need for further communication, technical detail, and targeted engagement with the most relevant customer segments.

Key findings

Area 1:

- The hypothesis that the introduction of QUEST voltage control had no notable impact on electricity supply experience was confirmed.
- Satisfaction with electricity supply remained consistently high, with no increase in customer contact or concerns.
- SMEs operating specialist equipment reported no negative effects during the trial.

Area 2:

- Businesses highlighted the critical importance of a stable supply, with over half noting that even small voltage deviations could halt operations, risking financial loss, safety, and reputation.
- Sectors such as healthcare, manufacturing, and energy generation are especially vulnerable to voltage fluctuations.
- Awareness of changing network pressures was low, and few organisations had plans to manage future supply challenges.
- Once explained, QUEST was recognised as a positive innovation to reduce risk and improve reliability.
- Communication materials developed from the research were well received for their tone, clarity, and accessibility.

Area 3:

- Participants were generally familiar with connection processes but had limited experience with constrained or flexible agreements.
- The existing pool of customers for whom this would be relevant was much smaller than anticipated. This created challenges in recruiting respondents for Area 3.
- Appetite for bespoke voltage-managed connections was mixed, with concerns about compliance, monitoring, and potential impacts on long-term investment or resale value.
- Interest was strongest among generation developers and organisations with fluctuating import/export needs, particularly where hybrid solutions (solar, wind, storage) could be supported.

03. Customer Workstream Background and Method

3.Customer Workstream Background and Method

3.1. Background

The QUEST project, led by SP Electricity North West, is an innovative initiative aimed at enhancing voltage control across the electricity distribution network. The project is driven by the increasing demand and generation caused by decarbonisation targets, which challenge existing voltage management techniques. Current methods, such as Active Network Management (ANM) and voltage optimisation, are often applied in isolation, leading to reduced effectiveness due to a lack of coordination and potential counteractions. Additionally, these methods frequently operate under conservative safety margins, resulting in inefficient network utilisation.

To address these limitations, QUEST developed an overarching, coordinated, and optimised voltage control system that integrates multiple discrete techniques. This approach balances centralised and decentralised control, enhancing network flexibility, reducing energy losses, and improving efficiency. The ultimate goal was to create a self-regulating distribution network capable of automatically adjusting voltage, both in response to customer demand and generation, and proactively to generate additional low-carbon transition benefits.

Engaging with electricity customers throughout the development and implementation of QUEST was essential for several reasons. Firstly, customers (including domestic users, large I&C customers, energy generators and those operating critical infrastructure) are directly affected by changes in voltage control and profiling. Understanding their perspectives, requirements, and potential challenges ensured that the project addressed real-world concerns and aligned with operational practices. Secondly, collaboration with customers enabled SP Electricity North West to identify technical and practical barriers to adopting managed voltage connections, which could otherwise hinder the transition to a more dynamic and efficient energy system. Lastly, by involving customers, SP Electricity North West fostered a sense of partnership and transparency, which is crucial for maintaining customer trust, particularly when trialling innovative approaches in energy management.

3.2. Objectives

The primary objective of the customer research workstream within QUEST was to explore and understand how changes in voltage control and voltage profiling would affect various customer groups, including domestic, non-domestic, generator, and sensitive customers such as large demand businesses and critical infrastructure. Specifically, the research addressed the following key questions:

1. Customer Experience:
    - Did customers notice when voltage control was applied? If so, how was it perceived in terms of acceptability?
    - Are the operating characteristics of generators and sensitive customers affected by voltage control, and under what conditions?

2. Customer Requirements:
    - Are there any specific voltage supply requirements for certain customer types?
    - What impacts did voltage profiling have on generator customers?

3. Appetite for Managed Connections:

- What was the interest among customers, particularly generators and large demand users, for voltage-driven, self-managed connections?
- What were the technical and operational constraints related to voltage-managed connections, and what benefits did customers perceive?

4. Implementation and Engagement:
   - How was customer collaboration effectively managed to trial voltage control devices on their equipment?
   - What communication and engagement strategies were most effective in ensuring customers were well-informed and supportive of the transition to QUEST's optimised voltage management system?

The findings from this research provided crucial insights into customer perspectives, enabling SP Electricity North West to refine its voltage management strategy and support the transition to a more resilient and flexible distribution network.

3.3. A 3-Stage Method

The customer research for the QUEST project was conducted in three distinct stages, each focusing on a specific customer group and research objective. This structured approach ensured that insights were gathered from diverse electricity users, including domestic, non-domestic and generator customers. The three stages were as follows:

3.4. Changes to scope and methodology

Area 1:

Originally, Area 1 was designed to re-engage the same participants at both the baseline and trial stages, enabling a direct comparison of perceptions over time. However, delays to the live network testing, caused by technical issues, extended the interval between the two stages to 22 months. This significantly increased the risk of lower re-contact rates due to participant mobility, recall limitations, and greater difficulty in re-establishing contact.

To maintain a robust and representative sample size during active trial, the domestic re-contact exercise was supplemented with an additional 265 participants sourced through free-finding, bringing the total trial-stage sample to 304. We were able to compare results from the baseline vs. those during active trial, but

also trial vs control (SP Electricity North West postcodes outside of the trial area) to fully explore any impact of the QUEST trials. Although the base size of those who took part in both the baseline and active trial survey were smaller than anticipated at 39 (due to the extended interval between waves), the inclusion of both trial and control groups helped ensure the robustness of the research and therefore its conclusions.

This adjustment ensured the validity of the findings while preserving the original research objectives.

Area 2:

There were no scope or methodology changes in Area 2.

Area 3:

During the course of the project, a number of adjustments were made to the Area 3 research approach in response to evolving fieldwork conditions and sample limitations.

Interviews were conducted using web-based platforms, with telephone follow-ups introduced for those who struggled with Zoom. In these instances, the stimulus materials were simply read out to respondents.

The original plan for Area 3 was to conduct 50 depth interviews with HV and EHV-connected generators and large demand customers. Despite extensive recruitment activity (including multiple waves of recruitment and targeted free-found approaches) only 16 interviews were ultimately achieved. The shortfall reflected both the limited pool of eligible organisations and the inherent difficulty of engaging senior contacts who were time-pressed, hard to identify, or viewed connection contracts as a low business priority. This experience highlights a valuable lesson for future projects: early assessment of the realistic participant universe, wider sourcing of contacts, and tailored engagement strategies are essential when setting ambitious recruitment targets.

To encourage participation from this hard-to-reach group, incentives were increased in recognition of the technical nature of the discussion, the seniority of potential respondents, and the time required for interviews. The team also broadened eligibility where appropriate by considering a wider range of relevant roles (such as technical managers, engineers, or operational leads) while carefully screening to ensure that participants had sufficient knowledge of their business operations and voltage connections.

In addition, the interview screener included questions to gauge familiarity with connection agreements, and the discussion guide was adjusted to start with respondents' own connection experiences before introducing managed-connection scenarios. These adaptations maintained the quality and relevance of insight despite the small overall universe of suitable participants.

While the final number of interviews was lower than originally proposed, the findings collected from the 16 interviews still provide valuable insight into customers' technical capabilities, barriers, and levels of interest in voltage-managed connections. The challenges encountered have also highlighted the limited immediate relevance of such connections for many customers, which is in itself an important finding for future implementation strategies. The challenges in finding sufficient appropriate customers could also reflect the scope (customer volume) for any future market for a managed connection contract.

More details about the methodologies used and changes made can be found in each Area's section of this report.

A note on organisational naming in the report:

In March 2025, Iberdrola acquired Electricity North West Limited (ENWL) and in August 2025 ENWL was rebranded as SP Electricity North West. As the QUEST project spans this period both names may appear within this report, and any associated materials, but refer to the same organisation. All stimuli, questionnaires and questions asked or shown to research participants were asked in the context of ENWL as all fieldwork took place before the rebranding.

04.
Area 1: Customer Trial Impact

4. Area 1: Customer Trial Impact

4.1. Background

Area 1 of the QUEST customer research was designed to answer a fundamental question: do domestic and SME customers notice any difference in their electricity supply when QUEST voltage management is in operation? Previous innovation projects, such as Smart Street and CLASS (Customer Load Active System Services), had shown that changes made within statutory voltage limits typically go unnoticed by end users. Area 1 set out to confirm whether that remained true under the QUEST trials (which would alter voltage concurrently at three different voltage levels), providing evidence that the system can deliver network benefits without affecting customers' day-to-day experiences.

While delays in the introduction of QUEST trials led to challenges around continuity, the core aim of Area 1 was met: to test whether QUEST introduced any noticeable difference for customers in the trial areas.

4.2. Objectives

The specific objectives of Area 1 were to:

- Assess whether domestic and SME customers noticed any changes in their electricity supply or in how their appliances performed once QUEST was operational.
- Establish a clear baseline measure of customer perceptions of supply quality, reliability, and satisfaction prior to the trials.
- Revisit these measures during active trial to see if any changes were reported.
- Identify the types of differences customers claimed to notice (for example, lighting flicker or appliances running slower) and consider whether these could reasonably be linked to QUEST activity.
- Provide clear evidence to support the technical assessment of QUEST and give reassurance that the trials did not create negative customer impacts.

By addressing these objectives through quantitative research, Area 1 provided the foundation for the wider programme, showing whether customers in trial areas noticed QUEST in practice and setting the context for the more detailed work with sensitive and generation customers in Areas 2 and 3.

4.3. Methodology

Baseline approach

The baseline survey was conducted in September 2023 (before any QUEST activity on the network), using face-to-face interviews with domestic customers in both the trial and control areas, the latter providing a benchmark for comparison.

- Trial areas were defined by postcodes in the Royton area where QUEST trials were planned to take place.
- Control areas were defined by postcodes outside the trial area but still within the SP Electricity North West network region.
- Respondents were free-found by knocking on doors in the target postcodes on a mix of different days and different times of day.

Face-to-face interviewing was chosen at this stage as it allowed for stronger engagement with participants, greater control over coverage within the relatively small geographic footprint, and the opportunity to probe more effectively on detailed questions.

In total, 306 customers were interviewed, with 201 from the trial areas and 105 from the control areas. Ahead of main fieldwork, a cognitive pilot with 10 customers was completed to refine the questionnaire and ensure that the balance of technical and customer-friendly language was clear and accessible. Interviews during the main baseline stage lasted around 20 minutes and explored perceptions of electricity supply, experiences of power cuts, and overall satisfaction with SP Electricity North West.

Approach during active trial

The survey during active trial was carried out in July–August 2025, using Computer-Assisted Telephone Interviewing (CATI). The shift from face-to-face to telephone interviewing reflected the need to complete recontacts efficiently after the long gap since baseline, while maintaining a robust and representative sample.

Respondents were free-found from purchased lists of phone numbers in the target postcode areas.

A total of 304 interviews were achieved, with 200 from the trial areas and 104 from the control areas. Interviews were shorter (around 5 minutes) and focused on whether customers had noticed any differences in their electricity supply since the QUEST trials began. The survey covered energy consumption, reliability of supply, and, in the case of SMEs, the use and performance of any specialist electrical equipment. For domestic customers, questions centred on household appliances and lighting, ensuring both groups' experiences were tested appropriately. A dedicated SME sub-sample of 40 interviews was included to ensure small business-specific perspectives were captured alongside domestic households.

Challenges and adjustments

The research was originally designed to re-engage the same participants at both baseline and trial stages to enable direct comparisons over time. However, delays to the introduction of live QUEST testing extended the gap between surveys to 22 months, rather than the intended 12. This created challenges in recontacting the original sample, as customers may move home, be harder to reach, or find it difficult to recall their previous perceptions after such a long interval.

Despite these barriers, we successfully achieved 39 re-contacts among original trial area participants, which provided valuable continuity. By contrast, attempts to recontact the baseline control sample were unsuccessful, with no respondents re-interviewed. This was anticipated, and the research design accounted for it: because the study retained a large and robust trial and control sample both at baseline and during active trial, comparisons between the two waves remain valid even without individual-level continuity.

To ensure the target sample size was achieved, a free-found top-up of 225 domestic and 40 SME participants was added during active trial. This safeguarded robustness and representativeness.

While the extended timeframe introduced challenges, these were addressed through a mix of re-contacts, top-up recruitment, and a pragmatic shift in methodology. These measures ensured that the Area 1 research remained robust and reliable, providing strong evidence on whether customers noticed QUEST in operation.

4.4. Sample overview

Baseline sample

At baseline, interviews were conducted with a broad mix of domestic customers across both the trial and control areas. Participants reflected a range of ages, genders, household types, and socio-economic groups. This inclusive spread ensured that views captured were not biased towards a particular type of household, despite the relatively small geographic footprint of the trial.

Sample during active trial

The survey during active trial again captured a diverse demographic mix, with both trial and control customers represented. A sub-sample of SMEs was also included at this stage to understand whether businesses with specialist equipment noticed any impact from QUEST in trial vs control postcodes.

Vulnerable customers

Samples both at baseline and during active trial included vulnerable customers, including those registered on SP Electricity North West's Extra Care Register (ECR). Including these customers was important, as it ensured the findings reflected the views of those with a heightened reliance on consistent and reliable supply. Their responses provided valuable reassurance that QUEST operation did not negatively affect those most dependent on electricity continuity.

Profile differences

The Area 1 research was designed to give all customers an equal opportunity to participate, with no demographic quotas applied. While the original intention was to re-interview the same participants at both baseline and trial stages, the delay to live network testing meant that full re-contacts were not possible, requiring a top-up sample at the trial stage. This has resulted in some differences in the demographic profile between baseline and trial samples.

Comparing the profile of the baseline and trial samples showed a slightly higher proportion of older respondents in the trial group, particularly in the 65+ age bracket. Additionally, there was a slight increase in respondents registered on the Extra Care Register (22% in the trial vs. 11% at baseline), while other demographics such as gender and socio-economic grade remained similar across both samples

However, this does not undermine the robustness of the results. The total sample remains sufficiently large and diverse, and the analysis has compared trial findings not only against baseline measures but also against customers in the control area. This triangulated approach provides a reliable basis for assessing whether QUEST introduced any perceptible change in supply, ensuring that any differences observed can be interpreted with confidence.

For a detailed breakdown of the Area 1 sample, please refer to Appendix A.

4.5. Key Findings from Area 1

The Area 1 research set out to determine whether domestic and SME customers in trial areas noticed any changes to their electricity supply as a result of QUEST network testing. Control areas were included to provide a benchmark, ensuring that any reported differences could be attributed to QUEST rather than anything else happening in the SP Electricity North West region at the time of the trials.

The key findings are highlighted below, for greater detail please refer to Appendix B.

Customer awareness of supply changes

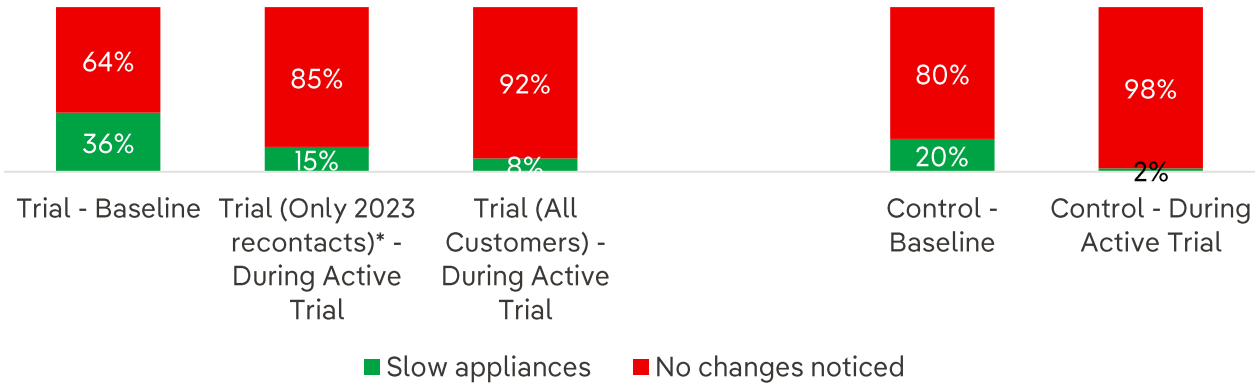
At the baseline stage, 36% of trial area customers reported noticing their appliances working differently, such as running more slowly than usual. By the active trial period, this figure had dropped to just 8%. In control areas, appliance issues were reported at lower levels both at baseline (20%) and during the active trial (2%).

One factor likely contributing to the higher incidence of appliance issues at baseline in trial areas is the interview method used. The face-to-face method employed during baseline interviews may have encouraged respondents to recall issues they had experienced, a phenomenon that can often lead to higher reporting rates compared to telephone interviews used during the active trial period. This potential bias is a known risk and was mitigated by including control areas for comparison, ensuring that any observed differences could be attributed to the QUEST trial rather than differences in the interview method.

When comparing the trial and control areas, a slightly higher incidence of appliance issues was noted in the trial areas during both the baseline and active trial stages. However, this difference was not statistically significant and remained consistent across both waves. As a result, we cannot conclude that the QUEST network trial activity during the active trial fieldwork had a noticeable impact on the functioning of customer electrical appliances.

There were no notable differences across demographic groups or between domestic and SME groups.

Figure 1 – Appliances working slower – Domestic Customers



Low base size warning

Figure 1 shows reported rates of appliances working slower than usual among both trial and control groups in the baseline and during active trial surveys among domestic customers

Base sizes: Trial baseline – 201; Trial (2023 recontacts) During active trial – 39; Trial (All) During active trial – 180; Control baseline – 105; Control during active trial - 84

Reports of **appliances working more quickly than usual** remained rare both at baseline and during active trial, at under one in ten across both trial and control samples. Similarly, reports of **flickering lights or changes in appliance performance** fell over time: one in four trial customers at baseline reported an issue with lighting compared with only one in ten during active trial. There were no notable differences between control (11%) and trial areas (8%). Where changes were reported, they tended to occur between 7pm and 7am in both waves, again pointing to customer routine variability rather than QUEST network activity.

Overall, the results demonstrate that QUEST network trials were not detectable to customers. In fact, the trend towards fewer reported problems during active trial provides reassurance that the technology does not compromise supply quality or the everyday functioning of domestic appliances.

Perceptions of power quality and reliability

Satisfaction with electricity supply was already high amongst baseline survey customers, with both trial and control customers reporting positive experiences of SP Electricity North West (referred to as Electricity North West to customers).

At baseline, 10% of trial area customers reported that they had contacted SP Electricity North West in the past, while the majority (83%) said they had not, with 7% stating 'don't know'. During active trial, this figure rose slightly to 17% having contacted the company, although the change was due to fewer "don't know" responses (falling from 7% to just 1%) rather than an increase issues requiring contact.

Control area customers showed the same pattern (12% had needed to contact SP Electricity North West at baseline; 18% during active trial), underlining that the small increase in reported contact was a result of the way responses were captured or something else happening in the region rather than an indication of QUEST related issues. This consistency across trial and control areas confirms that QUEST did not prompt additional contact or complaints.

Figure 2 - Reported contact with SP Electricity North West - domestic customers

Contact with SP Electricity North West	Trial – Baseline	Trial (only 2023 recontacts) – During active trial*	Trial (all customers) – During active trial	Control – Baseline	Control – During active trial
Ever needed to contact	10%	18%	17%	12%	18%
Never needed to contact	83%	82%	83%	85%	81%
Don't know	7%	0%	1%	3%	1%

**Low base size warning*

Figure 2 shows levels of reported contact with SP Electricity North West among domestic customers
Base sizes: Trial – Baseline (201), Trial (Only 2023 recontacts) – During active trial (39), Trial (all customers) – During active trial (180), Control – Baseline (105), Control – During active trial (83)

Specialist equipment used by SMEs

Among SMEs interviewed during active trial, 18% reported using specialist electrical equipment, such as generators or bespoke manufacturing machinery. Crucially, none reported any changes in performance during the trial period in either the trial or control areas.

The absence of any impact on this group, demonstrates that QUEST did not compromise the operation of sensitive or business-critical equipment. This finding is especially important given the potential operational and financial consequences if specialist kit had been affected as detailed in Area 2 findings.

Vulnerable customers (ECR)

The research also examined the experience of vulnerable customers, including those registered on SP Electricity North West's Extra Care Register (ECR). Representation of these customers was achieved both at baseline and during active trial, and the proportion of those registered on the ECR increased from 11% at baseline to 22% during active trial.

Importantly, responses from this group did not differ from the wider customer base. ECR customers were no more likely to report appliance or lighting issues, nor did they report higher levels of contact with the DNO. This shows that QUEST did not negatively affect customers with a heightened reliance on reliable supply, providing reassurance that the technology is acceptable and safe for all customer groups.

4.6. Area 1 Summary

The Area 1 research provides clear evidence that QUEST voltage management trial activity has had no noticeable impact on customers' experiences of their electricity supply. Across both domestic households and SMEs, customers in trial areas reported very similar experiences to those in control areas, and in some cases fewer issues were mentioned during active trial than at baseline.

No key measures, including appliance performance, lighting behaviour, and contact with SP Electricity North West showed a notable increase in incidence during the QUEST network trials in the trial area. SMEs using specialist equipment reported no changes in operation, and vulnerable customers on the Extra Care Register were no more likely than others to notice problems.

These results show that QUEST technology can deliver its technical and network benefits while remaining effectively invisible to end users.

05.
Area 2: QUEST Engagement

5. Area 2: QUEST Engagement

5.1. Background

Area 2 of the QUEST research focused on **sensitive I&C customers with High Voltage (HV) and Extra High Voltage (EHV) connections**. These organisations often operate equipment designed within a narrow voltage tolerance, making them more susceptible to even small fluctuations in supply. For such customers, the potential impacts of QUEST could be more immediate and material than for domestic or SME users, with consequences ranging from operational disruption to equipment damage, safety risks and financial loss.

Exploring this customer group was critical for QUEST, as their operational resilience and confidence in the network must be maintained if the technology is to transition to Business as Usual. It was also essential to understand what guidance and support these customers would require, adapting to any changes and to ensure communication materials about QUEST were clear, accessible and relevant to their needs.

5.2. Objectives

The specific objectives of Area 2 were to:

- Establish the expectations of HV and EHV customers from different sectors in relation to electricity supply and voltage management.
- Assess the risks and potential impacts of voltage variation for different types of sensitive businesses.
- Understand the support and guidance customers require to manage any impacts effectively.
- Develop communication materials to explain QUEST in a way that is accurate, credible, and easily understood by business audiences.
- Test and refine these materials to ensure they address customer needs and could be used by SP Electricity North West in the wider rollout.

5.3. Methodology

The qualitative research for Area 2 was designed to capture both operational insights and communication needs of HV and EHV customers. This was done through a three-part approach to ensure comprehensive feedback on both the technical aspects of voltage fluctuations and the effectiveness of communication strategies.

The qualitative design for Area 2 was intentionally structured to engage a diverse range of sectors, business sizes, and operational contexts. This allowed the research to capture the nuanced ways in which HV and EHV-connected organisations experience and manage voltage fluctuations and to understand operational sensitivities, communication needs, and practical challenges. By including multi-site and single-site organisations, as well as businesses from sectors with high voltage dependence, the research ensured that findings reflect the breadth of potential impacts on critical operations while providing actionable guidance for the design of communications and support strategies.

Part 1, Semi-Structured Interviews:

Businesses with HV or EHV connections were interviewed in March 2024 via 30-minute web-assisted discussions conducted through Zoom. A cognitive pilot involving 5 interviews was first carried out to refine the questionnaire and ensure clarity. The respondents represented various sectors, including agriculture, healthcare, energy generation, construction, manufacturing, and scientific/technical industries. The

primary objective of these interviews was to understand the usage and setup of voltage-sensitive equipment, providing in-depth insight into how different sectors manage their electricity supply.

Topics Covered:

- Organisation type, including sector, size, and locations
- Energy consumption patterns
- Importance of electricity supply to business operations, focusing on voltage-sensitive equipment

Part 2, Focus Groups:

90-minute online focus groups were conducted in June and July 2024 with a total of 12 business participants. These sessions explored the potential impact of voltage fluctuations on business operations and gathered opinions on the QUEST project. These explored the potential impact of voltage fluctuations on business operations, as well as introducing and exploring their opinions of the QUEST concept. Participants gave their views on draft communication approaches using examples of communication materials from previous innovation projects (CLASS and Smart Street).

Topics Covered:

- Business operations and challenges related to voltage fluctuations
- Initial impressions of QUEST and its potential benefits
- Current support mechanisms and desired support services

Part 3, Follow-Up Depth Interviews:

Follow-up depth interviews were reconvened with previous focus group participants in November 2024. These 20-minute interviews revisited the participants to evaluate their recollection of QUEST and its perceived benefits. The primary aim was to assess the clarity, relevance, and tone of draft communication materials developed based on insights from the focus groups. The feedback obtained was crucial for refining communication strategies.

Topics Covered:

- Recall of QUEST and its benefits
- Evaluation of communication materials, focusing on clarity, relevance, and appropriateness of tone
- Preferred communication channels for receiving future information about QUEST

5.4. Sample overview

Part 1, Semi-Structured Interviews:

A total of 31 organisations with HV or EHV connections participated in the semi-structured interviews. Participants were recruited by a specialist agency, Feedback Market Research, using a contact list provided by SP Electricity North West, ensuring that all respondents were based within the SP Electricity North West region. Organisations represented a diverse range of sectors, including agriculture, healthcare, construction, manufacturing, scientific/technical services, and energy generation.

While the sample was not designed to be statistically representative of the entire business population in the SP Electricity North West region, it was deliberately constructed to capture a broad range of business sizes and operational contexts. Both multi-site and single-site organisations were included to reflect variation in electricity use, infrastructure complexity, and potential sensitivity to voltage fluctuations. This approach provided robust qualitative insight into how different types of high-voltage-connected businesses interact with and are affected by the network.

Part 2, Focus Groups:

Three online focus groups were conducted, comprising a total of 12 participants. These participants were recruited via free-find by Feedback Market Research. To improve recruitment feasibility and ensure participation, a small number of participants were drawn from outside the SP Electricity North West region. This was considered appropriate given that challenges related to voltage stability and network capacity

are common across the UK, and the insights gained remain highly relevant to SP Electricity North West's operational context.

Participants were selected to reflect a cross-section of sensitive I&C customers where even minor voltage changes could materially affect operations. The sample included a mix of sectors such as manufacturing, construction, electricity generating stations, healthcare, and intentional community living, as well as a range of business sizes. While not statistically representative, this approach ensured the capture of diverse perspectives on voltage-sensitive operations and the communication needs associated with QUEST.

Part 3, Follow-Up Depth Interviews:

Nine follow-up interviews were conducted with participants from the focus groups. Despite the relatively small sample size, these interviews included businesses of varying sizes and sectors, encompassing manufacturing, construction, power stations, and healthcare. These interviews allowed for detailed exploration of participants' recollections, perceptions of QUEST, and evaluation of draft communication materials. All participants were recruited through Feedback Market Research to maintain continuity and reliability of the qualitative insights.

A full breakdown of the sample achieved across Parts 1, 2, and 3 of Area 2 is provided in Appendix D.

5.5. Area 2 Findings

The Area 2 research explored the expectations, experiences, and communication needs of HV and EHV-connected I&C customers, with a particular focus on how voltage fluctuations might affect their operations. Across the 31 semi-structured interviews, three focus groups, and nine follow-up depth interviews, the findings highlighted that these businesses place critical importance on a stable electricity supply, with many operating voltage-sensitive equipment whose performance could be materially affected by even small variations. Participants reported that operational disruptions, financial impacts, equipment damage, and safety risks are tangible consequences of voltage instability, particularly in sectors such as healthcare, energy generation, manufacturing, and construction. While prior awareness of network pressures and voltage management varied, respondents were able to engage meaningfully with the QUEST concept once introduced, recognising its potential to stabilise the network voltage, and provide more reliable connections to customers with voltage sensitive equipment, as well as providing operational and cost benefits. The research also identified clear preferences for communications and support, including concise, sector-relevant information delivered via named contacts, personalised email, in-person engagement, and visual media.

Customer expectations and reliance on supply:

A key objective of Area 2 was to establish the expectations of HV and EHV customers regarding their electricity supply. Across all sectors, participants stressed the essential role of electricity in sustaining core business operations, with reliability framed as non-negotiable. There were sector differences observed in how businesses described their reliance on a reliable supply:

Healthcare organisations emphasised the life-critical nature of supply:
"As a hospital it's critical, as without, it's a threat to life. We have no room for error and need a constant supply. That's why we have a back-up in place. It's totally not acceptable and we have no flexibility. We are open for patient care 24/7." *Health sector business*

An agricultural business described similar levels of dependency, with operations and animal welfare closely tied to supply stability:
"We have 150,000 birds at any one time on site for the food market, so supply is critical for the day-to-day running of the business. Without it the birds would be dead. We need a constant voltage supply for the survival of the birds and their health. The machinery is vital for the survival of the birds." *Agriculture, forestry & fishing sector business*

Energy-intensive businesses, such as power stations, highlighted their dual responsibilities - to maintain their own operations and to help balance the wider grid:
"It's critical for us because we help balance the National Grid. If we lose power and can't generate, we can't export to the grid, so if there are any losses we can't do that and if there's a demand on the grid, we can't balance that if the back-up generators don't come on either. Also, another aspect is the capacity market contracts that we have in place where we are obliged by National Grid to generate in case of an emergency." *Energy export sector business*

Industrial sites with multiple tenants also reported strong expectations of continuous supply, noting the compounding effect of disruptions across diverse businesses:
"As we are a large site with 100 businesses operating, if electricity was cut off temporarily, it has a massive impact because we have such a mix of tenants — some with sensitive equipment, manufacturing, engineering. In these events planning is essential, or business comes to a standstill." *Business centre*

Participants also highlighted that their reliance on electricity extended beyond core operations to broader business functions, including administrative tasks, data management, and day-to-day coordination. Many organisations described a high degree of integration between electricity supply and operational planning, noting that even short interruptions can disrupt workflows, reduce efficiency, and create knock-on effects for staff scheduling and logistics. For multi-site organisations, the expectation of uninterrupted supply was magnified, as any disruption at one site could cascade through connected operations. Several businesses further emphasised that reliability is closely linked to organisational resilience and reputation, with continuity of supply seen as essential not only for operational performance but also for maintaining trust with clients, partners, and stakeholders. This universal dependence demonstrates that a reliable electricity supply is a fundamental enabler for business continuity, operational planning, and strategic decision-making across the HV and EHV customer base.

Voltage-sensitive equipment and operational set-up:

A further core objective of Area 2 was to understand how HV and EHV customers configure their equipment and the implications for QUEST operation. Part 1 of Area 2 confirmed that a large proportion of businesses operate equipment with narrow voltage tolerances. Around 65% of organisations reported using voltage-sensitive equipment that requires stable supply to function optimally. 71% said they have a high-voltage electricity supply. 48% of businesses have their own generation capability to use as a back-up, and 39% have their own generation capability that runs independently of the main supply. 2 in 3 (65%) have equipment sensitive to the voltage of the incoming supply. These included research labs, control systems for wind turbines, generators, medical equipment and transformers.

The location of the business's electricity meter also varied. While half had their meter on a panel separate from the main supply, 1 in 5 had it connected directly to the incoming supply wiring. Of those who mentioned 'other', their meters were set inside a substation, on DNO switchgear, had their own incoming supply or in a mix of locations.
Many businesses cited specific tolerance bands, ranging from standard 230/240V domestic levels through to 11kV or 6.6kV for high-voltage industrial applications.

Respondents illustrated these requirements in practical terms:

- *"Yes, an 11,000 volt transformer. All our voltage on site is 11kV."* *Waste disposal/landfill business*
- *"It's only the standard 230 volts. Yes maintained 24/7 at 230 volts."* *Manufacturing business*
- *"The whole site is in line with network voltage requirements, that being HV 6600v, with a 5% tolerance either side of that."* *Distributed energy business*

Findings from Part 1 (semi-structured interviews) and Part 2 of Area 2 (focus groups) revealed how vulnerable many operations remain to voltage fluctuations. Over half of organisations (52%) indicated that their operations would shut down completely if voltage moved outside the range specified by their equipment manufacturers, and a further quarter said individual machines would stop working.

Figure 3 – Impact of voltage fluctuations on businesses operations

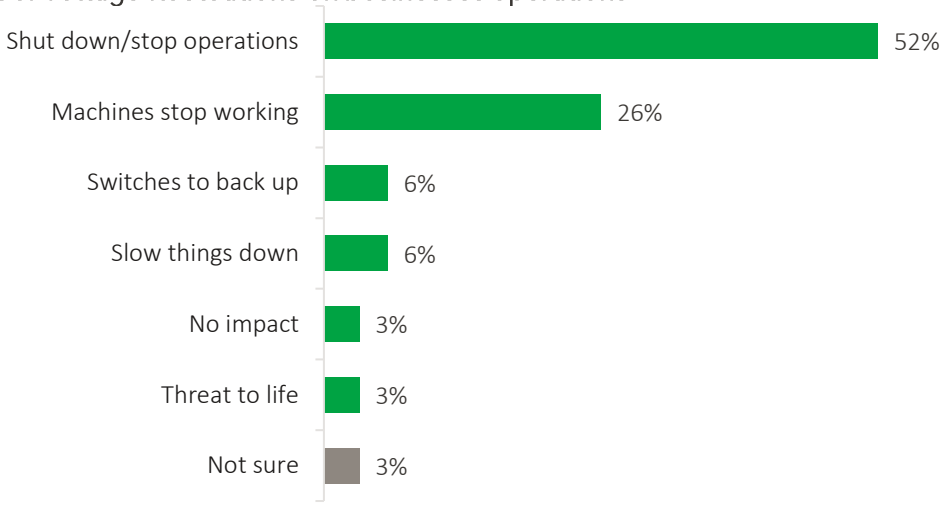


Figure 3 shows reported extent of impact on businesses operations if the voltage supplied to their facility fell outside the prescribed narrow equipment operation voltage bands
Base size: 31

Businesses across sectors consistently reported that even minor fluctuations in electricity supply could cause **operational disruption** - halting operations for extended periods, typically between 12 and 24 hours. During these events, staff were often unable to perform normal duties, and operations in facilities reliant on HV equipment were reduced to minimal manual tasks. In manufacturing and industrial sites, production lines could stop entirely, while in healthcare or laboratory settings, critical processes were paused or delayed. Some organisations noted that recovery required careful sequencing, as machinery and systems needed to be restarted in specific orders to avoid further issues, compounding the disruption.

The **financial implications** of such interruptions were substantial. Several energy-intensive businesses, including power stations and high-demand manufacturers, estimated losses of up to £60,000 per day, reflecting both halted production and penalties associated with delayed deliveries or missed contractual obligations. Additional financial burdens arose from deploying on-site engineers, investing in backup generation or surge protection, and ongoing expenditure to safeguard sensitive equipment. These costs were particularly acute for businesses operating under tight margins or with high-value outputs, such as precision manufacturing and food production.

Voltage fluctuations were also reported to cause **equipment damage and accelerate wear and tear** on sensitive HV equipment. In construction, manufacturing, and energy generation sectors, repeated disruptions shortened machinery lifespan, compromised calibration, and increased the frequency of maintenance interventions. Equipment such as turbines, control systems, medical devices, and industrial machinery were cited as particularly vulnerable. Organisations emphasised that maintenance costs were not purely financial; unplanned downtime for repair could further exacerbate operational delays and compromise quality or safety.

Respondents highlighted that unreliable electricity supply could create immediate **safety hazards**, including the risk of electric shocks, fires, and failures of life-critical systems in hospitals or care facilities. **Compliance-related concerns** were also raised, particularly where backup generators and emissions controls were involved. Businesses noted that operational failures could lead to breaches of statutory regulations or internal safety standards, potentially resulting in financial penalties, reputational damage, or legal exposure. These risks were especially significant in sectors with strict regulatory oversight, such as healthcare, energy generation, and food production.

Finally, interruptions were reported to have consequences that extended beyond individual sites, affecting wider **supply chains and client relationships**. Delays in production or service delivery could cascade through partner organisations, creating bottlenecks and compromising contractual obligations. In

precision-dependent industries, even minor operational delays were perceived to erode client trust and damage reputations. Several respondents noted that repeated interruptions could influence long-term business planning, with clients and investors factoring reliability concerns into project feasibility, procurement decisions, and partnership agreements.

Sector-specific risks were most acute in:

- Healthcare, where medical equipment and patient data systems require uninterrupted power, with direct consequences for patient safety.
- Power stations, where fluctuations compromised efficiency and safety, with lost generation capacity directly affecting revenues.
- Construction, where equipment performance suffered, leading to downtime, increased safety risks, and financial penalties.

Overall, voltage fluctuations represent not just a technical inconvenience but a material threat to the viability of many HV and EHV operations. This underscores the need for QUEST to be framed around reassurance, demonstrating that voltage adjustments will remain within statutory limits and will not compromise business continuity. Positioning QUEST as a solution or safeguard against voltage fluctuations could encourage business engagement by showing that SP Electricity North West is actively supporting their operational needs.

Understanding of network pressures and future planning:

Across Area 2, it was evident that businesses had a relatively low baseline understanding of the pressures facing the electricity network. While most participants were aware of occasional voltage fluctuations or short-term supply issues, few spontaneously recognised the increasing strain on the network resulting from decarbonisation, electrification, and the growing uptake of low-carbon technologies. For example, several manufacturing and agricultural businesses reported that they were focused primarily on maintaining their day-to-day operations and mitigating immediate supply disruptions, rather than monitoring or planning for wider grid-level changes. Similarly, healthcare organisations were acutely focused on ensuring continuity of critical systems, without explicit consideration of how broader network dynamics could affect their operations in the medium to long term.

When prompted, businesses acknowledged that pressures on the network were likely to increase in the future, particularly due to rising demand from electric vehicles, heat pumps, and distributed renewable generation. A power station operations manager noted that *"If it's something that's predicted is going to continue, and is going to get worse, no doubt with the demise of natural gas in the not-so-distant future, and if we're going to rely on renewables as opposed to nuclear we need to plan for that,"* while an operations manager at a hospital expressed cautious interest, highlighting a desire for concrete evidence of future impacts rather than speculative predictions: *"It's like they're a fortune teller. I'd rather they show what has actually happened and how we could be affected, than rely on forecasts for the future."*

Despite this limited understanding, some businesses are taking proactive steps to future-proof their electricity demand. Energy-intensive sites and those with critical HV equipment reported investing in on-site backup generation, surge protection, and uninterruptible power supply (UPS) systems to maintain operations during supply fluctuations. Several manufacturers described using flexible production schedules or staging high-demand activities to periods of historically stable supply. Agricultural businesses, particularly those with large-scale livestock operations, highlighted reliance on both backup generators and contingency planning to safeguard animal welfare. Data centres and hospitals reported regular maintenance and testing of emergency power systems to ensure resilience against potential outages.

However, these measures are largely reactive and tailored to the immediate needs of individual sites rather than informed by a strategic understanding of broader network pressures. The research indicates that as the UK electricity network becomes more complex and variable, businesses that do not develop a more informed understanding of grid dynamics may face increasing operational, financial, and reputational risks.

There is a clear opportunity for SP Electricity North West to support these customers by providing accessible guidance, technical advice, and proactive engagement on anticipated network pressures and potential mitigation strategies, helping businesses align their operational planning with the evolving demands on the electricity system.

Introduction to QUEST:

Businesses were first presented with information about current and future challenges facing the electricity network, including rising demand, increasing variability from low-carbon technologies, and the potential strain on network capacity. This context helped frame the importance of voltage management and the operational pressures that businesses might face. Following this, QUEST was introduced as an innovation project designed to optimise voltage levels across the network. The project was explained as a coordinated system integrating multiple voltage control techniques to improve network efficiency, enhance reliability, and support the adoption of low-carbon technologies. Participants were shown that QUEST operates within statutory voltage limits while dynamically responding to changes in both demand and generation. The introduction emphasised potential benefits for businesses, including reduced downtime, improved operational stability, and possible cost savings, positioning QUEST as a practical solution to help them manage the evolving pressures on the electricity system.

Following the introduction, businesses demonstrated a broad awareness of the purpose and potential benefits of QUEST and saw it as a positive innovation, although detailed understanding of the system's technical operation was limited. Most participants were able to grasp that QUEST aimed to stabilise the network and improve operational reliability, but few recalled specific mechanisms, such as the concurrent use of multiple voltage control techniques. Participants appreciated the framing of QUEST within the context of broader network pressures, recognising its relevance to their operations and its potential to reduce unplanned downtime or operational disruption.

Businesses were able to appreciate the benefits of QUEST:

- **Stabilising voltage levels on the grid**: Businesses valued the prospect of improved reliability and fewer outages, which would help maintain continuous operations and reduce costly downtime.
- **Cost savings**: Reduced disruption and more efficient voltage management were seen as direct financial benefits, with fewer expenses for repairs, engineers, or backup power.
- **Improved safety**: QUEST was associated with reducing the risk of electrical fires and other safety hazards linked to voltage fluctuations.
- **Environmental benefits**: While acknowledged, these were less prominent in business priorities. Reducing CO_2 and supporting low-carbon technologies were appreciated, but continuity of supply and cost efficiency remained the dominant concerns.
- **Technical assistance and monitoring**: Many welcomed the potential for additional services including advanced monitoring and technical support, viewing this as an opportunity to better understand and manage their own supply vulnerabilities. However this was not part of the base QUEST concept.

Respondents highlighted these benefits in their own words:
"So a lot of these audits, if we can understand better supply, obviously that will then benefit us and feed into those figures that we can measure. And so for me it's that community of different things sort of feeding into us." Operations Director, Corrugation Manufacturer
"If you can put those statistics and facts on a bit of paper and prove that it works, then NHS are on board." Network Manager, NHS Trust

Some businesses, particularly those in energy-intensive or highly regulated sectors, highlighted the need for **clear, practical information** about how QUEST might interact with their existing equipment and contingency measures. Overall, the introduction was effective in conveying the strategic rationale and high-level benefits of QUEST, laying the foundation for subsequent discussions and evaluation of draft communication materials in the follow-up depth interviews.

Participants also reacted positively to the idea of **support systems** (not part of QUEST but aligned to QUEST benefits). Real-time alerts were seen as valuable for helping businesses pre-empt problems and shut down equipment before damage occurred. Technical assistance to assess vulnerabilities was welcomed as a proactive measure, essentially acting as an audit. Financial support for mitigation measures appealed in cases where businesses were reluctant to invest unless such modifications became mandatory. By contrast, power quality improvement solutions attracted less comment, reflecting their lower perceived relevance compared with direct, actionable support.

Importantly, businesses did not raise concerns about QUEST operating within statutory voltage limits once this was explained. Instead, the emphasis was on transparency and proof through providing credible data to show that QUEST can deliver on its promises without compromising operational resilience.

Communication and support requirements:

A core objective of Area 2 was to test and refine communication materials for QUEST, ensuring that they were accurate, credible, and relevant for sensitive HV and EHV customers. The research highlighted clear expectations around the tone, content, and delivery of communications, as well as the type of support that businesses expected to accompany engagement.

Participants consistently emphasised the importance of **tailored and practical content**. Generic communications, such as standardised emails sent to generic inboxes, were perceived as ineffective, as they frequently fail to reach the right personnel or address sector-specific concerns. Businesses stressed that communications needed to speak directly to their operational context, acknowledging the particular pressures, equipment sensitivities, and challenges they face.

To facilitate design of QUEST communications materials, participants were shown materials from previous innovation projects, such as the Smart Street leaflet, as an exemplar of the professional presentation and clarity expected from SP Electricity North West.

Figure 4 –Smart Street communications

Figure 4 shows the Smart Street communications materials shown to focus group participants

Feedback on the materials was generally positive, particularly the first page, which participants felt effectively focused on the benefits to the customer and clearly demonstrated relevance. The professional layout and tone were also noted as building credibility. However, participants suggested improvements to enhance usability and engagement. A summary section at the end was recommended to allow readers to quickly identify key information. Some participants felt that the content was overly dense and should focus more on core questions: why QUEST is being implemented, the expected impact, the approach to implementation, and the timeline. Including concrete examples of past issues was highlighted as a useful way of illustrating the need for QUEST and making the material more relatable.

The second page, which contained more detailed content, was generally seen as manageable and easier to digest. Participants attributed this to the clear layout, with topics and sub-topics well-labelled, enabling rapid navigation to areas of interest. Nevertheless, respondents emphasised that the material should be personalised to make clear its relevance to the reader. This included the need for a named contact within SP Electricity North West, ensuring accountability and providing a clear avenue for follow-up questions. Concerns were also raised regarding the leaflet format; participants questioned whether printed materials would reliably reach the appropriate individuals, with the potential for critical messages to be missed. Digital channels, particularly personalised emails or online resources, were suggested as more effective alternatives for reaching busy, technically focused customers.

Overall, the findings underline that communications about QUEST must combine clarity, credibility, and operational relevance. Messages should be concise, visually structured, and tailored to sector-specific concerns, supported by accessible points of contact and practical guidance. This approach ensures that businesses not only understand the purpose and benefits of QUEST but are also confident in the support available to them as the project is implemented.

The feedback from the focus groups in Part 2 of Area 2 provided insights used to develop a clear set of guidelines for how QUEST should be communicated to HV and EHV customers. Businesses emphasised the need for transparency, consistency, and reassurance, underpinned by opportunities for two-way dialogue.

1. Be transparent and clear
Customers wanted QUEST explained simply and directly, with clarity on why it is necessary, how it works, and when changes will happen. Setting out a clear timeline was seen as essential to building trust.

2. Highlight benefits
Businesses responded most strongly to messages around improved reliability, fewer outages, and greater energy efficiency (especially when linked to cost savings). SP Electricity North West should provide assurances on how QUEST would support their future growth by providing a stable platform for operations. Environmental benefits were valued, but were secondary to continuity of supply and cost efficiency.

3. Address potential impacts
Respondents wanted acknowledgement of possible short-term disruptions and clear explanations of how these would be managed. They were reassured by evidence that QUEST will always remain within statutory voltage limits but also asked for practical examples of how any risks would be mitigated.

4. Offer technical support
Providing access to technical experts was highlighted as a priority. Customers valued the ability to ask questions specific to their sector and to receive practical advice on protecting sensitive equipment. Supporting resources such as FAQs, best practice guides, and sector-specific examples were seen as useful tools.

5. Communicate regularly
Regular updates were preferred over one-off engagement. Businesses wanted to be kept informed via multiple channels, including emails, newsletters, and dedicated webpages, and welcomed interactive formats such as webinars or events where concerns could be addressed directly.

6. Provide clear contact points
Confidence depended heavily on having a named contact within the organisation. Businesses felt that generic emails or helplines would be ignored; instead, they valued direct relationships with account managers or technical staff who could respond quickly to issues.

7. Emphasise partnership
Finally, respondents wanted QUEST framed as a partnership. By positioning the project as a joint effort to build a more resilient, efficient, and sustainable electricity network, SP Electricity North West could reinforce shared responsibility and highlight opportunities for businesses to contribute to wider system benefits.

These guidelines help communications to go beyond one-way information. Businesses expect QUEST to be explained in practical, relevant terms, backed by regular updates, trusted contacts, and tangible support systems.

Channel preferences:

In addition to **what** should be communicated, Area 2 explored **how** QUEST messages should best be delivered.
Respondents highlighted a clear hierarchy of preferred channels, reflecting both the need for trusted, personal engagement and the practicality of accessible, digital formats.

- **In-person engagement** was seen as particularly important for building trust and relationships, especially in sectors such as healthcare where the stakes are high and confidence in resilience is

critical. Face-to-face discussions were considered the most effective way to get decision-makers on board.

- **Audiovisual content** was regarded as one of the most digestible ways of explaining QUEST, especially for those who learn best visually. Respondents felt that well-designed video content could support understanding and improve engagement levels.
- **Emails** were welcomed as a direct and efficient form of communication, but respondents stressed that these should be personalised and come from a named contact rather than a generic account.
- **Social media** was seen as useful for distribution, particularly LinkedIn, which businesses regarded as a credible channel for sharing updates and explainer videos with professional audiences.
- **Leaflets**, by contrast, attracted largely negative feedback. Concerns included a lack of trust that printed materials would reach the right individuals within large organisations, and the contradiction of using paper for a project focused on efficiency and sustainability. As one respondent put it: *"It's a contradiction – you're trying to do all this CO_2 saving for the environment and then you're just cutting down a load of trees to print leaflets."* Construction business

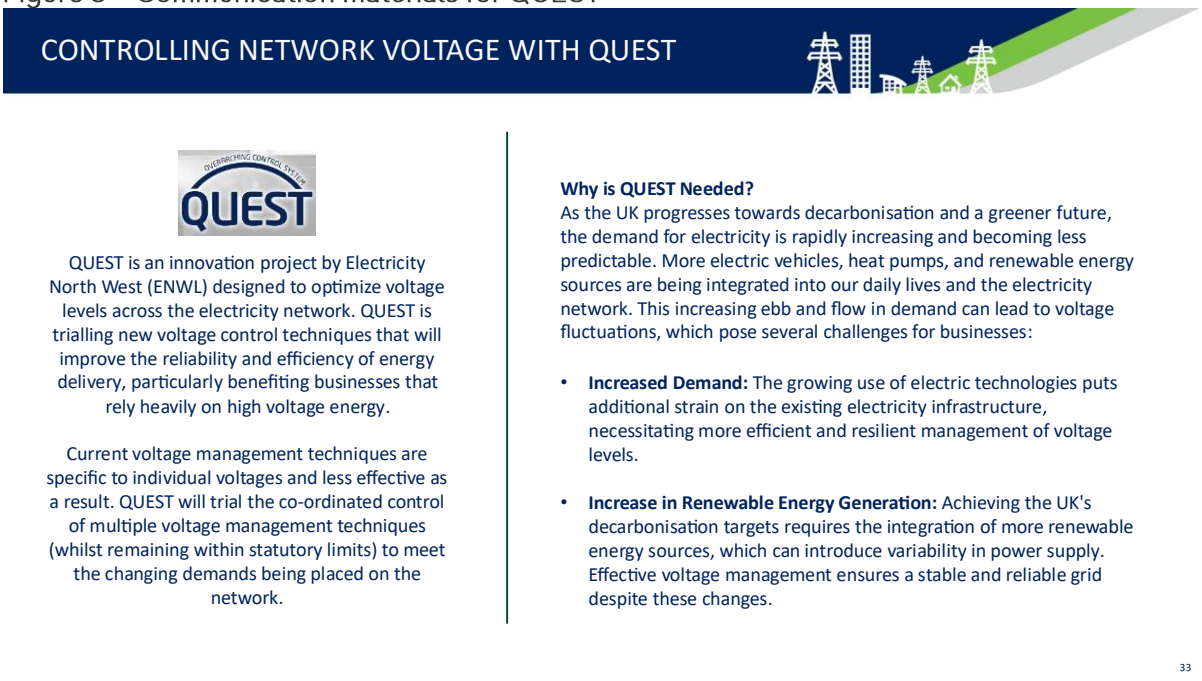
As explained previously, HV and EHV customers want QUEST communications to be **transparent, practical, and sector-specific**, with clarity on both benefits and potential impacts. Trust will rely on **named contacts, regular updates, and access to technical expertise**, alongside communication framed as a genuine partnership. Businesses prefer a **digital-first approach, such as emails, LinkedIn, and audiovisual content**, supported by opportunities for in-person engagement where relationships are most critical.

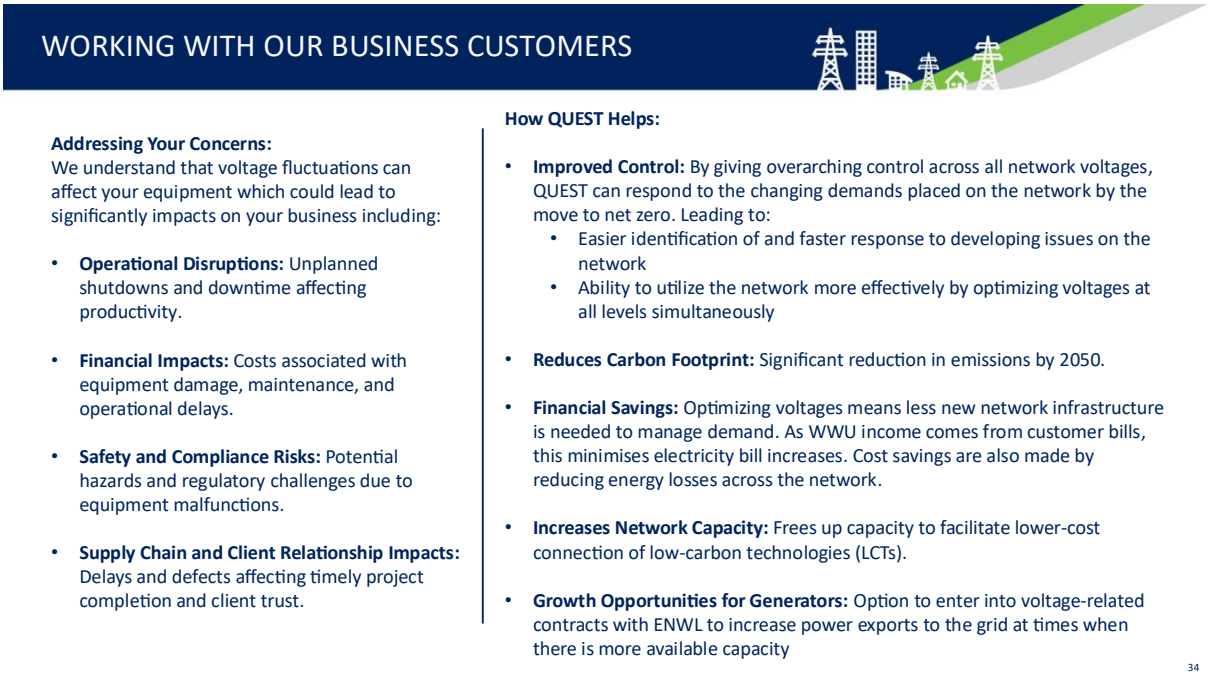
QUEST communication material design:

Building on the insights from Parts 1 and 2, Impact developed draft communication materials reflecting business priorities for clarity, relevance, and reassurance. These materials were designed to address sector-specific concerns using language and tone that HV and EHV-connected customers could readily understand.

They were subsequently tested in follow-up depth interviews with reconvened participants, allowing refinement of content, structure, and messaging to maximise effectiveness. The materials are shown below. At the time these materials were developed, SP Electricity North West was operating under the name Electricity North West Limited (ENWL).

Figure 5 – Communication materials for QUEST





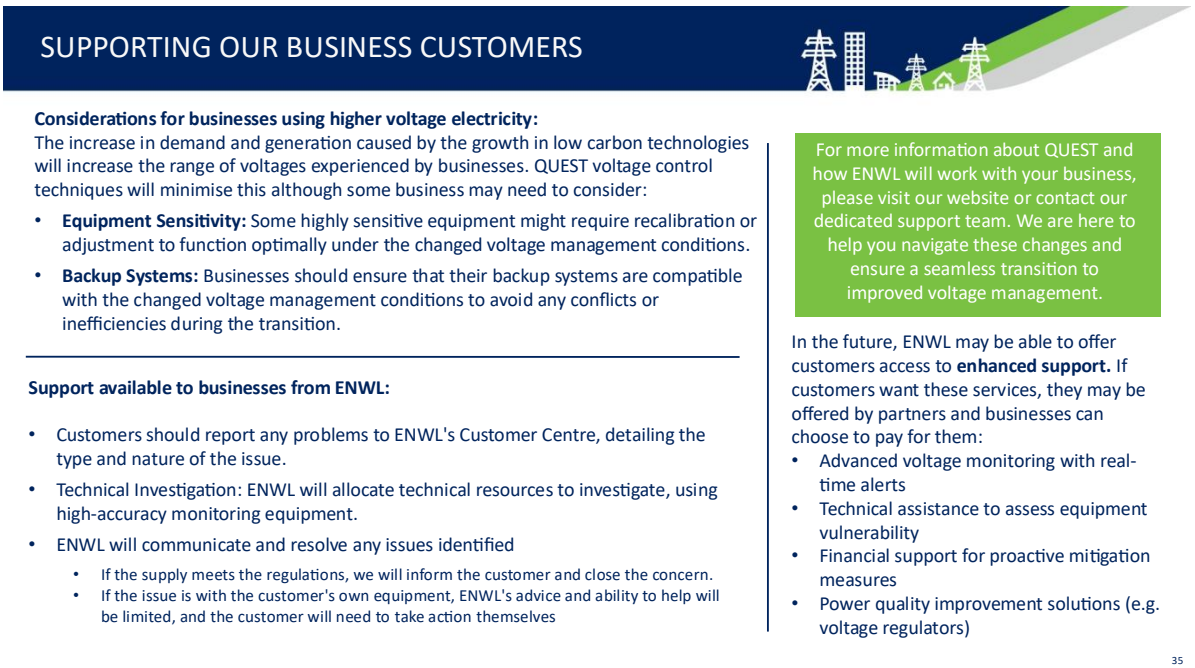


Figure 5 shows the communication materials for QUEST tested in Area 2 Part 3

Communications materials evaluation:

The nine participants reconvened from the earlier focus groups were asked to evaluate these materials in terms of how effectively they addressed their needs and expectations along with measuring how much of QUEST's purpose and benefits participants were able to recall after their initial exposure.

Most respondents had retained only a top-level understanding of QUEST. They generally recalled that it was a new type of technology designed to manage voltage fluctuations and reduce disruption for businesses by potentially blocking power surges but struggled to articulate the detail of how it worked. No participants spontaneously mentioned Smart Street or CLASS, or the specific benefit of QUEST being able to coordinate multiple voltage management techniques. In addition to this, no respondent spontaneously mentioned why voltage fluctuations and managing demand are likely to be more of challenge to business operations in the future.

*"I remember that they were looking at releasing a new type of technology, and it already had funding up in the North for reducing drops in volt drop in the mains. It seemed that the pitch was trying to look more at consumers, perhaps more than on the industrial application. So, I'm a plant manager at a power station. **I was explaining how it probably wouldn't really affect a larger commercial sort of installation.**" Power station*

This suggests that while the concept of QUEST was accessible, technical elements and the broader system rationale were harder for businesses to retain.

Customers then reviewed the draft communications materials (Figure 5). Overall, participants responded positively to the tone and presentation of the materials. They appreciated that the language was accessible without being overly simplified, and that technical concepts were explained in a way that maintained credibility while remaining understandable. The materials were described as professional, visually clear, and logically structured, which facilitated comprehension and made it easier for participants to engage with the content. Many participants noted that the materials successfully outlined the benefits of QUEST, particularly emphasising operational efficiency, reliability, and continuity of supply, which were immediately relevant to their business context.

The clarity of headings and sub-headings, as well as the use of concise bullet points, was highlighted as helpful in skimming and navigating the information. Participants also appreciated that the materials could be shared within their organisations, providing a clear summary of the project's purpose and potential advantages.

"No words or terms I'm not familiar with...reads in a good order, a good amount of information, not too little, not too much, good language." Construction business
"I really like that slide. It's quite obvious to me to see the major concerns. The reward or the benefit from that is really well laid out." Manufacturing business
"I mean, this is kind of exactly the things that I need, so that I can help sort of roll out any of this...I think it's smashing [about the tone]. I think it's not too overloaded. It's not too, you know, technical speak, it's fairly straightforward." Operations Director at a manufacturing company

While the draft materials were generally well received, participants highlighted some areas for refinement. They felt the content **should be more sector-specific**, using practical examples that directly reflected the realities of specific industries such as healthcare or manufacturing. The benefits of QUEST, particularly cost savings, could benefit from improved accuracy and clarity. One participant felt the term "high voltage energy" was not accurate and instead prefer the term "high voltage electricity". Another participant felt that people without an electrical background would struggle with some of the terminology used in the communications materials. The inclusion of a contact number was also suggested, echoing feedback in Part 2 where participants wanted someone in SP Electricity North West who businesses could contact. Finally, businesses stressed the importance of personalisation, suggesting that communications should include a named contact to increase credibility and ensure information reached the right decision-makers within their organisation.

"I don't actually understand how that's going to benefit a business that relies on high voltage electricity necessarily." Plant Manager at a power station
"It's not quite clear... it could be clearer... maybe how you would help them by reducing the cost, you know." Engineering Manager at an energy to waste power station
"High voltage energy doesn't really make good English... perhaps it should be high voltage electricity" Plant Manager at a power station
"I think it's painting the picture that these voltage fluctuations are far more frequent and far more drastic than reality." Plant Manager at a power station

When asked again in the Part 3 depth interviews, respondents reinforced the importance of choosing the right channels for QUEST communication. Email was seen as the most direct and efficient method, but participants stressed that messages must come from a named contact within SP Electricity North West.

Generic emails were viewed as likely to be ignored, particularly in larger organisations where information can easily get lost. In-person engagement continued to be valued for its greater impact.

In addition, some respondents expressed interest in real-time updates, such as monitoring tools that could alert businesses to network conditions or price changes. They saw value in this kind of functionality to support decision-making, for example, when assessing whether to increase or reduce activity in response to system conditions.

These further insights were used to refine the content, structure, and tone of the communications. The materials were then consolidated into a leaflet format, as illustrated in Figure 6, incorporating a summary of key points, practical examples, and a named contact to enhance accessibility, engagement, and usability for HV and EHV-connected businesses.

Figure 6 – Leaflet-style communication of QUEST

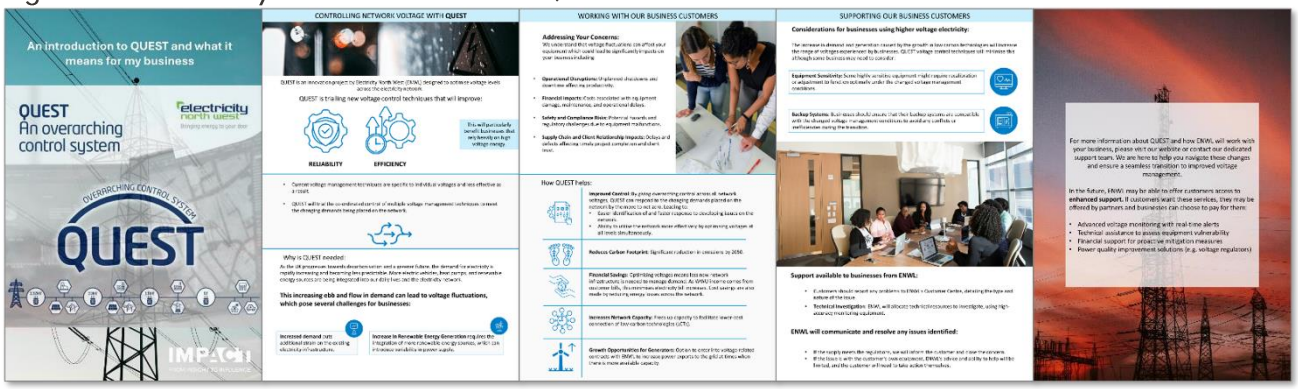


Figure 6 shows the leaflet-style communication of QUEST designed using insights from all stages of Area 2 research

5.6. Area 2 summary

Area 2 set out to understand expectations of HV and EHV customers, the risks and impacts of voltage variation on their operations, the support they require, and how best to communicate QUEST. Across sectors, electricity supply was viewed as business-critical. Customers expected stable, uninterrupted power and had little tolerance for fluctuation. Many operated within narrow voltage bands and reported that deviations would trigger shutdowns of whole sites or key assets. This confirms the need to manage change carefully and to provide clear reassurance on continuity of service, and (although not spontaneously mentioned), keeping within statutory limits.

Customers described the risks of operational, financial and safety consequences from even small voltage fluctuations on their electricity supply. Downtime of 12 to 24 hours, accelerated wear on equipment, compliance risks and knock-on effects for supply chains were all cited. These impacts were most acute in healthcare, power generation and construction although experiences of voltage issues were not frequently experienced.

When setting the context for QUEST, awareness of the changing demands on the electricity network and potential impact on businesses was low, especially regarding future system pressures. Once this context was explained and QUEST was introduced, most respondents saw it as a positive innovation. They recognised the benefits, prioritising reliability, fewer outages and cost control, with environmental benefits welcomed but secondary. Acceptance was contingent on transparent evidence that QUEST would not compromise operations (and reassurance that statutory voltage limits would not be breached).

On support and guidance needs, businesses asked for practical, sector-specific help. Advanced monitoring with real-time alerts, technical assessments of equipment vulnerability and clear points of contact were valued. Financial support for mitigations would unlock action for some.

Using insights from the research, draft materials were developed to communicate QUEST to businesses. Customers evaluated the draft materials, enabling refinement and the development of clear communications guidelines: Messages should be transparent about the why, what, how and when, highlight business-relevant benefits of QUEST, acknowledge and manage potential impacts, and be delivered through trusted channels. Digital-first communications, especially personalised emails from named contacts, short audio-visual explainers and LinkedIn communications, should be combined with in-person engagement where confidence is paramount. Generic mailings and printed leaflets were viewed as less effective.

Overall, Area 2 demonstrates that sensitive HV and EHV customers can accept QUEST where the case is made in their language, evidence is provided on reliability and limits, and tangible support is offered.

06.
Area 3: Managed Connections

6. Area 3: Managed Connections

6.1. Background

This section 5 examines the perspectives of customers who are most exposed to changes in voltage management. These include generators, generation developers, property developers, and other high-demand users connected at high or extra-high voltage. Their operations depend on reliable and cost-efficient access to the electricity network, and they are particularly sensitive to the way connection arrangements, capacity limits, and voltage control are managed. Any shift in these areas can have significant implications for investment decisions, project timelines, and day-to-day business planning.

As QUEST moves from an innovation trial towards potential business-as-usual deployment, these customers may be asked to participate in new forms of managed or flexible connections. Their willingness to engage will be shaped not only by the technical robustness of the approach but also by how well it aligns with commercial realities such as cost certainty, operational risk, and regulatory obligations. Understanding their priorities, concerns, and capabilities is therefore essential to designing a solution that achieves network benefits while remaining acceptable to those whose businesses depend on secure, predictable access to the grid.

6.2. Objectives

The specific objectives of Area 3 were to:

- Assess the capacity and potential for generators and large demand users to respond to changes in voltage, particularly where this could deliver benefits such as cheaper or more flexible connections. SP Electricity North West may ask these customers to increase or decrease output in line with voltage changes, or to operate within dynamic profiles set by the network.
- Explore the appeal and acceptability of bespoke managed voltage connections, including how these might reduce costs, unlock capacity, or support new development.
- Gauge levels of interest in and capability for engaging with connection agreements that incorporate conditions linked to QUEST or other forms of active network management.

6.3. Methodology

Approach:
Area 3 was conducted through a programme of in-depth qualitative research, reflecting the complexity of the issues under discussion and the specialist nature of the audience. Between the 7th January – 27th February 2025, a total of 17 depth interviews were completed with generators, generation developers, property developers, and organisations with high-demand HV/EHV connections. Interviews were carried out over Zoom or Teams and lasted 30–45 minutes.

The recruitment strategy sought to capture a broad spread of perspectives across the connections landscape. Recruitment combined recontacts from Area 2, free-found participants sourced by specialist recruiters (Feedback Market Research), and one identified directly by Impact Research. Screening ensured that respondents had relevant technical knowledge or responsibility for their organisation's connection agreements and equipment.

The discussion flow was designed to progressively build understanding, moving from respondents' day-to-day operations and connections experience towards engagement with the concept of QUEST and the potential role of bespoke voltage-managed connections.

Learnings from Area 2 suggested that QUEST and the concept of voltage-managed contracts might be difficult for customers to engage with, as voltage management is rarely top of mind in day-to-day business operations and staff responsible for HV connections often lack deep knowledge of network issues. To address this, the Area 3 discussion flow was designed to ease respondents into the topic by starting with their existing experiences of electricity use and connections, before moving on to QUEST.

The discussion followed four main stages:

1. Business electricity usage activities and import/export capacity.
2. Familiarity with, and involvement in, connection agreements, including how connection logistics influence site choice for new developments.
3. Acceptance and understanding of the need for QUEST and its implementation.
4. Relevance of, and interest in, bespoke managed connection agreements.

This structured flow allowed respondents to reflect on their own operations first, making the conversation more accessible and grounding subsequent discussions of QUEST in a practical context.

Challenges and Adjustments:

Area 3 was originally designed to involve around 50 semi-structured depth interviews with HV and EHV connected generators and large demand customers. The purpose was to test both the technical feasibility and appetite for voltage-managed connections, identify potential constraints, and explore willingness to participate in such arrangements.

In practice, several factors meant the original approach needed to be refined. The pool of eligible organisations in Area 3 proved smaller and harder to engage than anticipated. Suitable contacts were often difficult to identify, time-pressed, or hesitant to participate, and many businesses indicated that connection contracts were not a pressing issue within their day-to-day operations. To maintain coverage and insight quality, the team broadened recruitment beyond the initial lists and enhanced participation incentives, ensuring that a robust set of views was still gathered despite these engagement challenges.

To reflect these realities, the scope of Area 3 was revised. The total number of interviews was reduced from 50 to 16 (later 17 completed), but these were carefully targeted across generators, generation developers, property developers, and high-demand users to ensure key perspectives were still captured. At the same time, learnings from Area 2 shaped the approach. Findings had shown that many businesses were unfamiliar with voltage management concepts, so the Area 3 discussion flow was adjusted to first ground respondents in their existing connection experiences before introducing managed connection scenarios.

The objectives also evolved beyond simple feasibility testing. In addition to assessing capacity and potential to respond to voltage signals, Area 3 explored:

- The appeal and perceived fairness of bespoke managed connection agreements.
- Practical barriers to compliance, such as contract terms, technical capability, and internal decision-making processes.
- How QUEST could align with wider sector reforms, including connection queue management and flexible demand requirements.

The challenges faced in Area 3 provide an important learning in itself. The pool of customers who are both sufficiently informed about connection arrangements and available to take part is very small, despite best efforts to reach a broad cross-section. This reflects the reality of engaging with such a niche, technically specialist audience, and is a consideration for any future research or engagement activity in this area.

6.4. Sample overview

Area 3 focused on a specialist audience of generators, developers, property developers, and organisations with high-demand HV/EHV connections. Given the technical and operational expertise required, recruitment was tightly defined to ensure respondents had direct involvement in grid connections, electricity export, or management of high-voltage equipment.

A total of **17 depth interviews** were achieved between January and February 2025:

- **Generators (n=8):** individuals directly responsible for managing the export of electricity to the grid, including operators of biomass and waste-to-energy plants.
- **Property developers (n=4):** companies developing sites with HV/EHV connections, typically responsible for negotiating grid agreements during construction.
- **High-demand users (n=3):** organisations with HV/EHV connections and equipment responsive to incoming voltage, with knowledge of their connection agreements.
- **Generation developers (n=2):** consultants and firms developing new generation projects, often across solar, wind, and battery sites.

4 participants were recruited through a mix of recontacts from Area 2, 12 were free-found by specialist recruiter Feedback Market Research, and one identified directly by Impact Research. Approximately 500 recruitment phone calls were required to achieve the final sample, reflecting the niche and hard-to-reach nature of the target audience.

The range of industry representation allowed us to capture a wide variety of perspectives, including operators of large-scale generation assets, farmers with smaller renewable installations, developers of residential and industrial sites, and Independent Connection Providers (ICPs). This mix ensured that findings covered the breadth of potential engagement with QUEST, from those with established export contracts through to those with only limited or transactional experience of the connections process.

While the pool of customers with both the knowledge and availability to participate proved small, the achieved sample nonetheless provided valuable insight. It offered a clear view of the opportunities and barriers facing the groups most likely to be impacted by managed voltage connections under QUEST and highlighted where targeted engagement will be needed in any future roll-out.

6.5. Findings

The connection journey:

A key objective of Area 3 was to understand how generators, developers, and large demand users currently experience connection agreements, and how involved they are in the process. The interviews revealed that securing a new connection is a multi-stage journey, with decisions about voltage, capacity, and location made long before QUEST-type flexibility is considered.

Figure 7a – First stage of the connection process

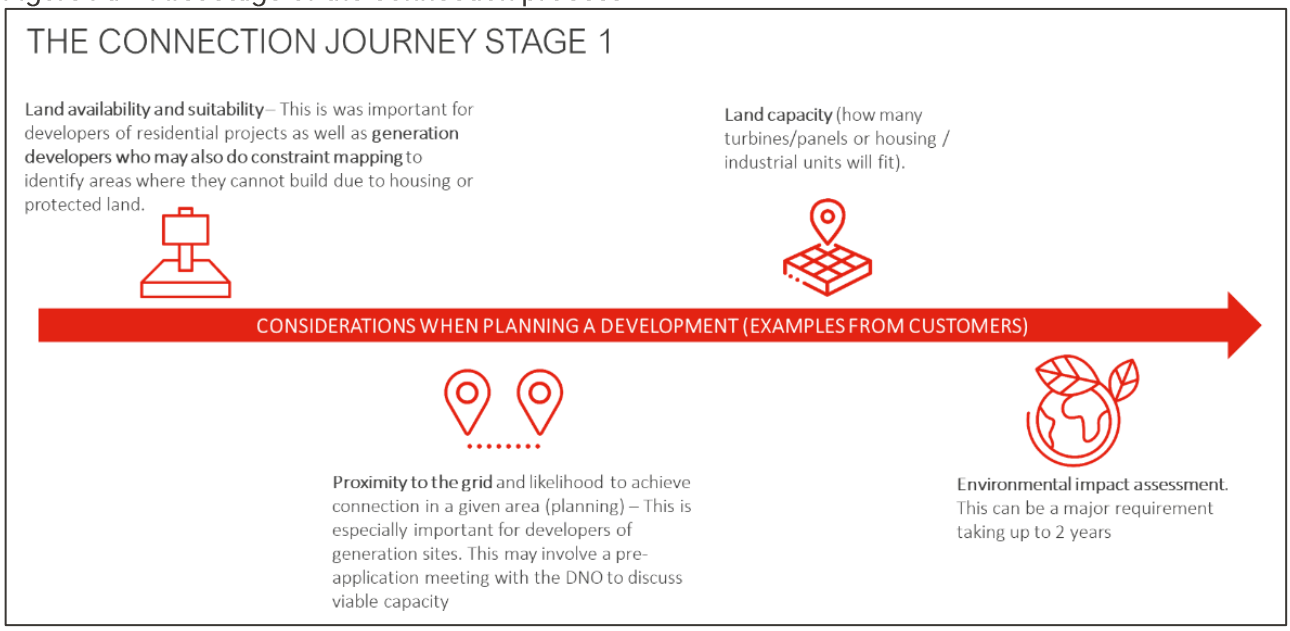


Figure 7a shows the first stage of the connection process as described by customers

At the planning stage, respondents described balancing a set of interrelated considerations. Grid capacity emerged as a decisive factor, but only in combination with land availability, environmental restrictions, and commercial feasibility. Developers of residential and industrial projects emphasised the need for sites with sufficient space, while generation developers often carried out **detailed constraint mapping** to identify where building was prohibited, for example, near existing housing or on protected land. They also **assessed land capacity**, asking how many turbines, solar panels, or industrial units a site could realistically support. **Proximity to the grid** was consistently cited as one of the most important drivers of choice, with generation developers frequently arranging pre-application meetings with DNOs to establish whether capacity was available and at what cost. **Environmental impact assessments** were described as another major hurdle, sometimes taking up to two years, and therefore a significant determinant of timescales and viability.

Figure 7b – Second stage of the connection process

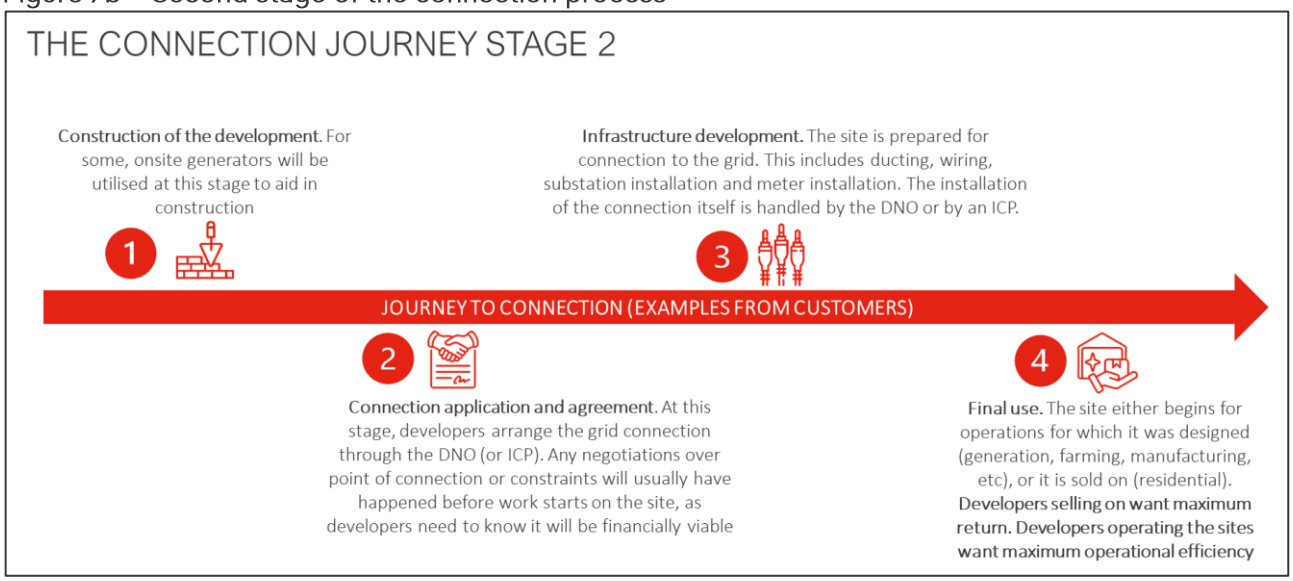


Figure 7b shows the second stage of the connection process as described by customers

Once a site is considered viable, attention shifts to the development and construction stage. Here, respondents (property developers in particular) explained that grid connection typically occurs towards the end of construction, meaning temporary generation is often required to power works in progress. Diesel generators were the most common solution during this interim period. For generation developers, construction is also the stage where constraint mapping is translated into design choices about how the project will connect and what infrastructure, such as substations or ducting, needs to be installed.

"When we do the analysis, we don't really know how to figure out whether a network is close to limits or not. That's part of the reason why we go in using thermal instead of using voltage as a limiting factor for the capacity we apply for. If it's a large remote network with not lots of demand or load, we would expect some issue. We usually leave it to the DNO engineer or planner to do that part and then tell us whether it's viable or not or what we have to do to hopefully get the connection we want." Solar/battery generation developer

The next step is the connection application and agreement itself. At this stage, the formal contract is arranged with either the DNO or an Independent Connection Provider. Customers reported that negotiations over points of connection and likely constraints usually happen here, with exporters often more heavily engaged than import-only users, given their dependence on grid access for revenue.

Finally, during the infrastructure and final use stage, the physical connection is made through the installation of substations, wiring, ducting, and metering. Once the connection is live, the development either begins operations, such as a power station or farm, or, in the case of property developers, the site is sold on. Operators tend to prioritise maximum efficiency, whereas developers are focused on achieving maximum return on investment.

The research found that the few customers that are active participants in the connections process almost exclusively experience conventional, standardised terms. Awareness of alternative approaches is low, and any appetite for bespoke managed voltage connections will depend on how clearly the benefits are explained compared with standard arrangements.

"And import-wise, there's no limit on what we can import. It's just we're restricted by the transformer as to how much voltage we can use at once, which is plenty enough for us anyway." Farmer with solar panels

"In some DNO areas there are constraints already known and solutions to them already known. So we just get offered those without much kind of choice in the matter. I don't think we often see optionality as in a bespoke consideration for our project and here's what we could do or we can do, it will be just a case of what offers are being made at the time." Generation Developer

Experience of new connections and related dealings with the DNO:

Discussions in Area 3 confirmed that customers' experiences of new connections are shaped as much by the contractual model as by their interactions with DNOs. As reported above, respondents reported very little experience with constrained or flexible agreements. For the majority, contracts had followed a standard cost structure determined largely by distance to the grid, with the DNO drafting an agreement that simply reflected the site's voltage requirements and import/export capacity.

Exporters tended to be more involved in negotiations than import-only customers, since the financial viability of their projects depends on understanding the likelihood of connection capacity at an early stage. Developers explained that without clarity upfront, it is impossible to confirm whether a site will be commercially viable. **One generation developer reported being offered both firm and non-firm agreements, the latter including the ability for the DNO to curtail exports if network issues arose.** While this demonstrated that constrained contracts exist, it also highlighted the challenge: **such arrangements make financial forecasting uncertain**, and the appetite for them is limited.

"Within the quotes themselves, they're pretty a single offering regarding flexibility...by the time the offer comes, that's all decided." Generation Developer

"The DNO is obliged to just produce whatever they think is the lowest cost scheme as an entire project. So if there are reinforcements required to that circuit, they'll send you to connect somewhere else" Generation Developer

In other cases, customers described how constraints were simply written into contracts, with little or no flexibility offered. Developers noted that in some DNO regions, constraints and solutions were predefined, leaving them to accept the offer presented rather than engage in meaningful negotiation. Others highlighted that contract offers tended to be finalised before they reached the customer, giving little room for input or adjustment.

Several respondents related constraints to other factors, such as the voltage of their transformer or conditions set by environmental agreements (for example, on waste-burning capacity). Others gave examples of businesses adopting multiple secondary connections for generation equipment, such as solar or wind, rather than upgrading an existing connection. This often resulted in sites with multiple meter points, which added to complexity and administrative burden.

Perceptions of DNOs were mixed. Many customers viewed the relationship as **neutral and transactional** – they pay the DNO, and the DNO delivers the connection. While some acknowledged positive experiences, such as when DNOs worked to identify the most practical connection points, others felt the process was skewed towards the operator's own cost and reinforcement priorities. This occasionally resulted in inconvenient connection locations or higher-than-expected installation costs.

For ICPs, experiences tended to be more positive, with installers reporting that DNOs often attempted to site connections as close as possible to where they were needed.

Relationships with DNOs were described as **functional but not collaborative**. Customers accepted this as the norm, but it carries implications for SP Electricity North West: bespoke managed voltage contracts will need to be positioned not as favouring the DNO, but as a **mechanism that benefits the wider network and society**. Without this reframing, they risk being seen as just another transactional contract with little added value to the customer.

Overall, the customer experience of new connections is marked by limited exposure to flexible models and an expectation that agreements will be standardised. Relationships with DNOs are seen as functional and often pragmatic, but rarely collaborative. This matters for QUEST because it shows that bespoke managed voltage contracts will need to be explained in terms that clearly differentiate them from the "single offer" experience customers are accustomed to, while also addressing concerns about risk, financial predictability, and enforceability.

The implications of sector reform:

When discussing the wider context around QUEST, it was often raised by customers that changes underway in the UK's electricity connections landscape are beginning to alter the way projects and connections are approached. **The reform of access and forward-looking charges**, introduced by Ofgem in April 2023, was raised as altering charging structures to better reflect cost drivers and reduce locational disparities. It was noted that it requires developers to reassess the economics of projects in certain areas. The Connection and Use of System Code (CUSC) modifications, being introduced throughout 2024 and beyond, were also mentioned as a potential positive change but with benefits yet to be validated.

Grid management reform was another issue, with flexibility markets and new optimisation measures being phased in. These were described as particularly relevant in constrained areas, with the implication that demand-side flexibility and storage may become prerequisites for future connections.

The **connection queue reform**, approved by Ofgem in April 2025, was raised as perhaps the most significant change. A generation developer highlighted the need to demonstrate firm delivery plans, including land rights and planning permission, to retain a place in the queue. The principle of "first ready,

first connected" was understood as a fundamental shift, requiring a more strategic and forward-looking approach to securing connections.

"Under the new queue management system, you need to fit with what is in NESO's strategic spatial energy plan...first ready, first connected, but also it needs to be the right technology in the right place. Now, you could go through this process, you could get your land, so you could get your planning consent, and then they say, we don't actually need that much wind in the north of Scotland, so we're not going to give you a grid connection." *Generation Developer*

Alongside these regulatory changes, participants gave examples of how their own practices were adapting:

- Grid capacity was described as increasingly constrained, with connections harder to secure.
- A generation developer reported turning to phased projects, where a wind or solar site is powered in stages and upgraded progressively as more capacity becomes available.
- Others emphasised that site selection is now driven primarily by whether a viable connection can be secured, with grid access becoming more important than land availability or other planning considerations.
- In some cases, financial optimisation strategies were being used, with hybrid models combining solar, wind, and battery storage to smooth intermittency and maximise revenues through storage.

It was clear in the interviews that these reforms are reshaping the landscape for developers, making grid access the decisive factor in project planning. In this environment, QUEST could be framed as potentially valuable as bespoke managed voltage connections were seen as one possible way of unlocking capacity in constrained areas, offering a route to progress developments that might otherwise be delayed or blocked. However, respondents did not spontaneously request any such arrangements.

QUEST and interest in bespoke connection agreements:

When presented with information about QUEST, participants demonstrated a strong ability to understand the concept. It was widely accepted that normal operation of QUEST would not affect them negatively, with no concerns raised that day-to-day business operations would be disrupted. For many, QUEST was seen as a natural response to changes already being experienced on the network, with grid reforms and new connection rules providing tangible evidence that the system is evolving.

"Until we [The UK] can generate the power required, there's got to be some changes. And I think businesses will understand that." *ICP*

QUEST was generally viewed positively. High-demand users, facing already significant energy costs, welcomed any initiative that could improve network efficiency and reduce the risk of future cost increases. Construction developers, while less directly motivated by cost savings (as costs are passed to site owners), nonetheless recognised the importance of improving network management for the long-term health of their industry. The fact that QUEST is backed by Ofgem innovation funding gave the project additional credibility, helping customers see it as a serious and future-facing solution rather than a speculative trial.

"I can see in some industries it could be needed, but all of our big fans have surge protection. Our generator is ready to go constantly. I don't think that this would impact us at all." *Biomass power station*

Figure 8 – Stimulus used to explain QUEST

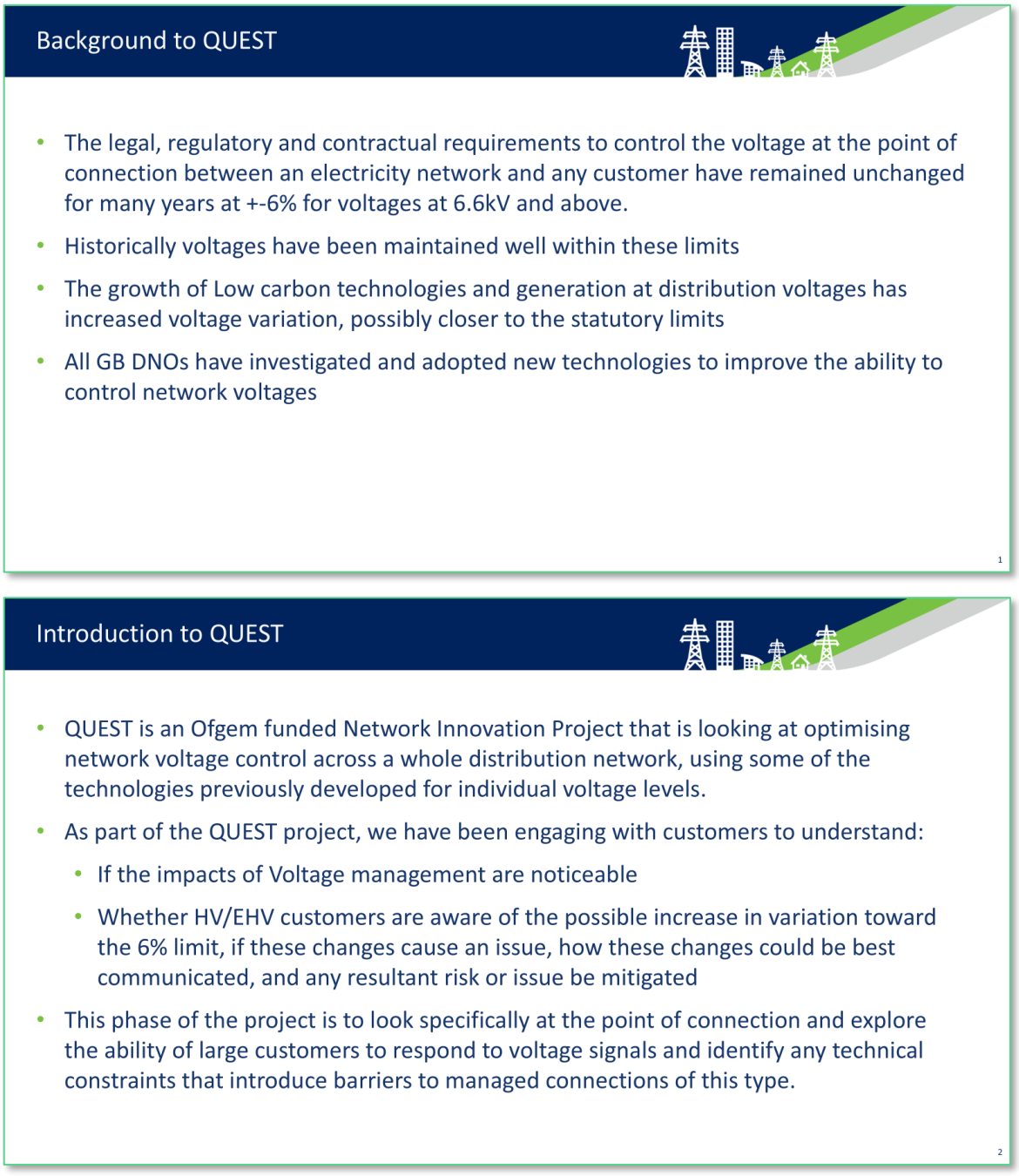


Figure 8 shows the stimulus used to explain QUEST in Area 3

When introduced to the concept of bespoke connection agreements using the materials shown in Figure 8, participants were able to grasp how bespoke managed connection agreements would work at a broad level. They understood that such agreements could define both capacity and voltage terms, and could include conditions based on time of day, season, or operating periods. However, many said they would need more detail before fully supporting the concept.

Several barriers were raised. The idea of placing responsibility for compliance on businesses was a concern, with questions about how enforcement and monitoring would work, and whether penalties would apply for non-compliance. Some worried that cheaper connections could undermine resale values of developments or assets, making sites less attractive to investors. Others questioned fairness, suggesting it

was unreasonable to require customers to change their behaviour simply to save the DNO from network investment.

Of the three potential constraints bespoke agreements might help with - capacity, fault levels, and local voltage management - capacity was the only one widely recognised as a tangible benefit. Most participants admitted the implications of fault levels or local voltage management were not completely relevant to their role and said they would need more information before considering these as meaningful advantages.

Figure 9 – Three constraints

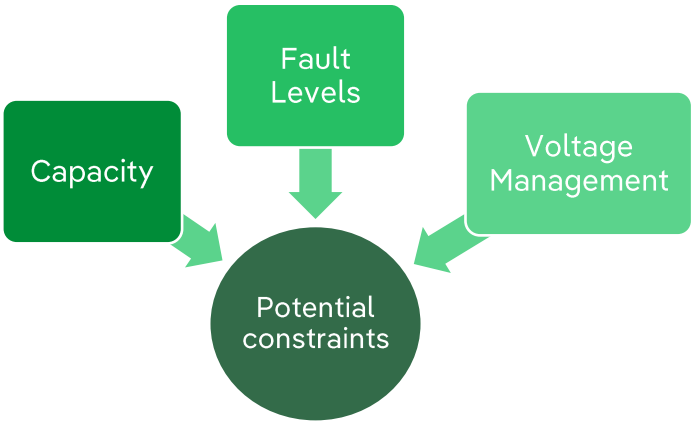


Figure 9 shows the three constraints that bespoke connection agreements could mitigate

"So that sounds different to a visibility and control whether the DNO sends signals or controls the generator or the point of connection. So active network management for example, does that, this is something different." Generation developer

"We've seen offers with operational restrictions on, for example, storage, limiting how quickly we can switch from import to export. At the moment we've decided those aren't too much of an issue, but what this programme is offering is maybe an alternative to that. So you maybe could forego the limit on how quickly you do anything, but no, you can only do it at certain times a day." Solar and battery generation developer

Figure 10 – Bespoke voltage managed connection agreement stimulus

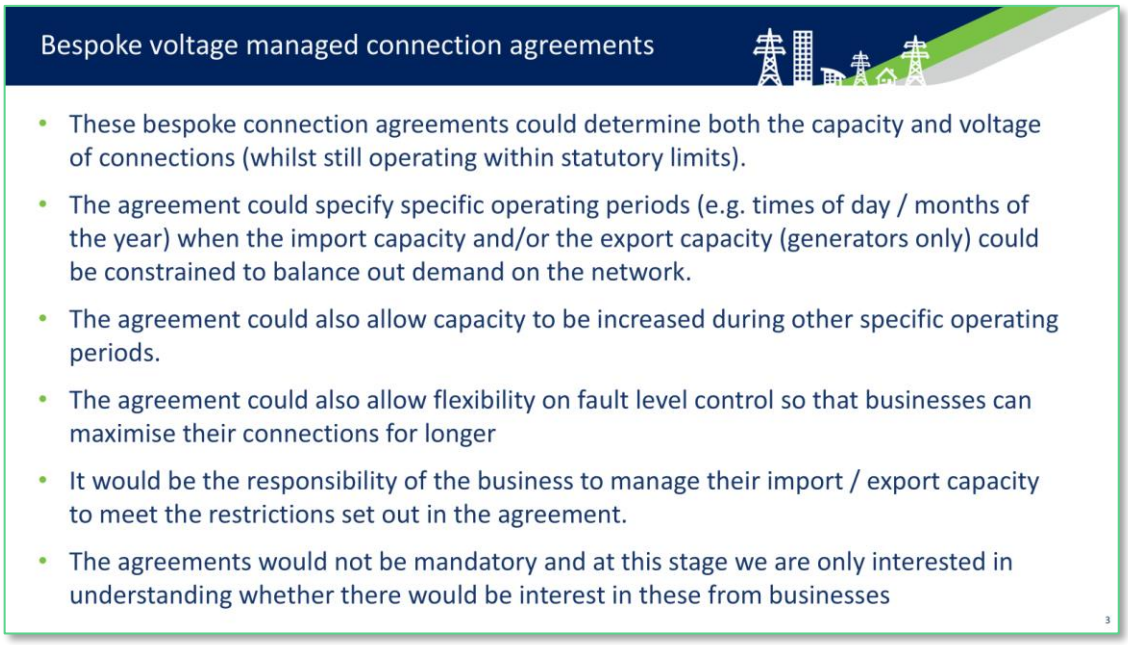


Figure 10 shows the stimulus used to explain bespoke voltage managed connection agreements in Area 3

Despite the barriers, **interest in bespoke connection agreements** was identified for specific circumstances: Renewable generation developers, operators, and investors involved in buying or selling energy projects were seen as natural beneficiaries, particularly where bespoke agreements could enable repowering with larger turbines or higher capacity equipment. Batteries and hybrid sites were also highlighted as strong candidates, as their inherent flexibility allows them to smooth export curves and adapt quickly to network signals.

For large landowners and investment companies with oversight of financial targets, bespoke agreements were seen as a potential opportunity to unlock additional value. A marketing angle was also suggested, with businesses able to present themselves as working in partnership with the grid, which could enhance reputation and stakeholder confidence.

Conversely, some groups showed low levels of interest. Solar-only operators noted that flexibility is only financially viable when maximising sunlight hours, making constraints unattractive. Housing developers, who sell on sites rather than operate them, had little incentive to accept bespoke conditions. Similarly, businesses without overall control of their assets (e.g. where a power station is owned by an investment company or a site by a council) were seen as unlikely to engage.

"Sometimes we can't get the capacity or the point of connection we want due to voltage issues, but that is with the assessment being that the site is exporting or importing continuously at full capacity or using quite conservative assumptions. So what you're describing means you might get offered a point of connection that otherwise might not have been possible as long as these conditions are as part of the offer." *Generation developer*

"I think it's going to discourage private investors from putting up solar or wind turbine because it's going to increase the length of time that they have to run it before they can see their money coming back" *Farmer with large turbine*

Another key factor in appetite for bespoke agreements is the technical ability to respond to voltage signals. Here, participants described **mixed levels of confidence and capability**. It was widely raised that

more information would be needed on what signals would be issued, how they would be delivered, and when.

Some power stations noted they could adjust voltage or power factor through their equipment but stressed this had operational impacts on areas such as boiler pressure, costs of importing power, and investor pressure to maximise exports. Other businesses acknowledged they could, in theory, respond but were unsure whether their equipment was set up to do so in practice, as such changes are not part of their routine.

Solar and battery developers were seen as the most natural fit, with the potential to use DC inverters to control the amount of power converted to AC and exported. Participants said this could provide flexibility, though they admitted they did not yet know whether their current technology allowed them to do it. By contrast, generator customers showed little engagement with the idea of accessing other energy markets through such signals, saying they would need much more detail before considering it as an opportunity.

"It's easier to run lower, it's easier to turn off. It's not a difficult thing to do. Obviously it's all about the money, isn't it. But as a site and as operators, it wouldn't be a problem and I think it would be beneficial." Biomass power station

"It would have to be a consultation at quite a lot of levels - financially, of course, but also in terms of the production managers, and it might not impact them directly, but it is a policy that they would have to remind subcontractors and people further down the train." Ferry manufacturer

Overall, the research showed that QUEST was well understood and broadly accepted as a positive innovation, with Ofgem's backing reinforcing its credibility. Appetite for bespoke managed connection agreements was more selective. Interest was strongest among developers, renewable operators, and battery sites where agreements could unlock new capacity, smooth export curves, or support growth. However, barriers around fairness, enforcement, resale value, and lack of understanding of technical constraints meant that enthusiasm was far from universal.

The capacity to respond to voltage signals exists in certain sectors, but many businesses lack clarity on how signals would work in practice or whether their equipment could adapt without disruption. This suggests that while there is clear potential for QUEST to add value, uptake will depend on providing customers with more detailed information, transparent benefits, and reassurance that agreements will be both fair and practical to implement.

The opportunity for QUEST-related managed connections:

In discussing the potential value of QUEST, and discussing experiences and challenges with making new connections, three potential benefits of bespoke connection agreements were identified. These link directly to the challenges customers face under current and future connection arrangements.

One clear theme was the **ability to align with seasonal import and export patterns**. A few participants already had seasonal conditions built into their agreements. For example, a biomass power station was limited by an environmental permit that capped the amount of fuel it could burn, restricting export capacity. Another had a "two-shift" arrangement, exporting at full capacity during the day but reducing or stopping exports overnight. A ferry manufacturer working to a 24/7 schedule explained that local noise restrictions limited certain activities at night. Beyond contractual terms, many organisations also described operational cycles that naturally drive seasonal variation. Farmers reported higher energy use during key agricultural periods, a caravan park highlighted increased demand in summer, and a data centre noted that billing schedules created spikes in activity at certain times of year. In these cases, bespoke agreements that flex in line with predictable patterns were seen as potentially valuable, provided they were designed to fit with established business practices rather than impose new constraints.

Another benefit identified was the **opportunity to mitigate voltage fluctuations**. Participants described how even small deviations can interfere with operations, and they gave a wide range of examples (as we

also found in Area 2). Farmers explained that egg grading machines, which are sensitive to power quality, can be disrupted, while turbines on some sites have tripped offline due to unstable supply. Operators of power stations also reported that under- or over-voltage can interrupt systems and force them offline, directly affecting revenues. A data centre highlighted that servers are particularly vulnerable to fluctuations, with risks to both business continuity and customer satisfaction. In manufacturing, reliance on high-voltage equipment running around the clock was said to mean that any fluctuation could halt production entirely. Although many organisations already invest in mitigations such as backup generators, surge protection, or Uninterruptible Power Supply (UPS) systems, QUEST was seen as offering the potential for an additional safeguard that reduces the frequency and impact of these disruptions. This was considered especially important in sectors where productivity, compliance and safety depend on a reliable, stable supply.

"Six, seven years ago, the grid was really, really struggling. Voltage fluctuations all over, blowing a lot of LED lights...one of the problems with free range, is they don't like flickering light, it stresses them out." Poultry farmer

"I think it tripped the incoming supplies, so lost generation for a couple of hours." Power station manager discussing a past power surge

The third benefit of bespoke connection agreements was **the potential to support business expansion by increasing export or import capacity**. Several participants emphasised that limited network capacity was the biggest barrier to growth, often preventing projects from going ahead or making them too expensive to be viable. Expansion plans were most common among generation developers repowering older sites with higher capacity turbines, farmers increasing the size of sheds and equipment which required stronger connections or larger transformers, and businesses planning for the additional import needs created by decarbonisation measures such as EVs and heat pumps. The use of battery units and hybrid sites was also raised as a way to increase the value of existing generation developments, especially in the context of growing mergers and acquisitions activity. At the same time, several barriers were highlighted, including low capacity on the network, non-electric constraints such as housing or protected land, the high cost of installing new infrastructure, and the impact of connection queue reforms, which could delay or block projects. In some cases, developers also noted difficulties in securing permission from other landowners if the connection point offered by the DNO was distant.

"We have looked at extending a chicken shed, so we'll probably draw more power there...we would probably have to look at the calculations at peak if we had enough power for it then...we might need a bigger transformer." Poultry farmer

"The distance obviously has an implication on the cost of deliverability of the site...you are less likely to need to have legal permissions for the cable than if it has to travel through other fields or other land holdings to get to that point of connection." Generation developer

Bespoke connection agreements were accepted to have the potential to offer practical benefits where they could align with predictable seasonal patterns, reduce the risks of voltage fluctuations, or unlock capacity for business expansion. While interest was selective, the potential value was clear in cases where bespoke managed connections directly supported operational continuity or growth.

6.6. Summary of Area 3

Area 3 confirmed that when explained, **QUEST is widely understood and accepted as a credible innovation**, with Ofgem's backing reinforcing its legitimacy. **Customers recognised the pressures driving grid reform** and saw QUEST as a positive step to improve efficiency and manage costs.

Appetite for bespoke managed voltage agreements was selective. Interest was strongest among renewable developers, battery operators, and hybrid sites **where agreements could unlock capacity or support growth**. For others, particularly property developers or those without operational control, relevance was limited.

Capacity to respond to voltage signals exists in some cases, but is uneven and often complex. Many businesses were unsure whether their systems could adapt without disruption and wanted more information before committing.
Area 3 showed that capacity and appeal exist but only in niche segments, as evidenced by the challenges in recruiting relevant and knowledgeable participants. Furthermore, engagement with new contractual models will require clear financial benefits, reassurance on fairness, and targeted communication.

For SP Electricity North West, this means that any **future introduction of bespoke connection agreements should prioritise targeted engagement with the small niche of customers most likely to benefit**, while providing clear evidence of financial value and practical guidance on how agreements would work in practice. Wider uptake will depend on the challenging identification of these customers, as well as on building trust, ensuring fairness, and demonstrating that bespoke arrangements deliver benefits for both customers and the network.

07.
Conclusions & Recommendations

7. Conclusions & Recommendations

7.1. Overall conclusions of the QUEST Customer Workstream

The QUEST customer research set out to explore how voltage control could improve network efficiency without negatively impacting customer experience, while also understanding the specific needs of sensitive customer groups and gauging the interest in more flexible, voltage-managed connections. The research succeeded in answering these objectives, particularly in terms of assessing the impact on domestic and SME customers. For these groups, QUEST did not lead to noticeable changes in supply quality, appliance performance, or overall satisfaction, indicating that the system operates without disturbing the day-to-day experience for most end users. However, the research also revealed that engagement with the topic of voltage control was limited, with many customers, especially within the I&C sectors, not fully aware of or engaged with the challenges and evolving demands on the network. This is particularly evident in Area 2, where even businesses with voltage-sensitive equipment had limited understanding of network pressures and the potential benefits of QUEST.

While the research confirmed that sensitive customers and high-demand users are heavily reliant on stable voltage, it also highlighted the difficulty in identifying and engaging the right types of businesses with the required level of knowledge. Recruiting participants who were both knowledgeable and sufficiently invested in discussing network-related issues proved challenging, especially for Area 3, where fewer respondents were able to engage with the idea of bespoke managed connections. Although QUEST was seen as a positive step once explained, the appetite for bespoke voltage agreements remained narrow and conditional on clearer financial benefits, operational feasibility, and regulatory alignment. In light of these findings, it is clear that while QUEST is technically sound, SP Electricity North West will need to further educate and engage stakeholders, particularly in the industrial and generation sectors, to build a deeper understanding of the long-term challenges and opportunities presented by the evolving energy system.

7.2. Area 1 Conclusions

Conclusions:

The Area 1 research set out to determine whether domestic and SME customers in trial areas noticed any changes to their electricity supply as a result of QUEST voltage management. Control areas were included to provide a benchmark, ensuring that any reported differences could be attributed to QUEST rather than wider variations between customer groups.

Results confirmed that customers did not notice QUEST in operation. Reports of slower appliances, flickering lights, or other performance issues declined over time and were consistent between trial and control groups, indicating that any changes reflected natural background variation rather than the effect of QUEST.

Satisfaction with electricity supply remained high, with customer contact rates stable and comparable across trial and control areas. SMEs with specialist equipment reported no changes in performance, and vulnerable customers on the Extra Care Register were no more likely than others to experience issues.

This demonstrates that QUEST delivered its intended network benefits without compromising supply quality, satisfaction, or customer confidence, even among sensitive or high-dependency groups.

Recommendations:

- Use the Area 1 evidence to communicate clearly to regulators, consumer bodies, and the wider industry that QUEST is effectively invisible to end users, providing reassurance that it does not disrupt household or business supply.
- Incorporate findings into public-facing communication to highlight QUEST's role in enabling a more efficient and decarbonised electricity system without impacting customer experience.
- Leverage Area 1 as proof of concept to support the wider rollout of QUEST as Business as Usual, positioning it as a network innovation that delivers technical efficiency gains while maintaining high levels of service quality.

7.3. Area 2 Conclusions

Conclusions:

I&C organisations with HV and EHV connections stressed the essential role of a stable electricity supply, with much of their operating equipment designed within narrow voltage tolerances. Even small deviations were reported to cause shutdowns, equipment damage, or financial loss, with sector-specific risks most acute in healthcare, power generation, and construction.

Initial awareness of increasing system pressures was low, but once QUEST was explained, businesses recognised its potential to mitigate risks, improve reliability, and reduce costs. The benefits most valued were continuity of operations, fewer outages, and technical support, with environmental gains welcomed but secondary. Importantly, businesses expressed that acceptance of QUEST depends on transparent communication and credible evidence.

The research confirmed that communication and support are decisive. Customers expect sector-specific information, opportunities for two-way dialogue, and practical support such as technical assessments and monitoring tools. They place strong value on direct contact with named individuals rather than generic mailings or printed leaflets.

Recommendations:

- Implement tailored engagement strategies for sensitive sectors, with clear case studies and examples of how QUEST will safeguard operations.
- Prioritise digital-first communications (personalised emails, audiovisual explainers, LinkedIn updates) supported by webinars and in-person sessions where trust and reassurance are paramount.
- Assign named technical contacts to build credibility and ensure queries are addressed quickly and effectively.
- Provide practical support services, including advanced monitoring, real-time alerts, and technical assessments, to help businesses manage risks proactively.
- Should QUEST or wider voltage managed contracts be rolled out, consider doing so not only as a technical tool but as a partnership that enhances business resilience, demonstrating how it reduces operational, financial, and compliance risks.

7.4. Area 3 Conclusions

Conclusions:

Generators, developers, and large demand customers generally viewed QUEST as credible and beneficial, with Ofgem's innovation funding adding legitimacy. However, appetite for bespoke managed voltage connections was selective. Interest was strongest among renewable developers, hybrid sites, and battery operators who saw potential to unlock capacity or support expansion. By contrast, property developers, solar-only operators, and those without operational control expressed little incentive to engage.

Capacity release was the only consistently recognised benefit, while local voltage and fault level management were less well understood. Barriers included uncertainty around compliance and monitoring, concerns about resale value and investor confidence, and questions about fairness if businesses were required to adapt behaviour in place of network reinforcement.

Engagement was challenging due to the small and highly specialised customer base. This highlights that uptake of bespoke arrangements will remain niche, with adoption depending on clear financial benefits, practical enforceability, and alignment with wider regulatory reforms.

Recommendations:

- Target engagement towards segments with the strongest potential: renewable generation developers, hybrid/battery operators, and high-demand users with fluctuating profiles.
- Provide financial modelling, pilots, and case studies to evidence viability and address concerns around compliance, enforcement and asset value.
- Develop transparent frameworks for monitoring and enforcement to build confidence and ensure demonstrable fairness.

08.
Appendices

8. Glossary and Appendices

8.1. Glossary of technical terms

This glossary explains technical terms and sector-specific language used throughout the QUEST Customer Workstream Research Report.
It is intended to help all readers, including those without an energy or engineering background, to interpret the findings with confidence.

Active Network Management (ANM)
A system used by electricity network operators to monitor and control the flow of power in real time. It allows distributed energy sources (like wind or solar) and customer demand to be managed dynamically, helping the network stay within safe limits and avoid overloads.

Bespoke Managed Connection Agreement
A customised contract between a customer (such as a generator or large industrial site) and the Distribution Network Operator (DNO). It sets specific conditions on when and how much electricity can be imported or exported, sometimes requiring the customer to adjust operations in response to network voltage or capacity constraints.

Capacity Constraint / Network Capacity
The physical limit on how much electricity a local grid can safely carry at any one time. When capacity is reached, new connections or increases in demand may require reinforcement work or flexible agreements.

CATI (Computer-Assisted Telephone Interviewing)
A survey method where interviewers call participants and input responses directly into a computer system. It ensures data is captured accurately and efficiently.

CLASS (Customer Load Active System Services)
An innovation project that demonstrated how small voltage changes within statutory limits can help balance electricity supply and demand without customers noticing.

Critical National Infrastructure (CNI)
Essential services and assets—such as electricity, water, or communications networks—whose disruption would have a serious impact on national security, public safety, or the economy.

Decarbonisation
The process of reducing carbon dioxide (CO_2) emissions from energy generation and consumption, typically by switching from fossil fuels to low-carbon sources like renewables.

Depth Interview
A one-to-one qualitative research interview that explores attitudes and experiences in detail, often lasting 30–60 minutes.

Distribution Network Operator (DNO)
The company responsible for operating and maintaining the local electricity distribution network (the cables and substations that deliver power to homes and businesses).

ECR (Extra Care Register)
A database of customers who are especially vulnerable—such as those reliant on medical equipment—so the DNO can give them priority assistance during power interruptions.

EHV (Extra High Voltage)
Electricity supplied at voltages typically at 33 kV and above, used for very large industrial or generation sites.

High Voltage (HV)
Electricity supplied at voltages of either 11 kV or 6.6 kV, used by large commercial or industrial customers.

Industrial and Commercial (I&C) Organisations
Businesses or institutions that consume electricity at scales larger than typical households. This includes factories, hospitals, data centres, and other sites with high or continuous energy needs. I&C customers often operate equipment with narrow voltage tolerances, making them sensitive to fluctuations in electricity supply.

Managed Voltage Connection
A type of grid connection in which the voltage level can be actively controlled by the network operator, often in exchange for a lower cost or faster connection.

Ofgem
The UK energy regulator (Office of Gas and Electricity Markets). It oversees the electricity and gas markets and funds network innovation projects such as QUEST.

QUEST
An innovation project trialling an integrated voltage control system across the distribution network. It coordinates multiple control techniques to optimise voltage, improve efficiency, and enable more low-carbon technologies without affecting customer experience.

Smart Street
An innovation project that tested ways to optimise voltage and reduce energy use at street level using smart technology.

Statutory Voltage Limits
The legal range of voltage that electricity suppliers must maintain for safety and equipment protection (in the UK typically 230 V +10 / -6% for households).

Transformer
An electrical device that changes the voltage of electricity so it can be safely transmitted and used.

Voltage Control / Voltage Management
Techniques used by network operators to keep electricity voltage within safe limits despite fluctuating supply and demand. Effective control reduces energy losses and protects equipment.

Voltage Optimisation
A method of adjusting and stabilising supply voltage to reduce energy consumption

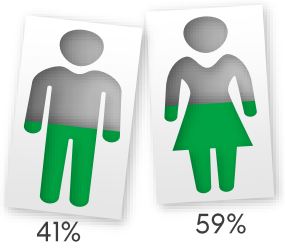
Voltage Profile
The pattern of voltage levels across a section of the electricity network over time. Profiling helps identify where and when adjustments are needed.

Uninterruptible Power Supply (UPS)
Backup equipment that provides immediate short-term electricity to protect sensitive devices when the main supply is disrupted.

8.2. Appendix A – Area 1 demographics & firmographics

Figure 11

Achieved gender breakdown among domestic customers in Area 1 baseline
Base size: 306



Achieved gender breakdown among domestic customers in Area 1 active trial
Base size: 264

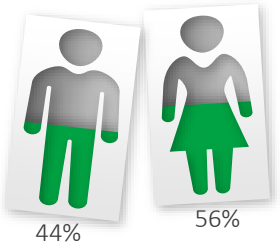


Figure 12

Achieved age breakdown among domestic customers in Area 1 baseline

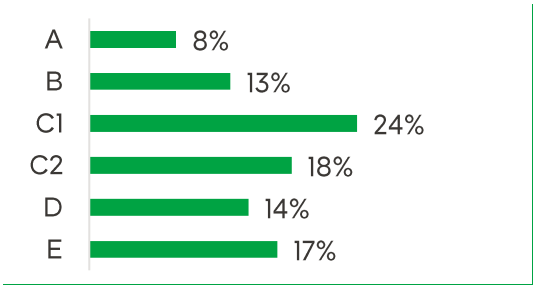
Age	Achieved % in baseline
18-25	6%
26-34	10%
35-44	16%
45-54	15%
55-64	23%
65+	29%

Achieved age breakdown among domestic customers in Area 1 active trial

Age	Achieved % in active trial
18-25	0%
26-34	3%
35-44	11%
45-54	23%
55-64	24%
65+	39%

Figure 13

Achieved SEG (Socio-Economic Grade) breakdown among domestic customers in Area 1 baseline



Achieved SEG breakdown among domestic customers in Area 1 active trial

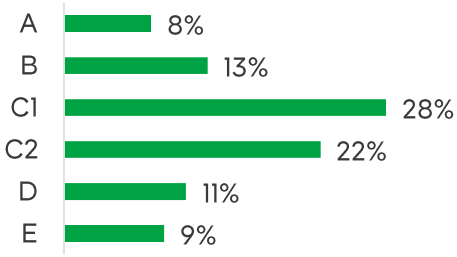


Figure 14 – Achieved employee size among SMEs in Area 1 active trial
Base size: 306

Figure 15 – Achieved sectors among SMEs in Area 1 active trial
Base size: 264

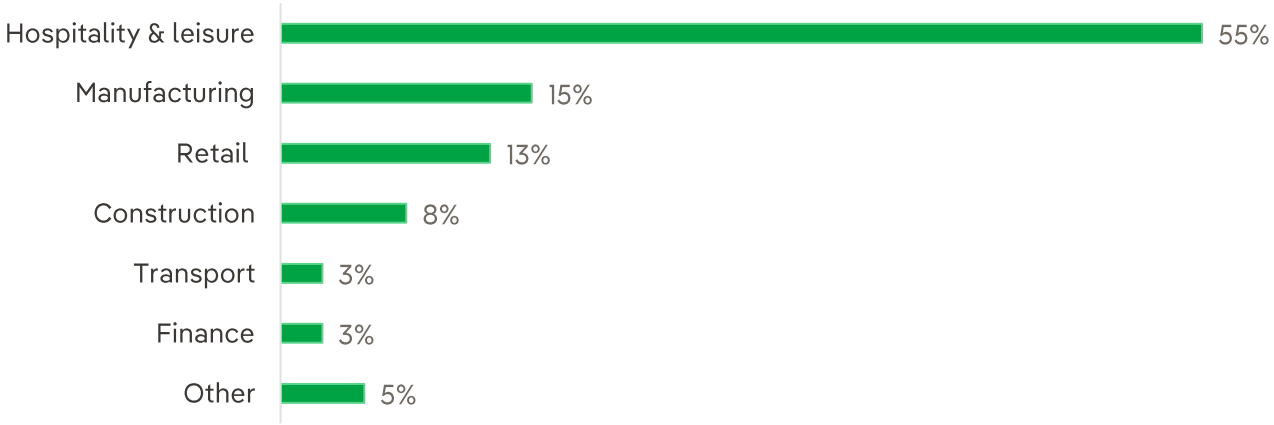


Figure 16 – Achieved ethnicity breakdown among domestic customers in Area 1 active baseline
Base size: 306

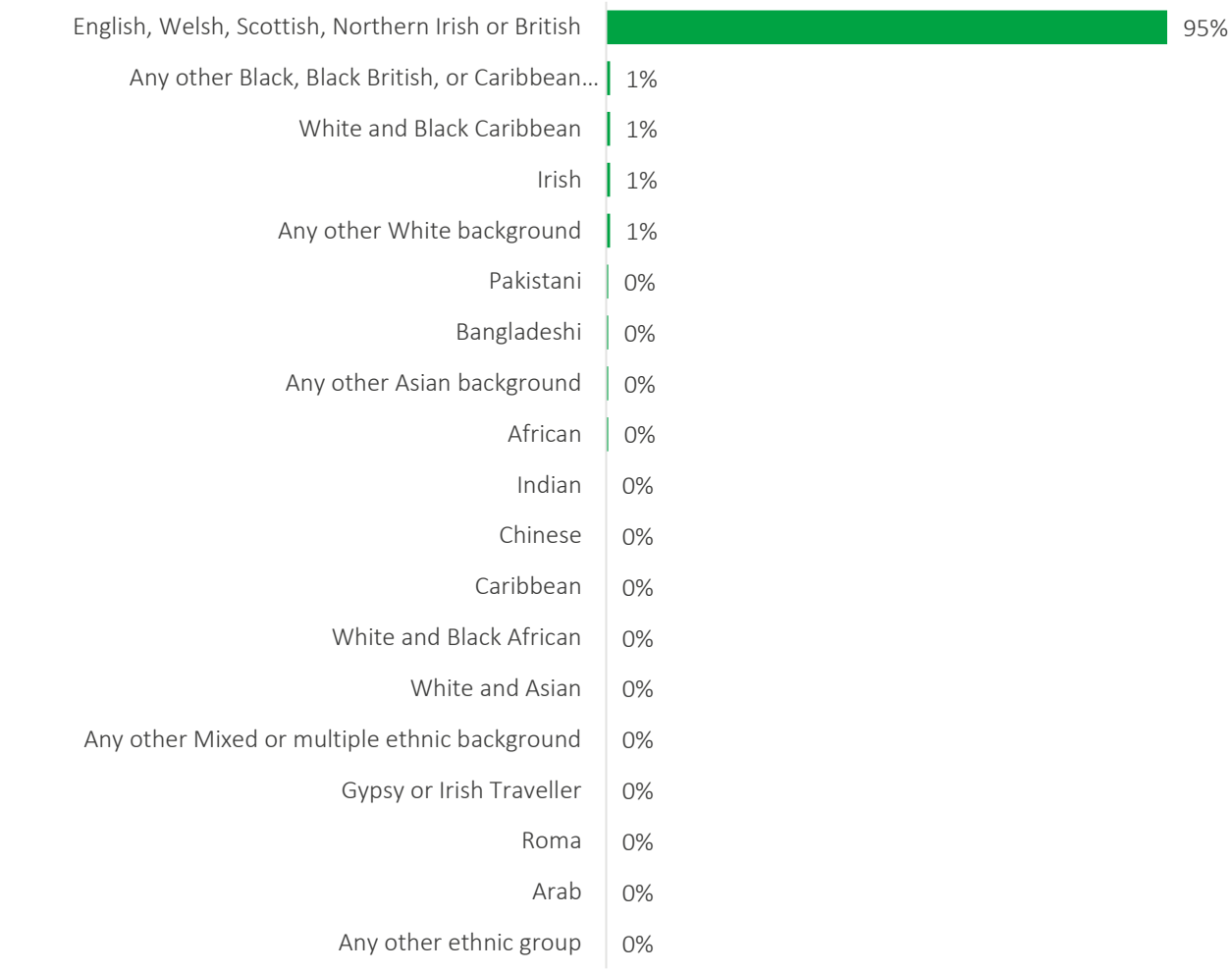


Figure 17 – Achieved ethnicity breakdown among domestic customers in Area 1 active trial
Base size: 264

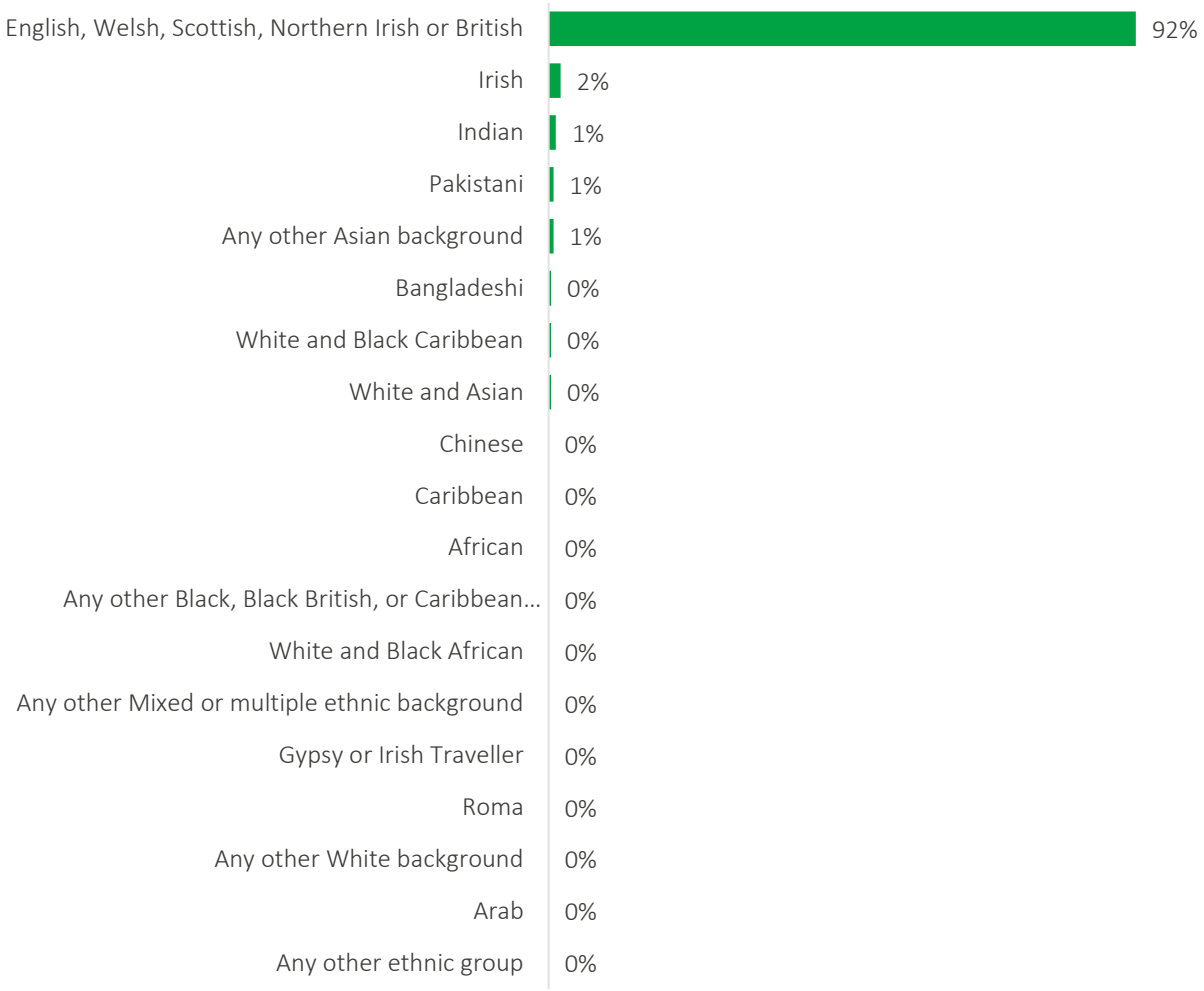
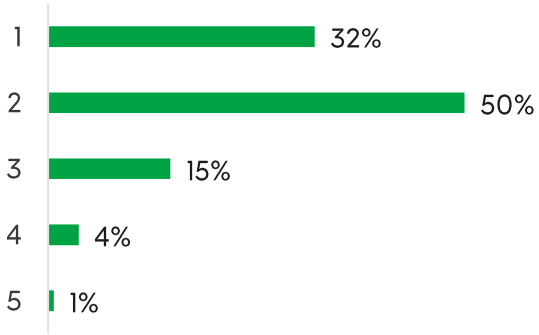


Figure 18

Number of people in household among domestic customers in Area 1 baseline



Number of people in household among domestic customers in Area 1 active trial

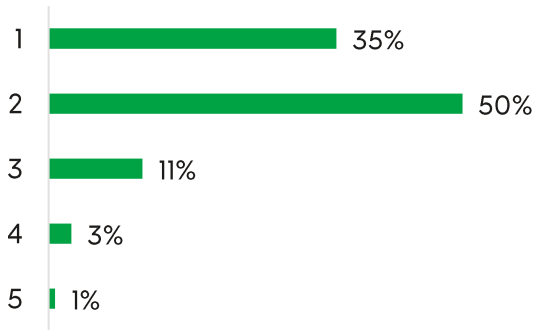


Figure 19 – Number of children in household among domestic customers in Area 1 baseline
Base size: 306

Figure 20 – Number of children in household among domestic customers in Area 1 active trial
Base size: 264

Figure 21 – Number of children in each group among domestic customers in Area 1 baseline
Base size: 306

Children in each age group	0	1	2	3	4
0-2 years	79%	20%	0%	1%	0%
3-5 years	77%	18%	4%	0%	1%
6-11 years	53%	33%	14%	0%	0%
12-17 years	53%	32%	12%	3%	0%

We did not ask about children in each age group in the Mid-trial survey to keep interview length down

Figure 22 – Household vulnerability among domestic customers in Area 1 baseline
Base size: 306

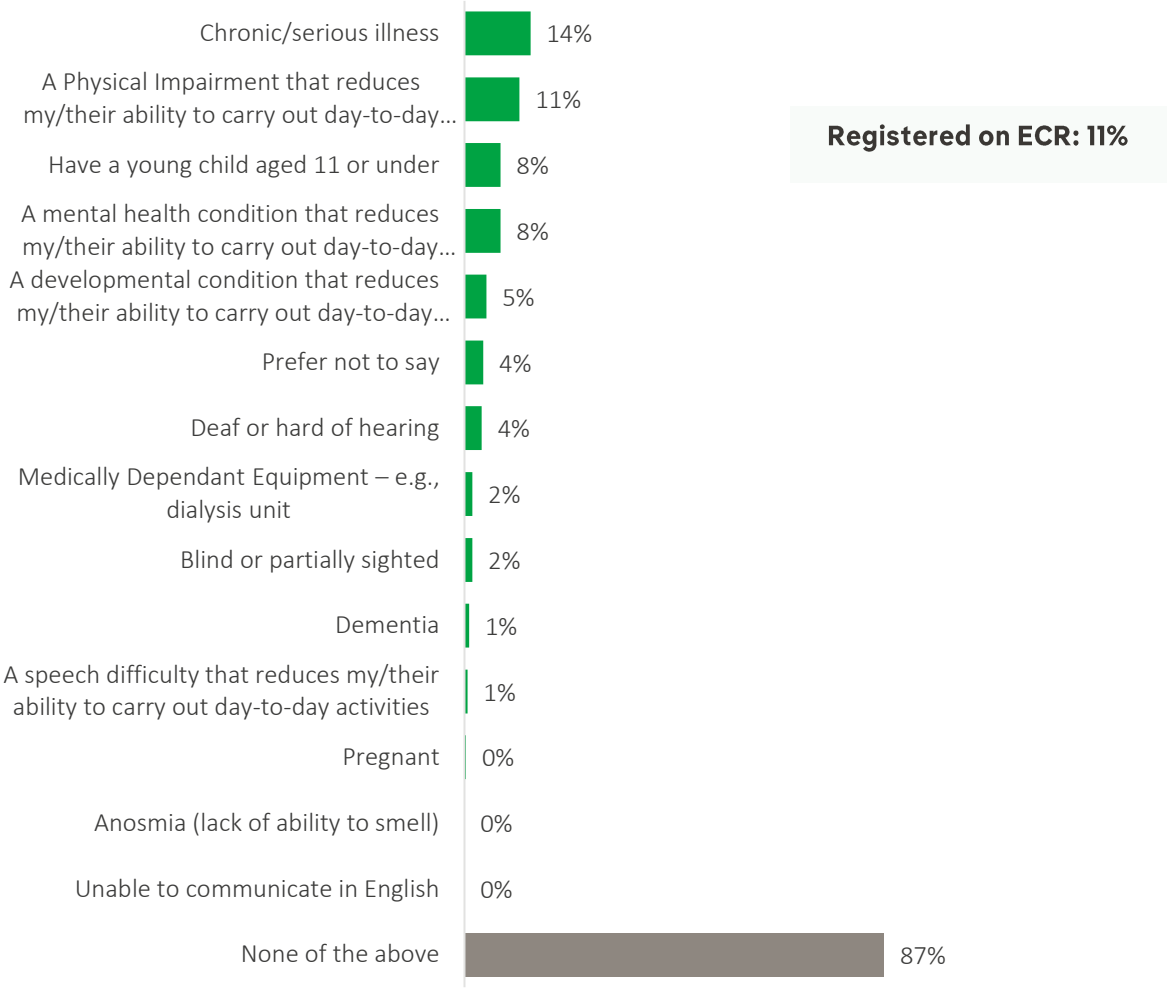
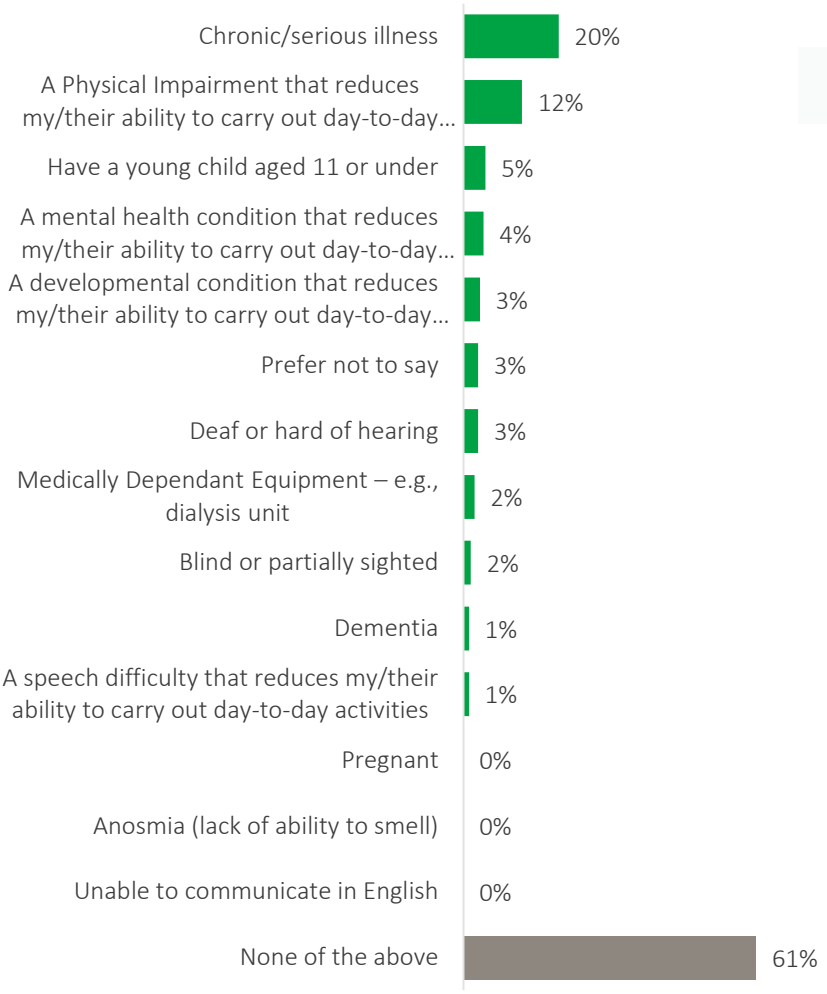
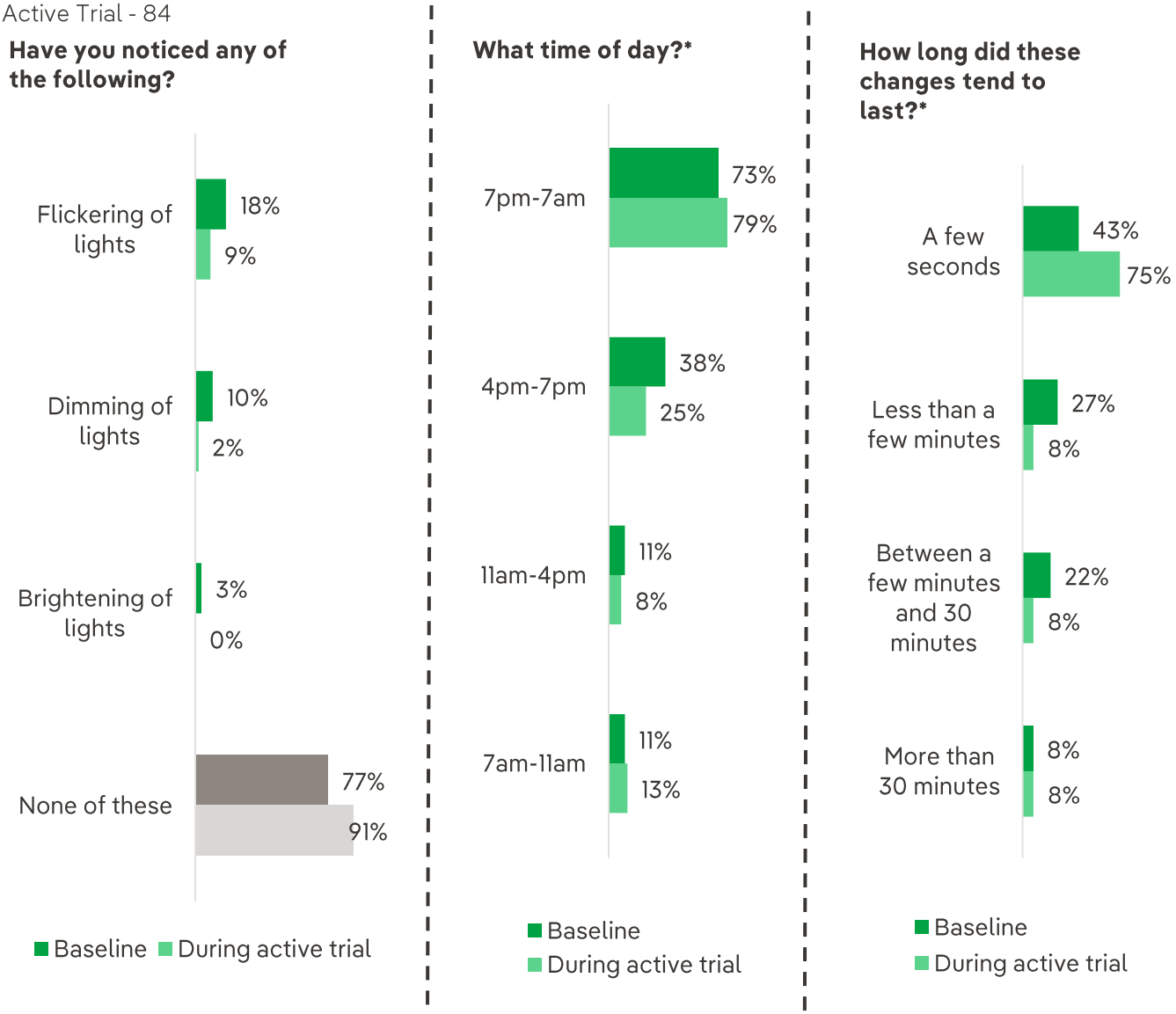


Figure 23 – Household vulnerability among domestic customers in Area 1 active trial
Base size: 264



8.3. Appendix B – Area 1 detailed results

Figure 24 – Changes in lighting behaviour among domestic baseline and active trial
Base sizes: Trial baseline – 201; Trial (All) During Active Trial – 180; Control baseline – 105; Control During Active Trial - 84



**Low base size warning among sample during active trial*

Figure 25 – Satisfaction with the service provided by SP Electricity North West among domestic baseline and active trial

Base sizes: Trial baseline – 201; Trial (All) During Active Trial – 180; Control baseline – 105; Control During Active Trial - 84

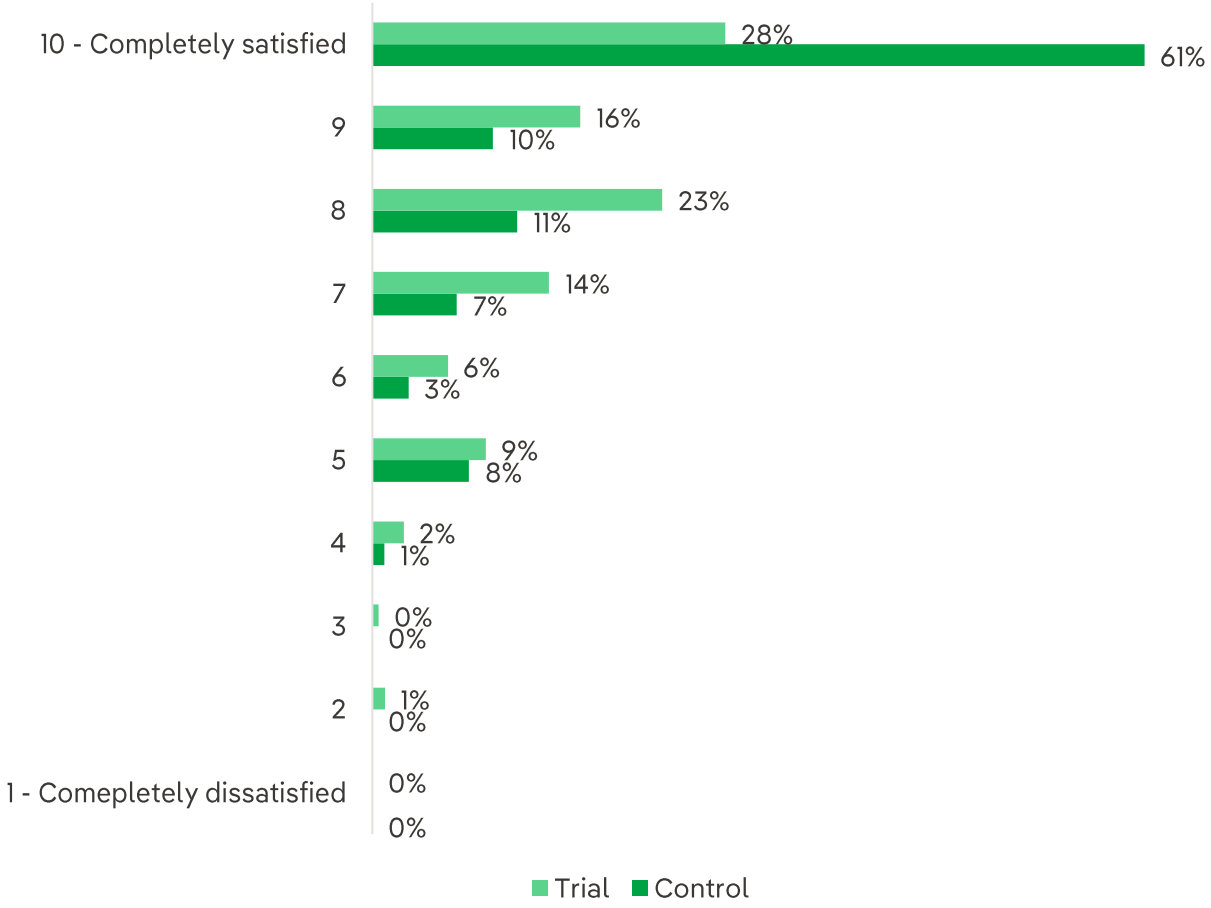


Figure 26 – Percentage (Row %) of time spent at home among domestic baseline - Trial
Base sizes: Trial baseline – 201

% of time spent at home – Trial	Never	Not very often	Occasionally	Often	Always	Don't know / varies too much
Daytime Monday to Friday (Anytime between 9am-5pm)	3%	13%	25%	26%	31%	1%
Evening Monday to Friday (5pm-9pm)	0%	1%	9%	37%	52%	0%
Nighttime Monday to Friday (Any time after 9pm)	0%	1%	5%	24%	68%	0%
Weekends	0%	1%	16%	38%	43%	0%

Figure 27 – Percentage (Row %) of time spent at home among domestic baseline - Control
Base sizes: Control baseline – 105

% time spent at home – Control	Never	Not very often	Occasionally	Often	Always	Don't know / varies too much
Daytime Monday to Friday (Anytime between 9am-5pm)	1%	9%	20%	26%	44%	1%
Evening Monday to Friday (5pm-9pm)	1%	3%	5%	28%	63%	1%
Nighttime Monday to Friday (Any time after 9pm)	1%	1%	2%	22%	73%	1%
Weekends	2%	1%	14%	32%	50%	1%

Figure 28 – Type of electricity meter in the home among baseline

Base sizes: Trial baseline – 201; Control baseline – 105

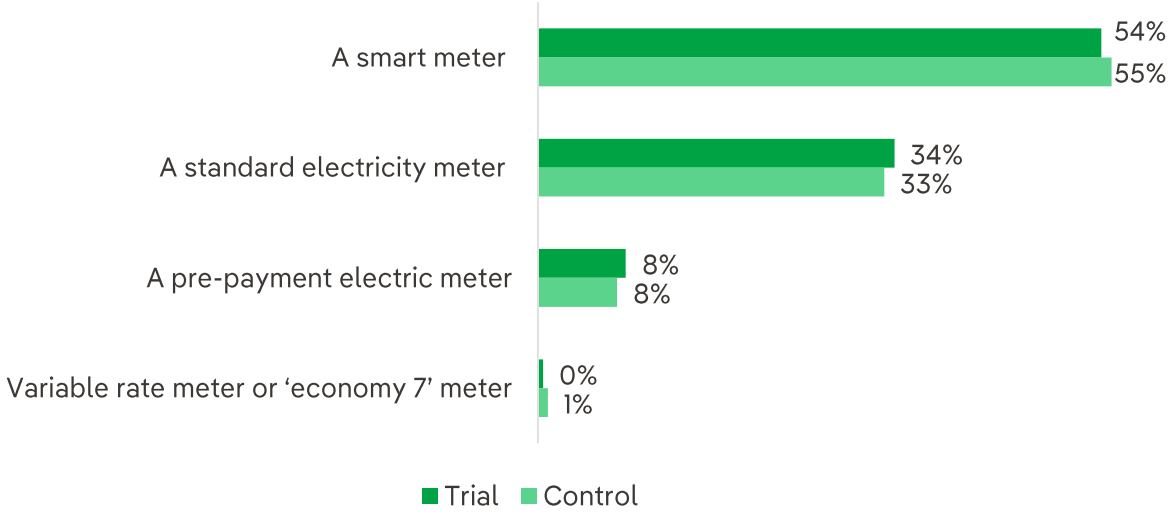


Figure 28 – Rate of lightbulb replacement among baseline
Base sizes: Trial baseline – 201; Control baseline – 105

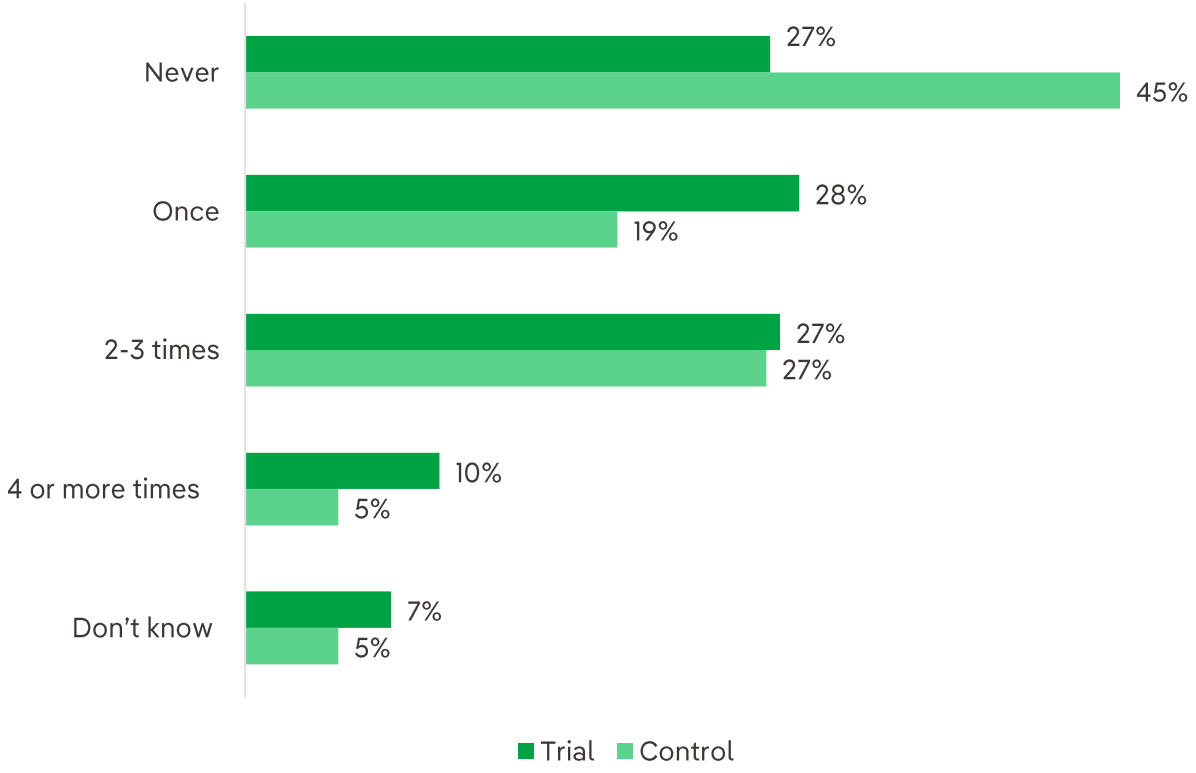
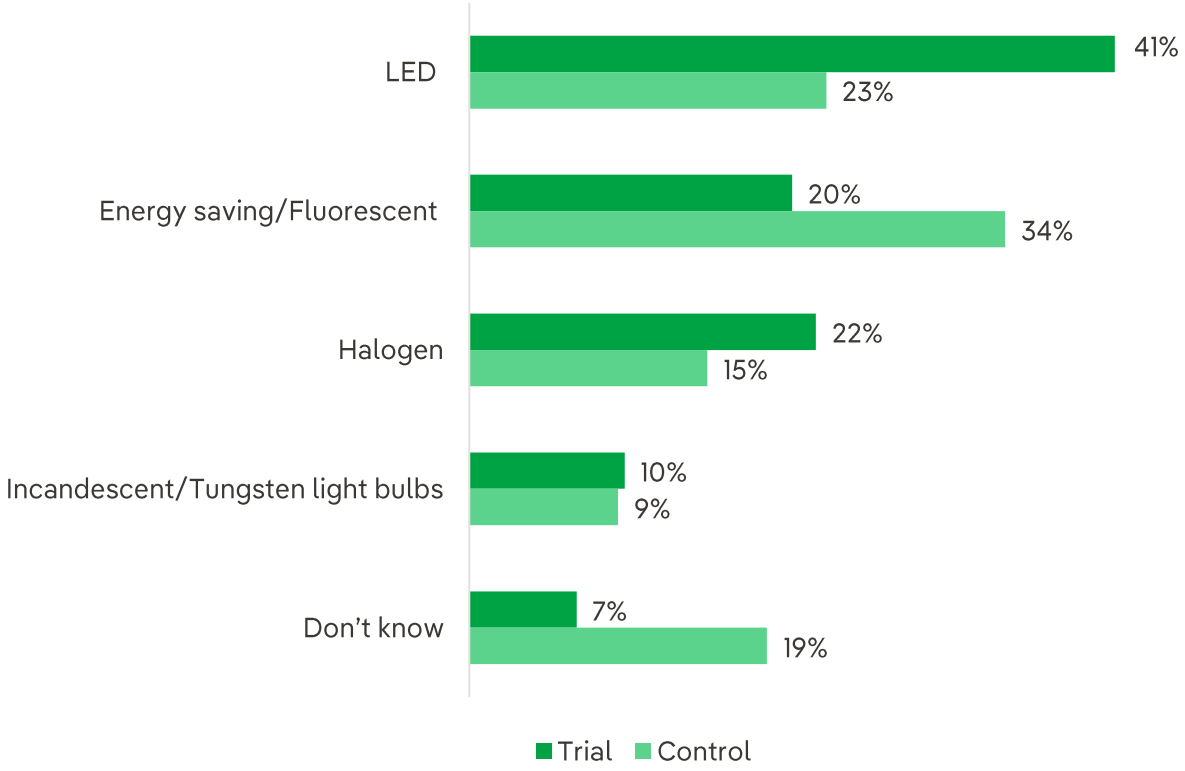


Figure 29 – Type of lightbulb replaced most often among baseline

Base sizes: Trial baseline – 201; Control baseline – 105



8.4. Appendix C - Focus group stimulus used in Area 2

Figure 30 – Electricity system stimulus shown in Area 2 focus groups. These are key findings from Part 1 of Area 2 (semi-structured depth interviews)

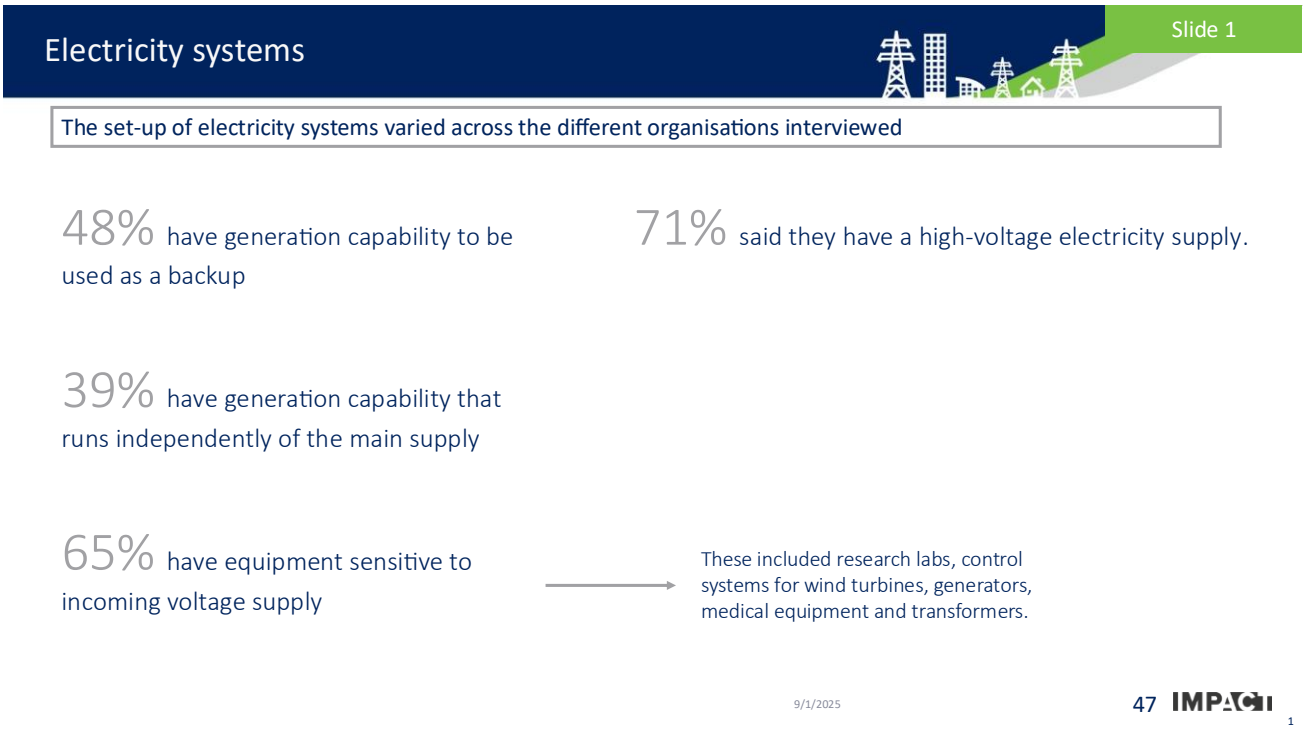


Figure 31 – Impact of voltage changes stimulus shown in Area 2 focus groups. These are key findings from Part 1 of Area 2 (semi-structured depth interviews)

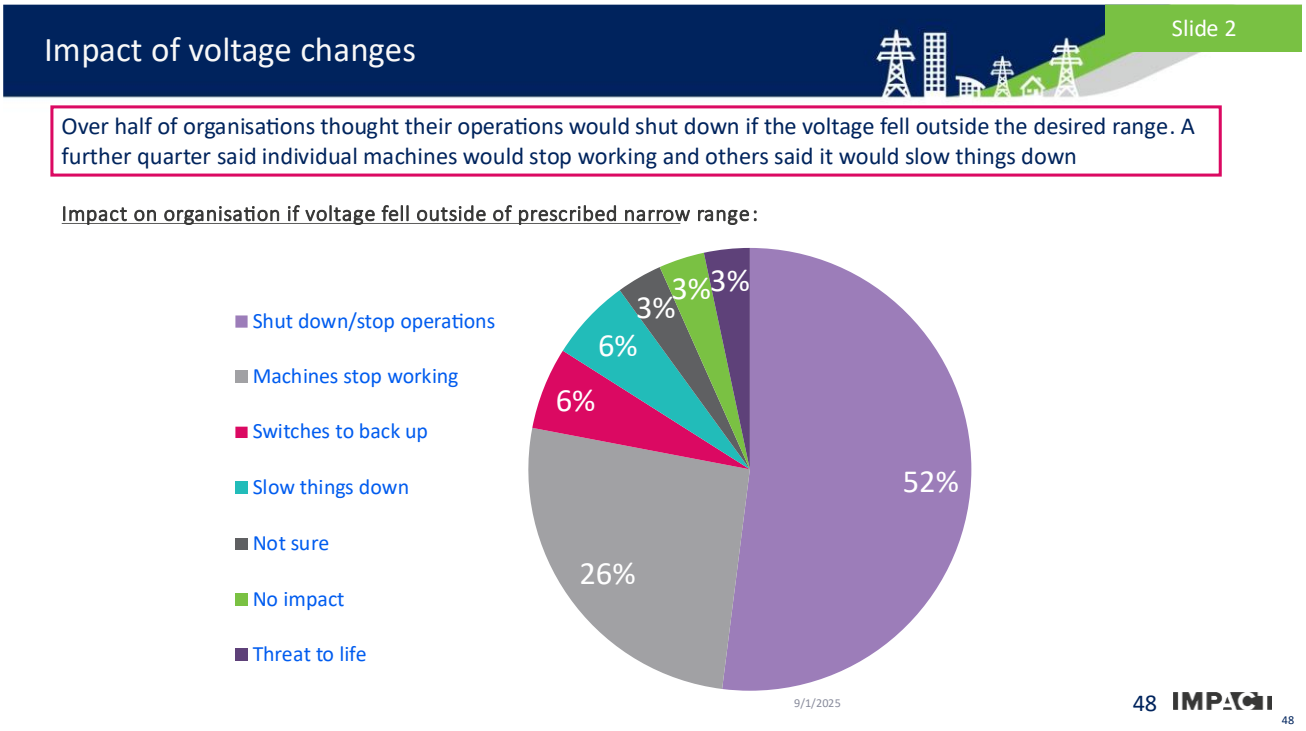


Figure 32 – Scenario stimulus shown in Area 2 focus groups. Example provided by SP Electricity North West for how a business, running specialised equipment could be impacted by a change of voltage.

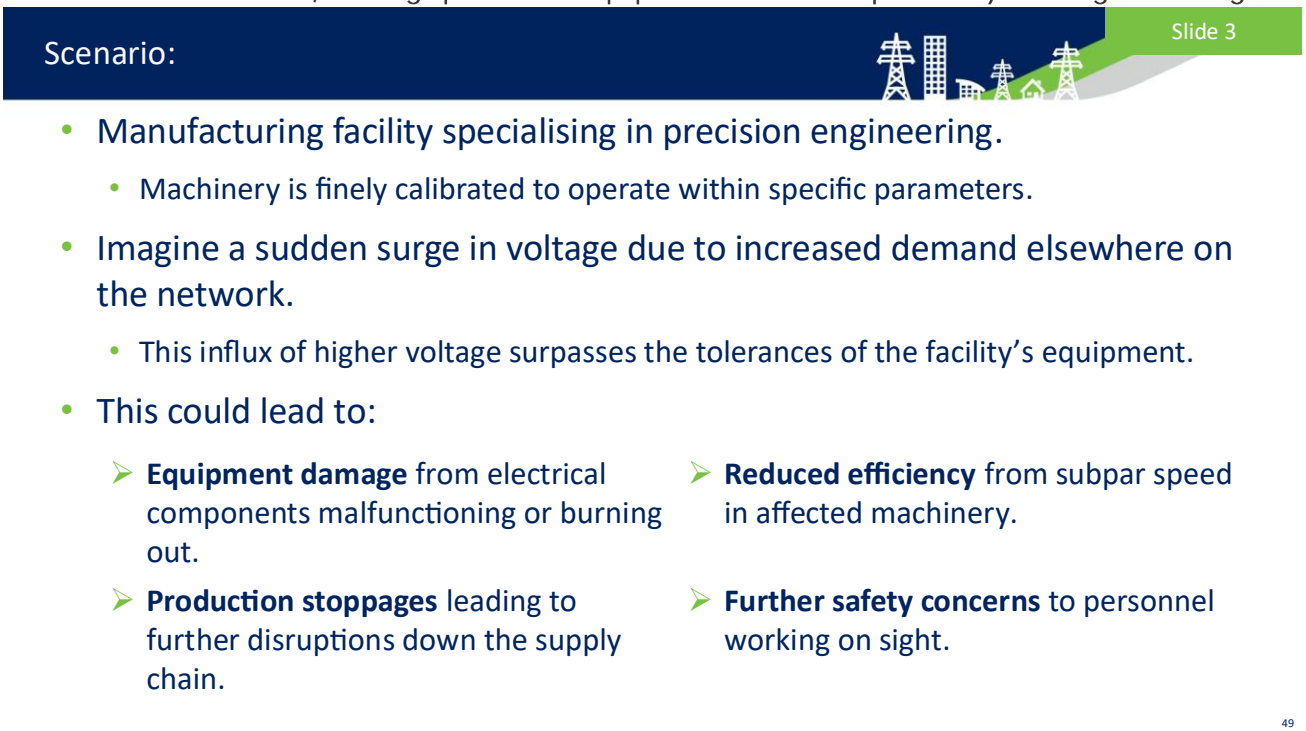


Figure 33 – Introduction to QUEST stimulus shown in Area 2 focus groups. Shown to set out context

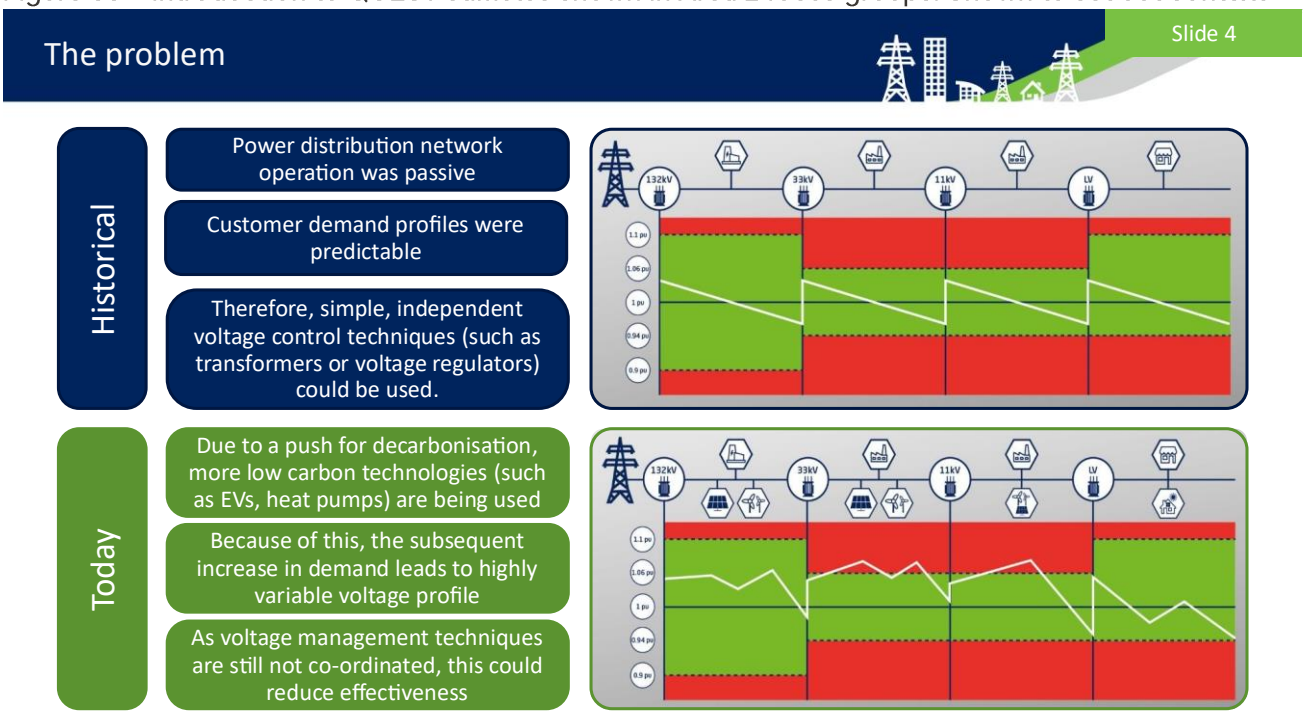


Figure 34– QUEST as a solution stimulus shown in Area 2 focus groups.

Figure 35 – Benefits of QUEST stimulus shown in Area 2 focus groups.

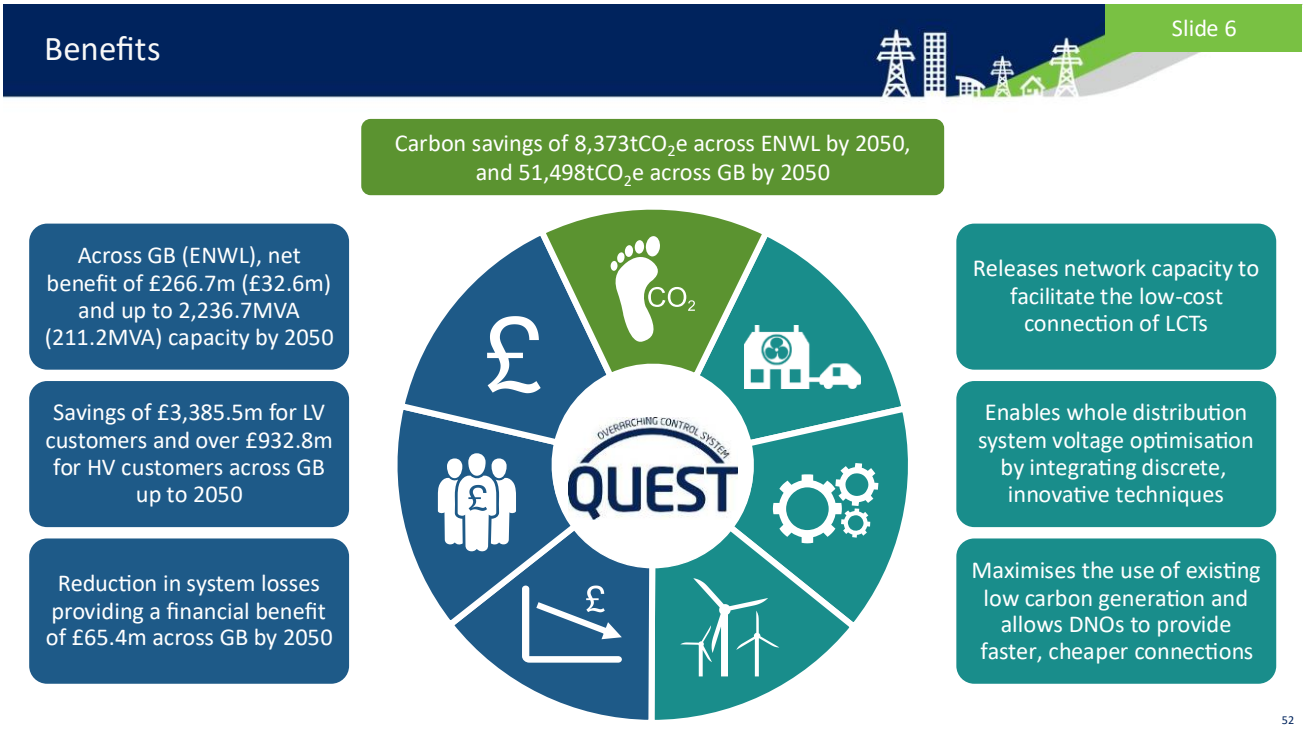


Figure 36 – Introduction to CLASS and Smart Street stimulus shown in Area 2 focus groups.

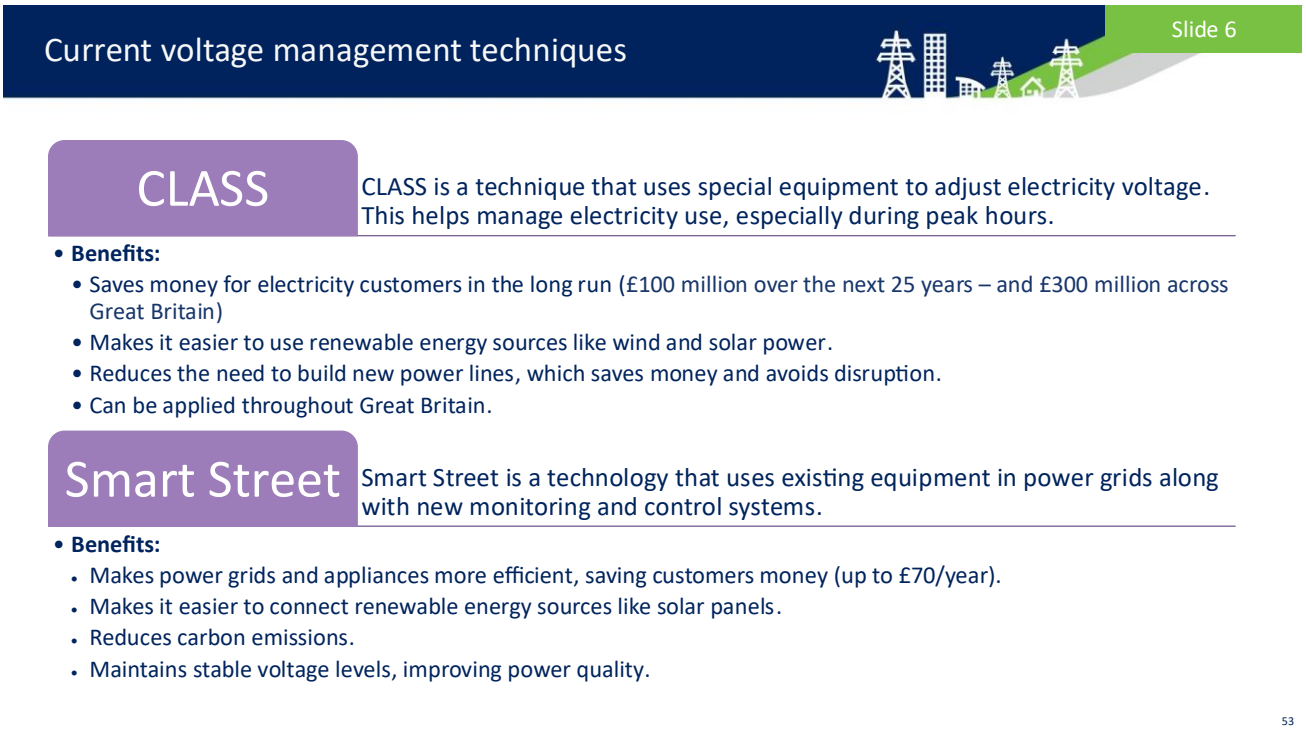


Figure 37 – Introduction to CLASS stimulus shown in Area 2 focus groups.

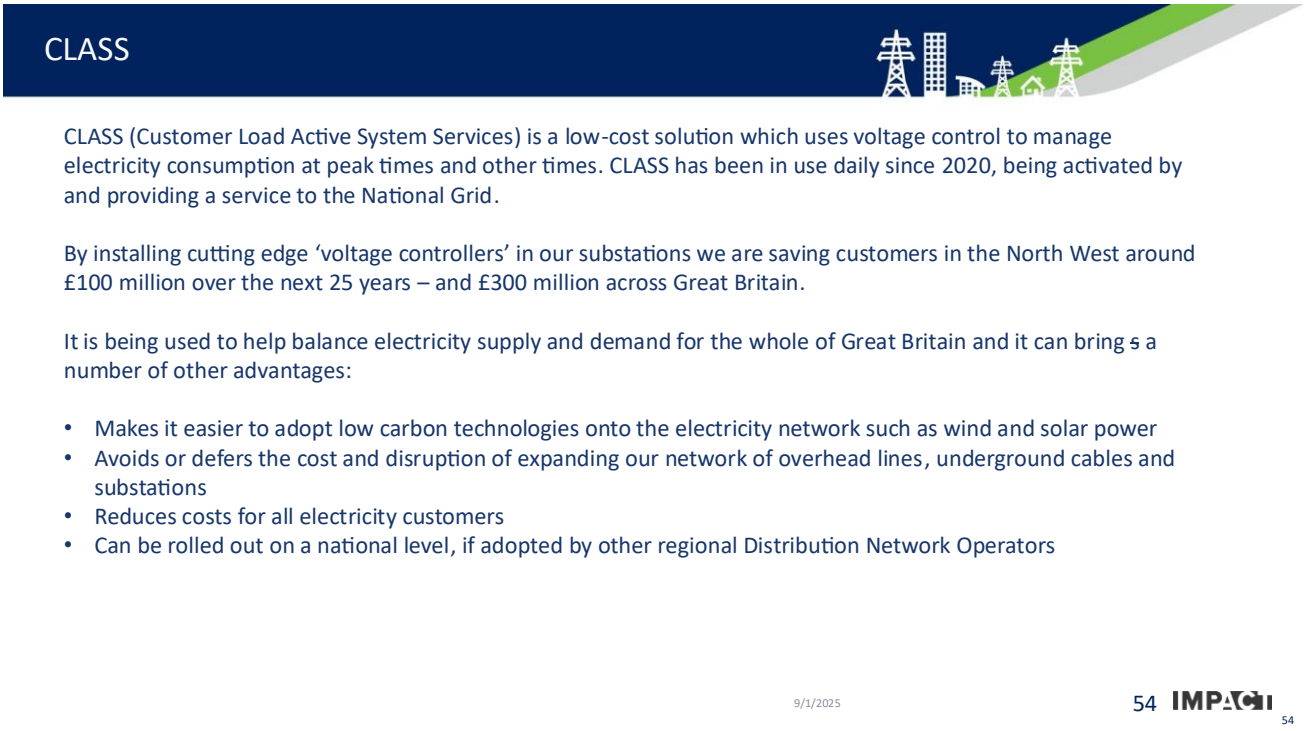


Figure 38 – Introduction to Smart Street stimulus shown in Area 2 focus groups.

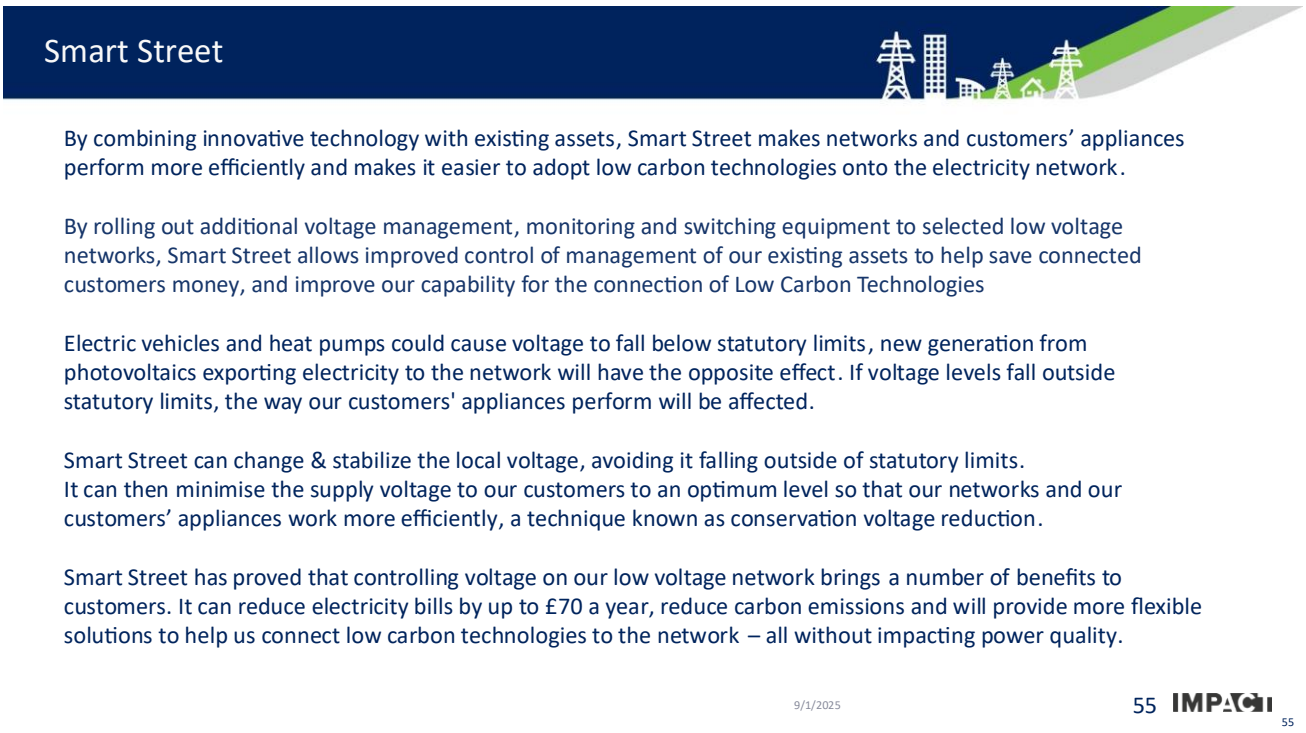


Figure 39 – First support process stimulus shown in Area 2 focus groups.

- All High Voltage (greater than 1,000V) connected customers will likely own/manage/operate private HV equipment.
- The Electricity at Work Regulations 1989, apply at all voltages but ENWL would expect a suitably competent person (in house, or contracted) in electrical engineering to be available for discussion, if necessary
- ENWL current approach is to manage our statutory requirements at the point of supply, but ensure the customer remains responsible for their equipment
- Whilst ENWL may explain some of the issues a customer may face and solutions others have adopted, they do not recommend any particular course of action.
- They are aware that any resolution required on the customers equipment may have a financial consequence.

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Figure 40 – Second support process stimulus shown in Area 2 focus groups.

- Customer Identifies a problem and calls ENWL
- ENWL Customer centre will register concern and take details, including type of customer, nature of issue (e.g., High/Low volts, intermittent issues)
- ENWL Technical resources will be allocated to Investigate, including installation of high accuracy monitoring equipment.
  - If an issue is identified with ENWL supply, ENWL will communicate this and will resolve the issue (Note: If this requires new infrastructure, time will be required for planning and installation)
  - If our supply is within limits (as laid out in the ESQCR) then ENWL will communicate this and close the concern
- The ENWL connection being compliant, will not always rectify the customers issue, as there may be a problem or a set up issue on the customers own equipment
  - ENWL advice at this point is limited, the customer and/or their designated engineer will be responsible for the course of action taken

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8.5. Appendix D - Area 2 firmographics

Figure 41 – Achieved number of employees in Part 1 of Area 2.
Base size: 31

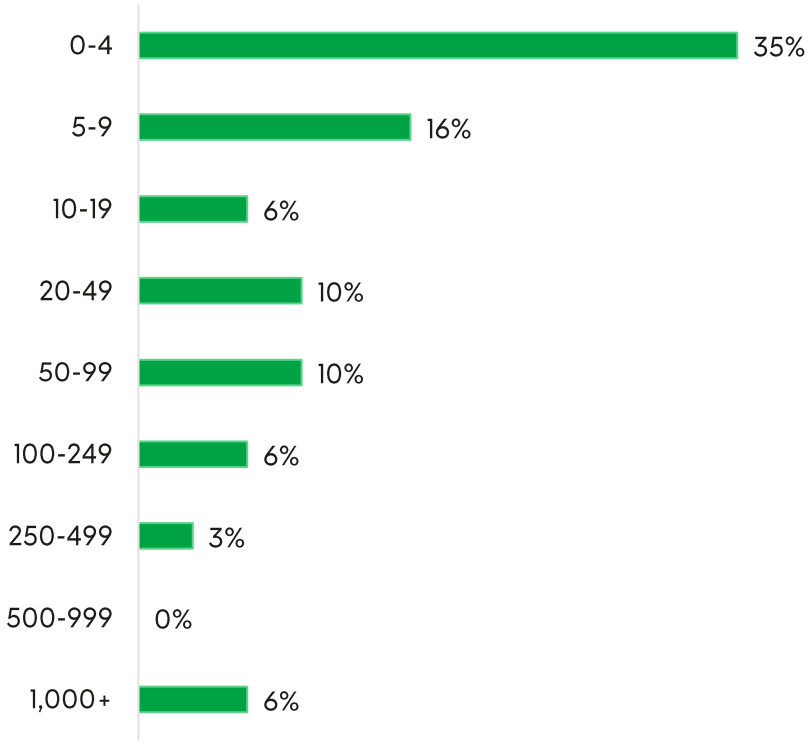


Figure 42 – Achieved number of employees in Part 2 of Area 2

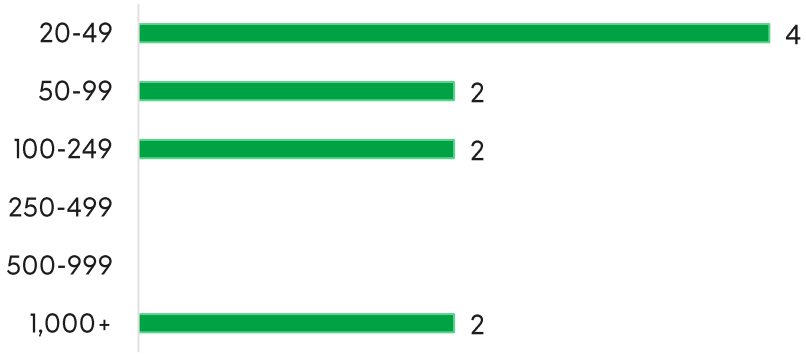


Figure 43 – Achieved numbers across business sectors in Part 2 of Area 2

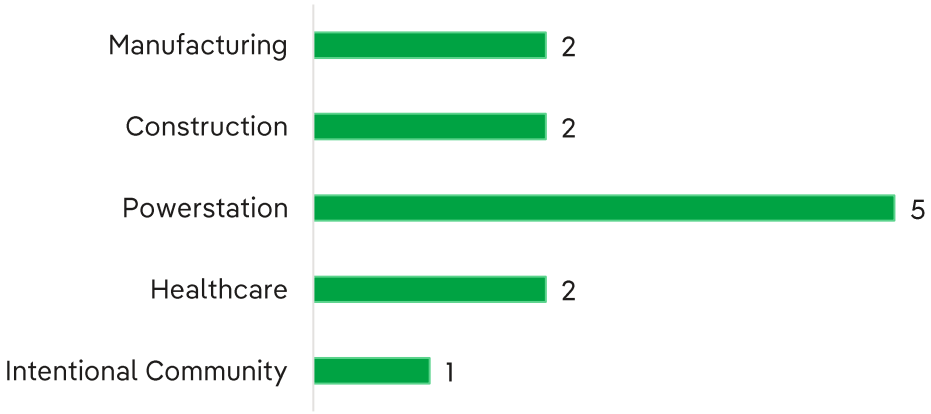
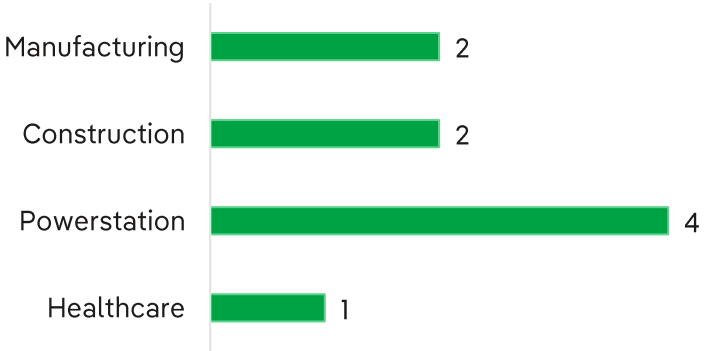


Figure 44 – Achieved number of employees in Part 3 of Area 2

Figure 45 – Achieved numbers across business sectors in Part 3 of Area 2



8.6. Appendix E - Area 3 firmographics

Figure 46 – Profile of power stations and generation developers spoken to in Area 3

Name	Company	Role	Electricity usage	Generation capacity	Involvement in connection agreements	Interest in bespoke QUEST agreement
Generation Developer 1	Generation Site Development and Operations	Head of grid connections	-	Solar PV and batteries. Capacity ranges from 6MW to 67MW. But max 49.9MW for solar due to planning limits.	Involved but they aren't offered a choice of agreements or any constraints.	Interested if it means they could get connections they otherwise wouldn't be able to get.
Generation Developer 2	Generation Site Development and Operations	Consultant	-	Works with high capacity wind farms across the UK	Involved - He has been offered firm and non-firm connections before.	They would need to understand how and when this would cost us so it can go into the upfront modelling
Generator 1	Biomass Power Station	Operations Manager	-	They export at 11Kv and the grid upgrades it to 132. 12MW capacity.	Aware of agreement. No export constraints	Interested - But would have to work in line with business needs
Generator 2	Biomass Power Station	Principal Electrical Engineer	HV standby generators constantly in use (4MW)	Export 225MW per day	Aware of agreement. No export constraints	Not interested - Business would take a hit if constrained
Generator 3	Waste to Energy plant	Electrical Engineer	Substations, turbines that are HV, standby generations, fans and motors	-	Aware of agreement. No export constraints	Sees the benefits, but ultimately take-up would be dictated by the bottom line

Figure 47 – Profile of agriculture respondents spoken to in Area 3

Name	Company	Role	Electricity usage	Generation capacity	Involvement in connection agreements	Interest in bespoke QUEST agreement
Farmer 1	Farming	Owner	Standard voltage - Electric motors for the grain drying equipment	Wind turbine for own use and for export	Fully involved - no constraints in contract, but export price is fixed	Wary of the effect on investment as it may take longer to see returns on investment from renewable energy
Farmer 2	Farming	Owner	Medium/High voltage from the farm to the wind turbine/solar panels	Biomass boiler, a wind turbine, and solar for own use and export	Fully involved - Limited to what was left on the grid (250)	Does not think renewable energy would be financially viable on a contract like this - already getting squeezed
Farmer 3	Farming	Owner	3 phase and single phase to get electricity from solar panels to the chicken sheds	Solar panels for own use and export	Fully involved - No constraints	Don't see an issue with doing something like this, but there would have to be an incentive
Farmer 4	Farming	Owner	Low voltage	50KW turbine, a 50KW solar array and a 60KW solar array.	Involved - Import and export is 200kVa, no constraints	Positive views

Figure 48 – Profile of property developer and construction respondents spoken to in Area 3

Name	Company	Role	Electricity usage	Generation capacity	Involvement in connection agreements	Interest in bespoke QUEST agreement
Developer 1	Property developer	Director	Low and High voltage equipment	None	Makes the grid connection but client signs the agreement	Positive views, but this is more relevant for the end client
Developer 2	Property developer	Director	Standard-voltage battery operated equipment	Low voltage generators to use while building	Negotiates agreement with DNO	Not interested - too high a commitment
Developer 3	Property developer	Director	Low and High voltage equipment	Onsite generators	Negotiates agreement with DNO	Wary of the effect of such a contract on the end sale

Developer 4	Construction	Owner/Director	n/a	Diesel generator in case of an outage	Makes the grid connection but client signs the agreement	Thinks some clients would be interested if they could receive money for it

Figure 49 – Profile of 'other' respondents spoken to in Area 3

Name	Company	Role	Electricity usage	Generation capacity	Involvement in connection agreements	Interest in bespoke QUEST agreement
Other (holiday & tourism)	Holiday & tourism	Owner	56KW solar panels to power their own site.	Solar panels for own use and export	Installer had to deal with NPg - There is a export limit but they would never reach it	Open to the idea
Other (ICP)	Construction - Provides power to large developments (an ICP)	Director	n/a	n/a	Makes the connection - Never seen a flexible connection	Would not impact our business as we don't install power to industrial units
Other (manufacturing)	Manufacturing	Financial Director	High voltage manufacturing equipment	Two backup generators	Some involvement but it is a complex arrangement with the Council who own the land	Hesitant - Not straightforward due to the admin involved
Other (billing)	Billing department for water supplier	Operations Manager	Data centre - Low, high, and extra high	Yes - backup generations	Aware of agreement. No constraints	Sees the benefits, but ultimately take-up would be dictated by the bottom line