

Delivering flexibility services for hard to reach or vulnerable domestic energy consumers

Socially Green Phase 3 Market Engagement

Research report – version 1.2

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Executive Summary

This report forms the market engagement element for Phase 3 of the Socially Green project. Delivered on behalf of UK Power Networks (UKPN), Socially Green is exploring how UKPN, as part of its work in RII0-ED2, can continue to support vulnerable customers in the transition to a net-zero energy system.

Phase 3 of Socially Green focuses on delivering more flexibility services to vulnerable customers. Inclusive flexibility is an area that has received increasing government and industry interest over the last few years. Socially Green Phase 3 seeks to develop and implement a trial of an inclusive flexibility service through which UKPN will be able to secure more flexibility services from vulnerable or hard to reach customers in future.

The objectives of this research were:

1. Engage with two groups of people involved with inclusive flexibility (flexibility service providers and vulnerable customers) to seek their opinions on a range of proposed solutions for enabling providers to obtain more flexibility from vulnerable or hard to reach customers.
2. Draw together some recommendations from both groups to inform the development of the trial of an inclusive flexibility service in the rest of Phase 3.

Research design

Survey of flexibility service providers

An online survey was emailed to a total of 52 flexibility service providers and community energy groups known to be interested in potentially delivering flexibility services in UKPN license areas. The survey sought opinions on a range of both procurement and enabling solutions for increasing access of vulnerable customers to flexibility services. It also asked about any support providers might need to increase their confidence in offering inclusive flexibility services.

17 responses were received in total (four complete, 13 partial). Data was cleaned then analysed in MS Excel and Word. Only eight responses provided insight about delivering flexibility to vulnerable customers, so only these responses are included in results.

Focus groups with vulnerable customers

A sampling frame was designed to recruit four focus groups of participants living in UKPN areas with different vulnerabilities and opportunities to benefit from flexibility services:

- Deep Impact Low Enabler (DILE) - Participants had health vulnerabilities.

- Deep Impact High Enabler (DIHE) - Participants had electric hot water (and heating).
- Wide Impact Low Enabler (WILE) - Participants were digitally constrained with low choice in household appliances.
- Wide Impact High Enabler (WIHE) - Participants were digitally confident with high choice in household appliances.

Focus groups were conducted with 24 participants online. Building on the procurement and enabling solutions discussed by flexibility providers, vulnerable customers discussed four examples of flexibility services:

1. Home Energy Action Plan (HEAP) with flexibility information and advice
2. Battery with grid services package – home installation and 2+) battery and solar PV – community installation
3. Use of surplus renewable electricity to heat hot water

A poll was also used to establish customer willingness to participate in the different examples, and attitudes towards flexibility services in general. Transcripts of focus groups discussions were analysed thematically.

Results

Flexibility service providers

Benefits and concerns

Overall, providers were more supportive for enabling (and consumer) over procurement measures. Providers felt educational solutions were more appropriate as they focused on the consumers UKPN wanted to support. Providers thought that better engagement with innovators would help to overcome inertia on flexibility in the sector and that the market could come up with interesting options, such as gamification of user interfaces.

On procurement solutions, providers flagged the prior need to build consumer trust in and awareness of flexibility services and the need for matching services to household needs: demand turn up was seen as more relevant to vulnerable consumers than demand turn down. One provider was unsure if any procurement activities could help them obtain flexibility from vulnerable customers as their service was more applicable to higher income households. There was support for common standards like HOMEflex, but acknowledgement that these should be accompanied by punitive measures. One provider felt that specific procurement rules for vulnerable customers were required.

‘[We] suspect a better route would be adopting punitive measures on providers that fail to meet their obligations under codes of conduct.

Aggregator, Tech Company & LCT Installer

Providers also gave feedback on perceived benefits and concerns around delivering flexibility services to vulnerable consumers in general. Several providers felt that services designed to meet the needs of vulnerable customers could help deliver lower costs, especially in social

housing with heat pumps or households with electric water or space heating. Nonetheless, a range of concerns were also highlighted. These included challenges identifying consumers, data and GDPR issues, and a lack of digital skills or trust on behalf of consumers.

Building confidence

Providers felt that specific funding, or a reduction in associated risks, were required to help build confidence in delivering flexibility services to more vulnerable customers. Other suggestions raised here included: better information around identification of vulnerable customers and their needs and partnerships with those already working with vulnerable groups.

Vulnerable customers

Benefits and concerns

The HEAP was the most preferred example overall. This suggests that vulnerable customers would recognise benefits from the enabling solutions favoured by providers. Most focus group participants liking the opportunity to receive advice and potentially save money.

I probably would participate in it. It seems like, obviously, it's just gonna give me ideas on what I can do and give the advice on how I can do it to cut down.

P1 DILE group

Some participants in the WIHE group were less convinced: they would rather find out about flexibility opportunities themselves. One WIHE participant said having a smart meter made it easier to track their energy usage. Some DIHE participants also were concerned about not having Economy 7 smart meters.

Although some providers suggested batteries may help to tackle both flexibility and energy efficiency solutions, the battery examples split opinion amongst customers. The home battery was relatively popular with the DILE and WIHE – who liked the backup power supply and bill-saving potential. Nonetheless, a wide range of concerns were raised about this example. Space and safety were common issues. Some participants also had doubts about complexity of operation, financial reward and contract length. The community battery was overall as popular as the home battery, but with different participant groups. Participants in the two groups with flexibility barriers (DILE and WILE) preferred the community battery, citing the lack of direct responsibility for the battery as a benefit. WIHE and DIHE participants had concerns about logistics and preferred the direct control offered by the home battery.

Feedback from vulnerable customers aligned with that of flexibility providers around the surplus electricity example. Providers suggested this would be ideal for some households with high electricity demand and this was borne out by testimony from the customers. Participants with high electricity usage (DILE and DIHE) were most keen on the surplus electricity. This reflected their need to reduce bills and the ease (for DIHE participants) with which the example would fit with their existing hot water system. This also tallied the broader perception that this offer would work well for low-income families with young children: most DIHE participants lived with children. Participants in all groups felt the example would work best in new-builds or in

properties with existing immersion tanks. They feared disruption and extra costs in other property types.

Building confidence

To improve their confidence in taking up a HEAP, participants wanted more detailed information about what a HEAP would entail, including how any financial calculations were made. This reflects general concern around the finances of flexibility services. One participant also suggested delivering HEAPs via trusted intermediaries. This may help to address some concerns raised around certain household groups receiving HEAPs.

Flexibility provider accreditation or sign up to codes of conduct and endorsement of flexibility services by trusted organisations would further increase vulnerable customer confidence in flexibility offers. These findings support the suggestions of flexibility providers that an enforced code of conduct would be an effective procurement solution.

Case studies were deemed important for raising confidence in the home battery, plus the opportunity to trial the example before committing to a long contract. Participants also wanted more safety information and guaranteed financial returns: reflecting the broader concerns around minimising risk for flexibility services in general.

DIHE participants felt that using the electricity to reduce communal charges might allay some of their logistical concerns about the community battery example. Other participants wanted guaranteed bill reductions and clear live information to use alongside the offer.

As with all other examples, participants reported that more detailed information on financial savings would give them more confidence in taking up the surplus electricity example. This reflects the broader importance of finances in relation to flexibility services in general for the participant group.

Evidence from participants also indicated a number of other options for increasing uptake of flexibility services in general amongst hard to reach groups. These included: transparency around finances, emphasising different benefits of flexibility services in communications with clients, using trusted intermediary organisations and working with landlords of private tenants.

Recommendations and next steps

Drawing on the analysis of both vulnerable consumer and flexibility service provider results, the following suggestions are made to inform the design of a trial flexibility service with hard to reach or vulnerable consumers in a UKPN license area in 2023, and future flexibility services.

1. Prioritise enabling solutions that will increase awareness, understanding and trust of flexibility services amongst vulnerable customers. Provide funding for a holistic suite of support for vulnerable customers to overcome multiple barriers to adopting flexibility services, including digital support.

2. Deliver advice about flexibility sensitively, acknowledging that many customers are already doing all they can to manage and limit the energy use due to poverty.
3. Support community energy groups or other intermediaries to act as trusted messengers to vulnerable groups.
4. Clearly explain all aspects of in-home flexibility services: space requirements; safety of technologies; connectivity; installation; how financial rewards are calculated; means to check live electricity use; how customers can optimise financial savings via time of use tariffs. Reassure consumers of protections for adequate electricity or hot water supply.
5. Communicate the community and wider benefits of flexibility services: giving back to the grid; environmental benefits; energy security; continuity of supply.
6. Consider how to manage financial barriers by offering free or discounted technologies. Provide a running cost guarantee, to minimise risk and appropriately reward domestic customers for flexibility services.
7. Explore flexibility service design to support engagement with private tenants and landlords.
8. Identify appropriate solutions that fit with consumers' needs, appliance replacement timeframes and dependence on electricity supply, e.g. trial the delivery of in-home battery storage solutions that provide resilience to those medically dependent on electricity, replace immersion heaters with smart hot water tanks, or enable automation of electric heating. Consider turn up solutions as well as, or instead of turn down solutions.
9. Specify adoption of HOMEflex as a requirement of all flexibility providers UKPN procures from. Establish penalties in contracts aligned with HOMEflex, particularly to prevent false advertising, and enforce if obligations are not met.
10. Give flexibility service providers clear direction and guidance on how to identify vulnerable consumers and measure their uptake of services, such as via use of UKPN vulnerability mapping tool.
11. Share learning from trials with flexibility providers to establish best practice and build an evidence base to inform future service design. Engage with innovators to develop trial options and explore new solution areas.

Next steps

Research and suggestions can be used to inform the development of a trial flexibility service with hard to reach customers in 2023 in UK Power Network licensed areas and future flexibility procurement and service design.

Introduction

This report forms the market engagement element for Phase 3 of the Socially Green project¹. Delivered on behalf of UK Power Networks (UKPN), Socially Green is exploring how UKPN can continue to support vulnerable customers in the transition to a net-zero energy system. Phase 3 of Socially Green focuses on delivering more flexibility services to vulnerable or hard to reach consumers².

Flexibility services are products or services which enable consumers to obtain cost savings or other incentives for shifting their energy demand. Such services are growing increasingly popular in the UK. National Grid's Demand Flexibility Service (DFS) in winter 2022-23 was the biggest 'consumer flexibility experiment' to date³. Twenty flexibility service providers (energy suppliers and other organisations) engaged with around one million households⁴. These flexibility services have a key role to play in the transition to a net-zero energy system – enabling Distribution Network / System Operators (DNO / DSOs) to bring more green renewable energy onto the grid whilst balancing supply and demand.

Vulnerable consumers face a range of barriers to participate in flexibility services⁵. They also might encounter a range of risks that could expose them to harm, or limit their ability to benefit⁶. This limiting of access to flexibility services risks hampering the UK's energy transition and multiplying social disadvantage. As a result, recent research and policy work has focused on solutions for making flexibility services more inclusive⁷.

As a DNO / DSO, UKPN have an important part to play in this process.

Ensuring a fair and accessible energy system is a key obligation for DNO / DSOs as part of RDII-ED2⁸. Ofgem identify vulnerability for RII-ED2 as customers (1) most at risk during a loss of supply, (2) in, or at risk of, fuel poverty, (3) most at risk of being left behind in the energy system transition towards net zero. Fair treatment of domestic customers for DNOs involves having measures in place that deliver positive outcomes including identifying such customers in an

¹ <https://innovation.ukpowernetworks.co.uk/projects/socially-green/>.

² Hard to reach is described in the Socially Green Phase 3 literature review, pg. 6 as vulnerable, disadvantaged or excluded consumers e.g. due to tenure, geographic constraints, building constraints, lack of access to capital, lack of engagement in the energy market, lack of flexibility or digital skills.

³ <https://moneytothemasasses.com/news/demand-flexibility-service-how-to-get-paid-to-use-less-electricity> 23.01.23

⁴ [download \(nationalgrideso.com\)](https://download.nationalgrideso.com).

⁵ <https://centreforsustainableenergy.ams3.digitaloceanspaces.com/wp-content/uploads/2023/03/18215611/smart-and-fair-phase-1-report-september-2020.pdf>, 10.

⁶ [Demanding attention - Managing risks with demand-side response, to improve consumer experience tomorrow.pdf \(citizensadvice.org.uk\)](https://citizensadvice.org.uk/globalassets/citizensadvice/energy/citizensadvice_a_flexible_future_extending_the_benefits_of_energy_flexibility_to_more_households_2023.pdf).

⁷ For example:

https://www.citizensadvice.org.uk/Global/CitizensAdvice/Energy/CitizensAdvice_A_flexible_future_Extending_the_benefits_of_energy_flexibility_to_more_households_2023.pdf.

⁸ <https://www.ofgem.gov.uk/publications/riio-ed2-final-determinations>.

effective and appropriate manner and interacting with these consumers in a way that takes into account any vulnerability⁹.

Since 2020 UK Power Networks (UKPN) has proactively explored the needs of vulnerable customers through its Socially Green project. Phase 1 of the project segmented consumers informed by consumer capabilities, opportunity and willingness to engage in the energy market. Phase 2 produced a vulnerability mapping tool and framework with which UKPN can identify the locations of vulnerable and hard to reach consumers to focus on and inform the development and delivery of services so that the UKPN energy network is fair and accessible to all.

Phase 3 of Socially Green – the current phase of which this research is part – focuses primarily on hard to reach flexibility. As a DNO / DSO, UKPN actively procure flexibility services to manage constraints and avoid or defer infrastructure spend on their energy networks. The objective of Phase 3 is to develop and implement mechanism(s) through which UKPN will be able to secure more flexibility services from vulnerable, disadvantaged or fuel poor customers.

Phase 3 started with a design phase which included long listing possible flexibility solutions, business case development and a market engagement process which this report describes. These activities were designed to feed into a pilot of an inclusive flexibility service. Further details on Socially Green Phase 3 are in the appendices.

Objectives of this study

This study explores how to create inclusive flexibility services for customers experiencing vulnerability or disadvantage. The study was designed with two objectives.

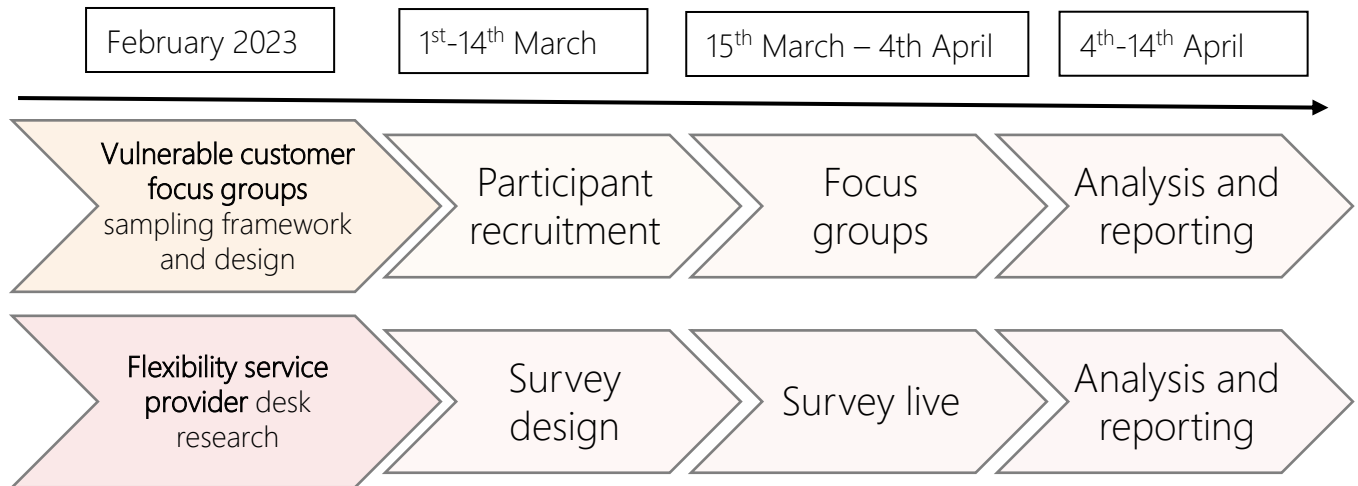
1. Engage with two groups of people involved with inclusive flexibility (flexibility service providers and vulnerable customers) to seek their opinions on a range of proposed solutions for enabling providers to obtain more flexibility from vulnerable customers.
2. Draw together some recommendations from both groups to inform the development of the trial of an inclusive flexibility service in the rest of Phase 3, and any future flexibility services and procurement.

Overview of research activities, time scales and reporting

Figure 1 gives an overview of the research activities conducted and timescales.

Figure 1: Research process diagram

⁹<https://www.ofgem.gov.uk/publications/riio-ed2-final-determinations>, 115.



Structure of the report

This report is divided into four sections:

Section one summarises the research design for the focus groups with consumers and online survey with flexibility service providers.

Section two gives the flexibility service provider results. Results are discussed and suggestions made for flexibility service design based on flexibility service provider views.

Section three presents the customer engagement results. Results are discussed and suggestions made for flexibility service design based on consumer views.

Section four consolidates the insights from the research and collates suggestions to inform the design of a trial flexibility service with hard to reach or vulnerable consumers in 2023, and future flexibility services.

Appendices provide full detail of the methodology.

Section 1: Research Design

This section gives a short summary of methodology. Full methodology details are included in the Appendices.

Online survey of flexibility service providers

Survey design and administration

A list of 52 flexibility service providers and community energy groups known to be interested in potentially delivering flexibility services in UKPN license areas was compiled from desk research and UKPN contacts.

The survey sought opinions on a range of both procurement and enabling solutions for increasing access of vulnerable customers to flexibility services. It also asked about any support providers might need to increase their confidence in offering inclusive flexibility services.

The survey link was distributed via email and also circulated by the Association of Decentralised Energy to their flexibility service provider contact list. The survey was open for 20 days (15.03.23–03.04.23); three survey reminders and personal email requests were sent to prompt responses or gather additional input.

Survey analysis

17 responses were received in total (four complete, 13 partial). Data was cleaned then analysed in MS Excel and Word. Only eight responses provided insight about delivering flexibility to vulnerable customers, so only these responses are included in results.

Focus groups with consumers

Sampling framework

A sampling frame was designed to recruit focus group participants living in UKPN areas with different vulnerabilities and opportunities to benefit from flexibility services. This was informed by Priority Service Register needs codes, fuel poverty statistics, the Socially Green Phase 1 customer segmentation and CSE's Smart and Fair consumer capability lens. The sampling frame was based on the following two aspects as shown below.

Figure 2: Sampling framework

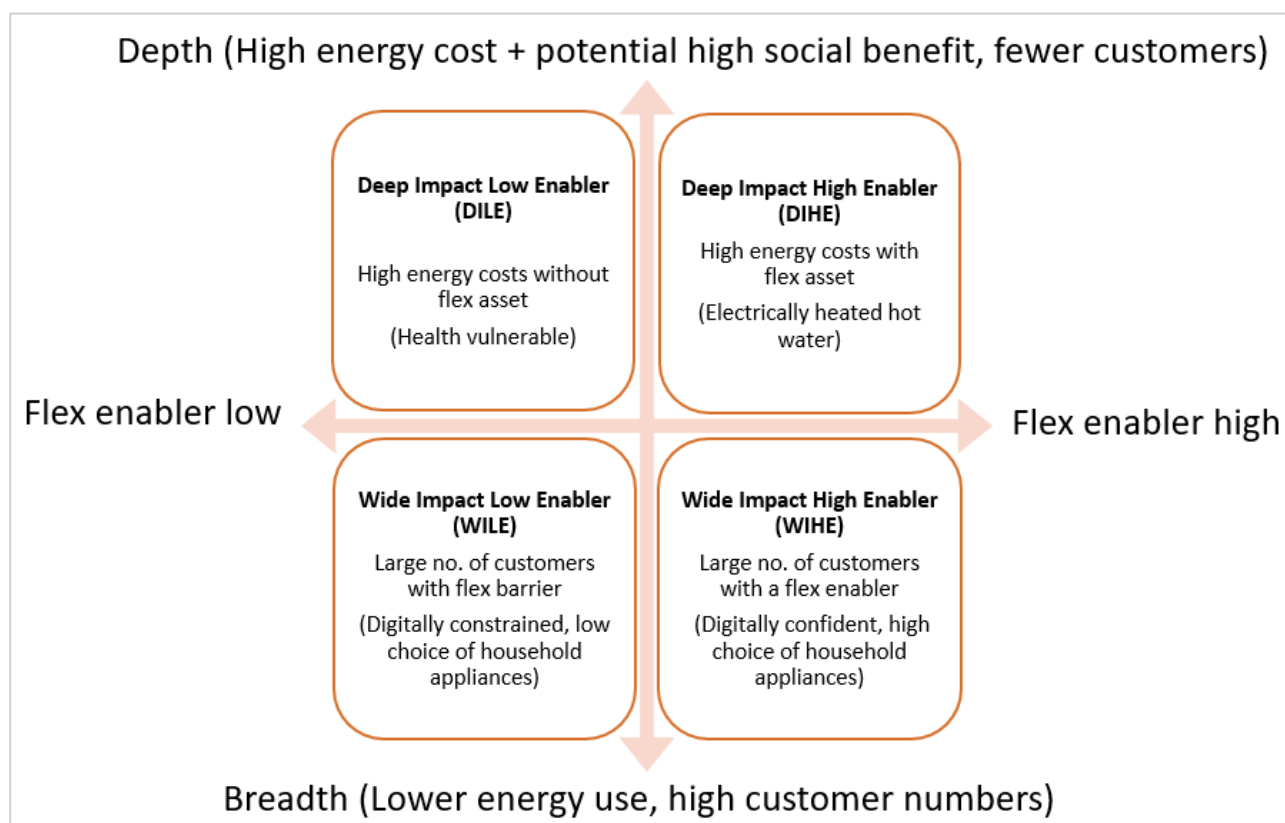


Table 1: Summary of rationale for focus group sampling framework

Group	Depth	Breadth (proportion of consumers in UKPN area)	Rationale
- Deep Impact Low Enabler (DILE) - Health vulnerable customers	High electricity use. Unknown / variable ability to shift load.	Low	Flexibility services not accounting for differing needs and abilities to flex. Lack of commercial viability.
- Deep Impact High Enabler (DIHE) - Electric hot water and heating	High electricity use. High ability to shift load.	Low. 13-39.7% of homes heated electric only in some areas of East of England and London ¹⁰ .	High social impact if coupled with rented sectors. High fuel poverty as electricity more expensive than gas. Association between electric heating & low income.
- Wide Impact Low Enabler (WILE) - Digitally constrained (no home	Low / variable	High. 88% of UK adults have smartphone ¹¹ . Low-income users (< £25,000 pa), 31% will	Reluctance to use data to participate or infrequent access to internet e.g. via library. Secondary factor of low choice of household

¹⁰ [ONS map How homes are heated in your area](#), Census data 2021, Electric only

¹¹ <https://www.uswitch.com/mobiles/studies/mobile-statistics/>

broadband), little or no choice of household appliances.		ration mobile data use ¹² .	appliances - private renters. High risk of fuel poverty.
• Wide Impact High Enabler (WIHE) • Digitally confident, choice of household appliances.	Low / variable	High. 17.4% households in UKPN area are social housing tenants ¹³	Social housing tenants have control over household appliance purchases. Often in homes of good energy efficiency, sometimes with LCTs. High risk of fuel poverty due to low income.

Recruitment

A total of twenty-four participants were recruited in total to fill the four focus groups. Other vulnerability factors were included in recruitment. Each focus group involved participants with a mix of tenures, incomes, ages, genders, meter type, and property energy efficiency rating. All participants lived in UKPN license areas. A summary of recruited participants is given in Table 2. Full details of participants is given in Table 6 in the Appendices.

Table 2: Summary of recruited focus group participants

Group	Number of participants	Details
Deep Impact Low Enabler (DILE) Health vulnerable customers	5	All were medically dependent on electricity.
Deep Impact High Enabler (DIHE) Electric hot water and heating	7	All had immersion tanks; 6 also had electric heating.
Wide Impact Low Enabler (WILE) Digitally constrained (no home broadband), little or no choice of household appliances.	7	Private renters (5, 71%) and social renters (2, 29%).
Wide Impact High Enabler (WIHE) Digitally confident, choice of household appliances.	5	Low-income households (one participant, 20%) and females (two participants, 40%) were underrepresented compared to other focus groups. All social renters.

¹² Institute for Development Studies, Digital Poverty in the UK, 2022

¹³ <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/bulletins/housingenglandandwales/census2021>

Discussion

Focus groups were structured to introduce the topic of energy system flexibility and share four flexibility service examples. The examples emerged out of the project long list and short list and procuring and enabling solutions discussed by the flexibility providers in their survey:

- Example 1: Home Energy Action Plan (HEAP) with flexibility information and advice
- Example 2: Battery with grid services package – home installation
- Example 2+: Battery and solar PV – community installation
- Example 3: Use of surplus renewable electricity to heat hot water

Participants discussed these examples and responded to polls to gauge their likely take up of services, the perceived benefits, their concerns and what would improve their confidence in flexibility offers.

Analysis

Transcripts of the focus group discussions were analysed thematically using primarily deductive coding based on the focus group structure. The results were compared across the four groups and differences were highlighted. Coding was completed by one researcher.

A summary of the coding reference count for thematic analysis by focus group is given in the appendices. It gives an indication of the relative contributions on different topics made in discussions by focus groups.

Participants responded to two polls during the focus groups, an initial introductory poll and final flexibility poll. Full poll results are included in the Appendices. The final flexibility poll results are reported in following sections.

Limitations

This research engaged with a small number of vulnerable customers and flexibility service providers. As such, findings offer a snapshot and cannot be extrapolated broadly.

Section 2: Flexibility provider results

Eight survey responses were included in results. All analysis of survey responses gives the number of respondents to each question, as $n=x$.

Flexibility services were defined in the survey as any product, technology or service that aims to enable domestic customers to shift or optimise the way they use energy to help deliver system balancing.

Organisations and flexibility service provision

Survey respondents were asked to give the type of organisation they represented (Table 3). Note that respondents could select more than one organisation type. The most common organisation type was technology company (six respondents, 75%). One organisation (13%) provided heat pump and solar installation in addition to other services.

Table 3: Organisation types as reported by respondents (n=8)

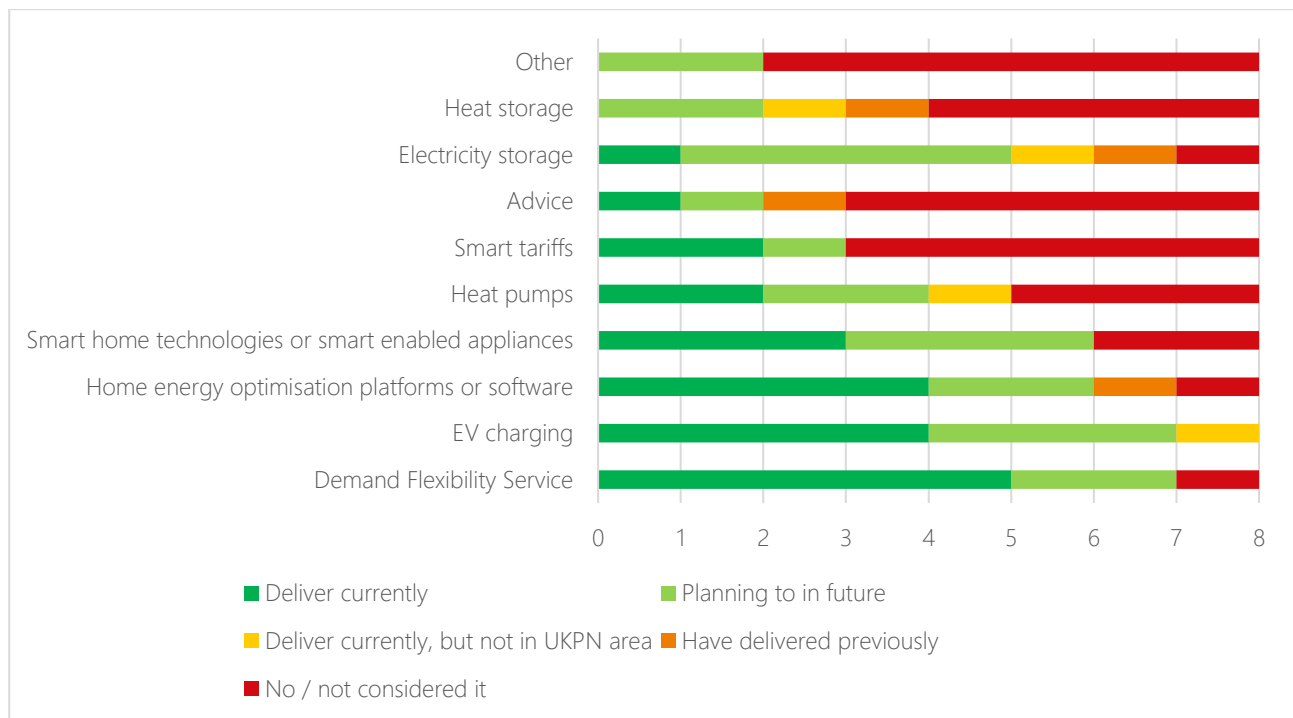
Organisation type	Count	%
Technology company	6	75%
Aggregator	4	63%
Community energy group	1	13%
Energy supplier	1	13%
Heat pump and solar installer	1	13%

Five organisations (63%) reported as fitting into more than one organisation type. Three (38%) of these reported as fitting both the role of aggregator and technology company. One (13%) reported as both aggregator and energy supplier. One (13%) reported as an aggregator, technology company and heat pump and solar installer.

Flexibility services provision

Respondents were asked to indicate which flexibility services they provide to the domestic sector. The results are shown in Figure 3. The most common flexibility service currently delivered in the UKPN distribution area was the Demand Flexibility Service (five respondents, 63%).

Figure 3: Flexibility services offered in the domestic sector, percentage of respondents (n=8)

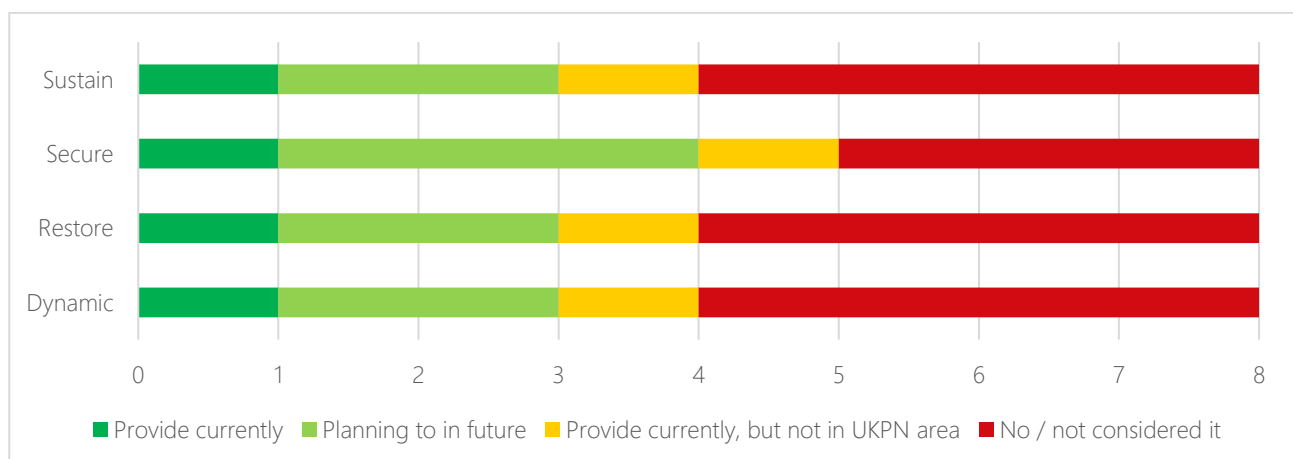


Two comments were received in the other field. One respondent indicated they were planning to offer a Virtual Power Plant service in the future. Another indicated they were working towards EV charge flexibility service, but that this would be arranged through partnerships, not with individual households.

Respondents were asked to indicate which flexibility services they currently provided to UKPN. The results are shown in Figure 4. Across the categories, only one respondent (the same organisation) currently provides services to UKPN. For each service, another respondent (the same organisation) also indicated they provide the service but not in UKPN's distribution area.

Four respondents (50%) indicated they were planning to provide Dynamic, Sustain, or Restore services to UKPN in the future, and three (38%) indicated the same for Secure.

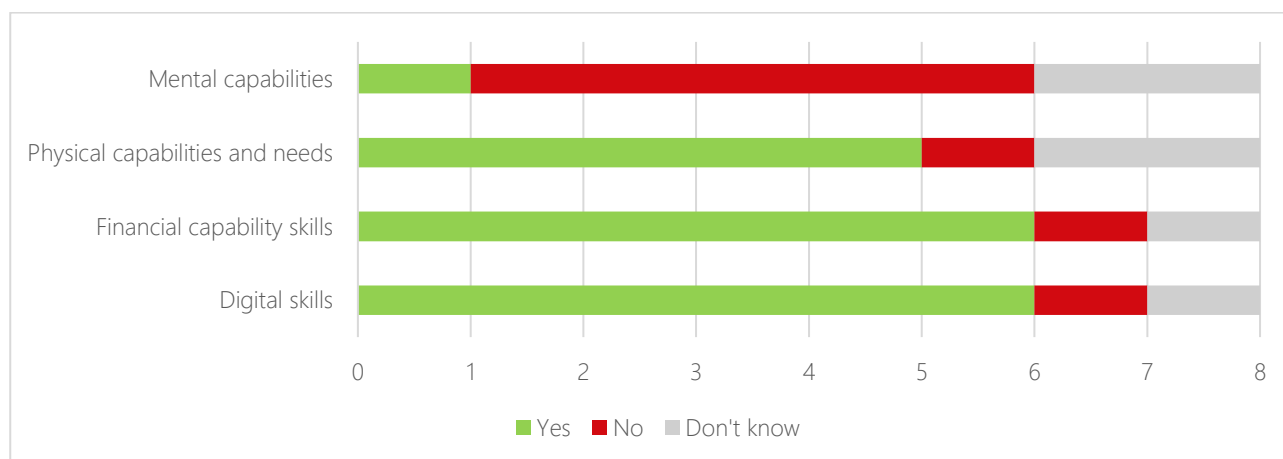
Figure 4: Services provided to UKPN by percentage of respondents (n=8)



Current provision for vulnerable customers

Respondents were asked to indicate which customer circumstances, capabilities and preferences they take into account in their services. Results are shown in Figure 5. The most common capabilities taken into account were digital skills and financial capability skills (both six respondents, 75%), with mental capabilities the least common (two respondents, 25%).

Figure 5: Circumstances, capabilities and preferences taken into account in services by percentage of respondents (n=8)



Respondents could make comments on their selection. One organisation said that they provide heat flexibility in a way that ensures a warm home for customers.

Physical capabilities and needs - our algorithms put a very high premium on maintaining warmth at home for all customers. This is of paramount importance. So, when we deliver heat flexibility, we always do it in a way that protects the physical environment. **Aggregator, Tech Company & LCT installer**

One provider offered communications in large print and gave an example of assisting a blind consumer. They had also encountered client self-neglect and organisational neglect whilst providing energy services.

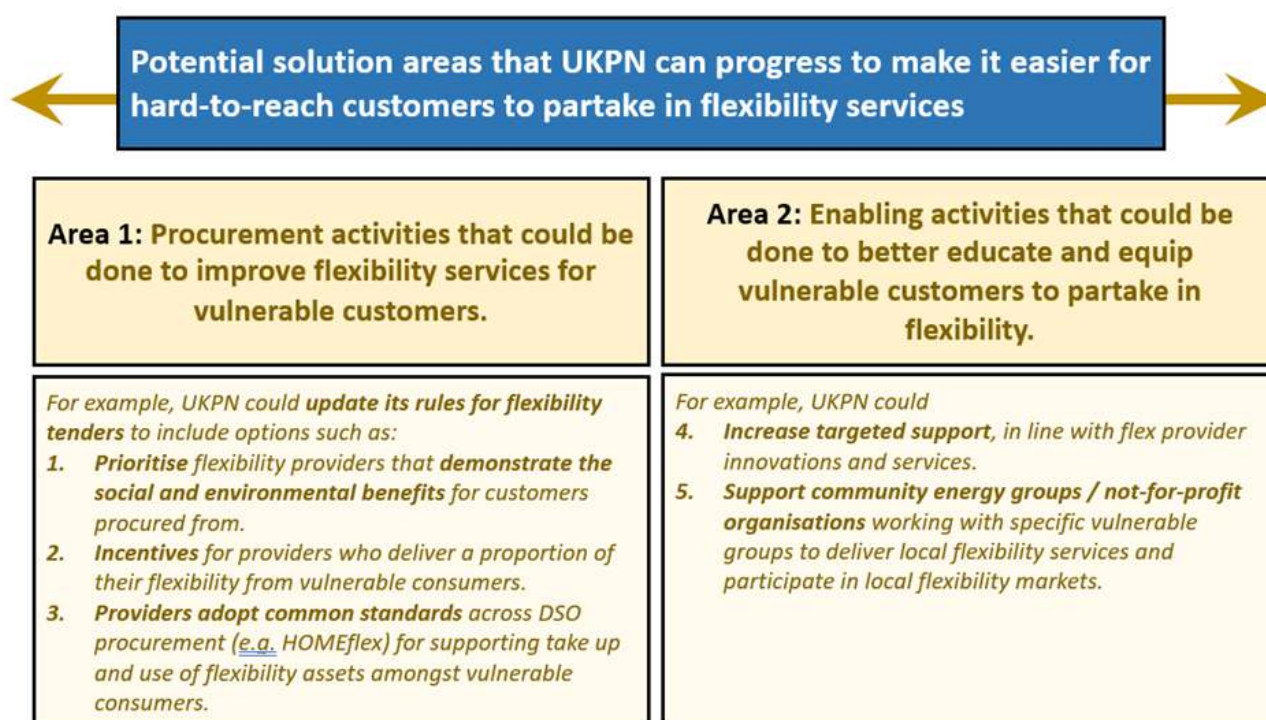
Flexibility service providers were asked about whether they measure uptake of their services amongst consumers with other vulnerabilities. Only one organisation said yes, and they had then offered 'special services solutions to the communities' (Aggregator & Tech Company 3). One organisation reported involvement in trials and ongoing services mostly geared to support low-income customers who have other vulnerabilities such as health challenges within the household. Other organisations flagged that measuring vulnerability is challenging, indicating a need for support in this.

Benefits and concerns

Specific solution areas

Flexibility service providers were asked to comment on two potential solutions areas for increasing accessibility of flexibility services for vulnerable consumers within the UKPN service area (Figure 6). Four organisations (all aggregators and tech companies) responded to these questions.

Figure 6: Potential solution areas for increasing vulnerable customer access to flexibility services



Procurement solutions – benefits

Of the four respondents, one (Aggregator & Tech Company 3) was interested in new procurement solutions. This organisation said that it had incentives and consumer interfaces already in place but needed to integrate them with the data and platforms for procurement activities. Two proposed alternatives; using industry-wide codes of conduct (Aggregator, Tech Company & LCT Installer); and having a dedicated procurement service to help vulnerable customers decarbonise (Aggregator & Tech Company 1). The fourth (Aggregator & Tech Company 2) was unsure what procurement activities could help them obtain flexibility from vulnerable consumers, their service being currently more applicable to higher income households.

HOMEflex, the voluntary common standard for flexibility service providers was proposed as more appropriate than UKPN developing their own set of procurement prioritisation and incentive mechanisms but suggested that enforcement of provider obligations would be required.

'[We] suspect a better route would be adopting punitive measures on providers that fail to meet their obligations under codes of conduct.

Aggregator, Tech Company & LCT Installer

Procurement solutions - concerns

Responses from 3 organisations flagged the need to increase consumer awareness and education of flexibility services (Aggregator & Tech Company 2), the need to build trust (Aggregator, Tech Company & LCT Installer) and the need for carefully matching of services to household needs (Aggregator & Tech Company 1). This organisation explained:

Demand turn down is not the best product for vulnerable customers as they have already reduced the electricity used. Demand turn up could be a good product for vulnerable customers. **Aggregator & Tech Company 1**

The organisation who had suggested HOMEflex as an alternative to UKPN procurement incentives, flagged the credibility danger that is emerging for the broad provision of flexibility services and the likely creation of procurement barriers it will create.

Voluntary codes of conduct not providing meaningful disincentives. Particularly false advertising - a bane of our industry and doubtless something that will be rife here. Even with DFS, false advertising and misleading claims about possible savings are rampant, and this will hamstring trust in the sector.

Aggregator, Tech Company & LCT Installer

Enabling solutions - benefits

Flexibility service providers were asked whether enabling activities (that educate and equip vulnerable consumers to participate in flexibility services) would help their organisation obtain flexibility from vulnerable consumers.

Two organisations responded positively, with one (Aggregator, Tech Company & LCT installer) preferring this solution area because it focused on the actual customers that the company wanted to benefit from flexibility services. Another organisation said it was essential to remove complexities involved in end users participating in campaigns.

Hand holding is vital in order to ensure there is no discrimination against vulnerable people or sections of society. **Aggregator & Tech Company 3**

Two organisations suggested alternatives. Aggregator & Tech Company 3 felt their approach to gamification of user interfaces was suitable to engage vulnerable consumers. While Aggregator & Tech Company 1 felt that 'more interesting options' could be developed by trialling a few innovation projects.

Enabling solutions - concerns

Two organisations commented on the relatively low benefit from flexibility services for vulnerable consumers.

It's hard! Particularly in that there are insufficient benefits for most vulnerable consumers to merit the intervention - a pound or two each month.

Aggregator, Tech Company & LCT Installer

Aggregator & Tech Company 3 gave a different view, suggesting there was inertia on flexibility within the sector that needed better engagement with innovators to overcome.

Broader energy sector transformation

Flexibility service providers were asked whether the procurement and enabling activity solutions presented would complement or challenge other existing transformation in the energy sector, such as energy efficiency. Two organisations responded to this question. One organisation (Aggregator & Tech Company 1) flagged that battery storage was recognised as an energy efficiency improvement which created a good synergy between retrofit and flexibility policy areas.

Aggregator & Tech Company 3 suggested that discussion needed to take place so that UKPN can understand 'the level of innovative technology and interfaces present in the market that will help deliver significant uplifts in service delivery and reductions in bills, available technology in the marketplace.

Other solutions

Flexibility service providers were asked what other solutions could be helpful in widening access to flexibility services for vulnerable consumers, in addition to procurement activities and enabling activities. Two organisations reiterated their suggestions of demand turn up and gamification.

Why not trial demand turn up with National Grid and local vulnerable customers to offer some cash back to use more electricity when renewable is spilling to constrain the network. **Aggregator & Tech Company 1**

Delivering flexibility services to vulnerable customers in general

Survey respondents were also asked about their general perceived benefits and concerns around delivering flexibility services to vulnerable customers.

Benefits

One organisation suggests that flexibility service providers should reduce electricity costs by giving cashback and offering a discounted electricity period when there is surplus local renewable energy (Aggregator & Tech Company 1). Another organisation (Tech Company 2) identified similar potential benefits for vulnerable consumers including lowering costs for those customers, specifically seeking to include vulnerable customers and personalising flexibility rules. One organisation (Aggregator, Tech Company & LCT installer) suggested that heat pump flexibility should be utilised in a social housing context while another (Tech Company 1) saw benefits in automating flexibility of electric heat demand amongst households with electric heat.

One organisation described the benefits they'd encountered through providing a community solar and battery storage trial service.

We work at small-scale, building genuine trust with local communities. In terms of [energy service] the billing process is streamlined and user-friendly. Some participants may have a better understanding than others of what is happening on the rooftops and behind the meters, but all participants benefit from discounted costs, easy-to-comprehend billing, and a smooth customer journey. **Community Energy Group 3**

Concerns

One organisation (Aggregator, Tech Company & LCT installer) identified that digital skills limited engagement, particularly in the initial phase of communication with consumers and with app products and offers.

Three respondents also noted challenges identifying and 'classifying' vulnerable consumers. Two organisations (Tech Company 2; Aggregator & Tech Company 3) reported that identifying vulnerable customers was a barrier; another organisation (Aggregator & Tech Company 2) described 'labelling and classifying' vulnerable customers as challenging.

A tech company commented that collaboration with current support organisations could help to overcome barriers to reaching hard to reach consumers.

Engagement with vulnerable customer groups is typically difficult and works best in partnership with existing support networks.

Tech Company 1

One organisation (aggregator) suggested that there are barriers linked with scale of capacity as well as issues with IT implementation to control customer assets and questions about access to data and GDPR (Aggregator).

Another organisation (Aggregator & Tech Company 1) stated that there are not enough procurement rules leaning toward vulnerable customers.

A community energy group (Community Energy Group 3) cited poor energy supplier practice in relation to smart meters, in creating barriers to providing flexibility services to vulnerable customers.

One barrier is the reputational damage caused to smart metering by energy suppliers' use of remote mode-switching to prepayment without adequate checks and balances, frequently in breach of licence conditions. The fact that smart meters have been misused as instruments of punitive credit control is a legitimate cause of distrust among financially vulnerable customers.

Organisations that wish to engage with vulnerable consumers in this area could consider offering a holistic suite of support that addresses the many barriers to energy security that vulnerable customers face – not just the specific

barriers of lack of digital inclusion or mistrust of smart metering.

Community Energy Group 3

Building confidence

Flexibility service providers were asked about what support or incentives they would need to engage more vulnerable consumers with flexibility services.

One organisation (Aggregator, Tech Company & LCT Installer) suggested that dedicated funding would be required to explore how offerings would need to evolve to meet the needs of vulnerable customers. Another organisation (Aggregator and Tech Company 2) said that government recognition and incentives were required. However, one organisation felt they didn't need additional incentives but need to reduce the risk of offering services to vulnerable customers (Aggregator & Tech Company 1).

Gaining better understanding of vulnerable consumers' needs was also raised by a tech company (Tech Company 2) which wanted to understand the liabilities with working with these groups. Respondents said that better data was needed to support the identification of vulnerable consumers, such as household profiling information (Aggregator & Tech Company 3, Tech Company 2).

Two organisations (Aggregator, Tech Company 1) felt that partnerships and collaboration were crucial for delivering domestic flexibility with vulnerable consumer groups.

I think the best support will come from working in collaboration with those who already engage with this consumer group. **Tech Company 1**

In support of collaborative working on flexibility, a community energy group commented that it liked to think and work collaboratively and to embrace opportunities when it could (Community Energy Group 3).

Summary and recommendations

This section pulls together findings from across this section and provides some recommendations for designing the design of a trial flexibility service with hard to reach or vulnerable consumers in a UKPN license area in 2023, and future flexibility services.

Summary of findings

Benefits and concerns

Overall, providers were more supportive for enabling over procurement measures. Providers felt educational solutions were more appropriate as they focused on the consumers UKPN wanted to support. Providers thought that better engagement with innovators would help to overcome inertia on flexibility in the sector and that the market could come up with interesting options, such as gamification of user interfaces.

On procurement solutions, providers flagged the prior need to build consumer trust in and awareness of flexibility services and the need for matching services to household needs: demand turn up was seen as more relevant to vulnerable consumers than demand turn down. One provider was unsure if any procurement activities could help them obtain flexibility from vulnerable customers as their service was more applicable to higher income households. There was support for common standards like HOMEflex, but acknowledgement that these should be accompanied by punitive measures. One provider felt that specific procurement rules for vulnerable customers were required.

Providers also gave feedback on perceived benefits and concerns around delivering flexibility services to vulnerable consumers in general. Several providers felt that services designed to meet the needs of vulnerable customers could help deliver lower costs, especially in social housing with heat pumps or households with electric water or space heating. Nonetheless, a range of concerns were also highlighted. These included challenges identifying consumers, data and GDPR issues, and a lack of digital skills or trust on behalf of consumers.

Increasing confidence

Providers felt that specific funding, or a reduction in associated risks, were required to help build confidence in delivering flexibility services to more vulnerable customers. Other suggestions raised here included: better information around identification of vulnerable customers and their needs and partnerships with those already working with vulnerable groups.

Recommendations

1. Prioritise enabling solutions that will increase awareness, understanding and trust of flexibility services amongst vulnerable customers. Provide funding for a holistic suite of support for vulnerable customers to overcome multiple barriers to adopting flexibility services, including digital support. Support community energy groups or other intermediaries to act as trusted messengers to vulnerable groups.
2. Consider solutions that will bring direct cost savings to vulnerable customers: for example demand turn up offering surplus local renewable electricity at cheap or discounted rates.
3. Share learning from trials with flexibility providers to establish best practice and build an evidence base to inform future service design. Engage with innovators to develop trial options and explore new solution areas.
4. Specify adoption of HOMEflex as a requirement of all flexibility providers UKPN procures from. Establish penalties in contracts aligned with HOMEflex, particularly to prevent false advertising, and enforce if obligations are not met.
5. Give flexibility service providers clear direction and guidance on how to identify vulnerable consumers and measure their uptake of services, such as via use of UKPN vulnerability mapping tool.

Section 3: Vulnerable customer results

This section presents the results from focus groups with vulnerable or hard to reach customers. It discusses the results and makes suggestions for the design of flexibility services based on consumer views. Respondent numbers are indicated with (n=x) where relevant.

Benefits and concerns

Flexibility service examples - overall

Figure 7 shows results for all participant groups regarding their willingness to take up the different flexibility service examples.

Participants were most likely to report being willing to take up the HEAP example: 18 respondents (75%) were either extremely likely (6, 25%) or fairly likely (12, 50%). This reflects the preference of the flexibility service providers for enabling solutions. A total of 13 respondents (54%) were either extremely or fairly likely to take up the other three examples discussed.

Figure 7: Willingness to take up flexibility services examples for all participant groups (n=24)

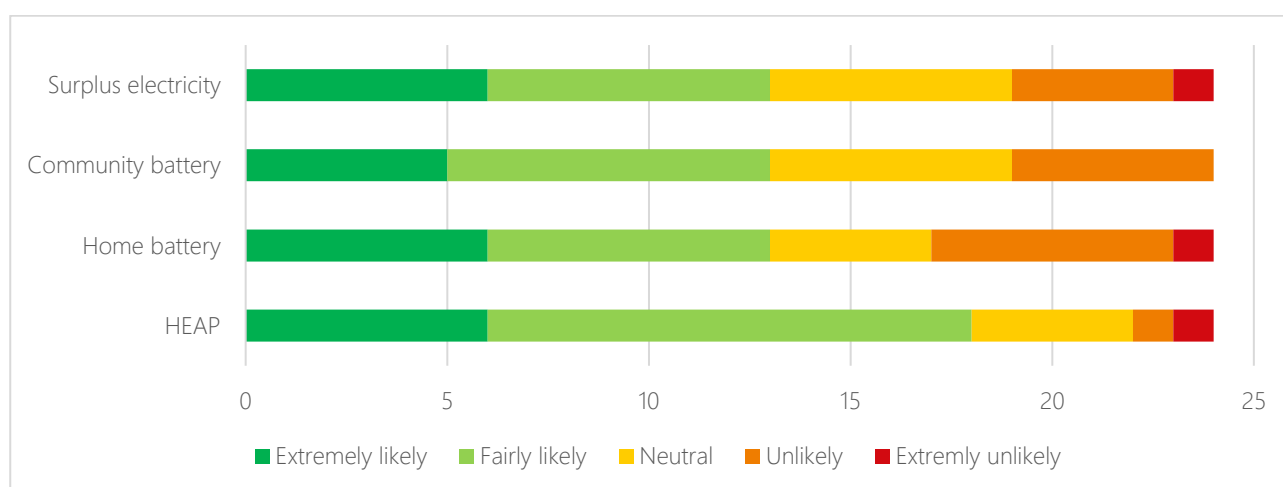


Table 4 summarises the principal benefits and concerns reported for each example by all participant groups.

Table 4: Benefits and concerns for flexibility service examples for all participant groups

Example	Benefits	Concerns
HEAP	- Increased energy knowledge - Saving money - Environmental benefit	- Accuracy of information - Accessing information: e.g. for digitally disconnected or those with busy schedules

Home battery	- Financial benefit: reduced running costs and grid services payment - Backup power supply - Environmental benefit	- Internal space - Safety: e.g. fires - Need for internet connection - Length of contract - Complexity - Liability in case of things going wrong - Poor financial returns
Community battery	- Not needing space in home - Not having direct personal responsibility for battery - Communal nature - Ease of use compared to domestic battery	- Logistical issues, especially in larger buildings - Lack of personal control - Lack of trust in providers to operate fairly or effectively - Complexity of using or selling energy share - Communality = increased financial risk
Surplus electricity	- Saving money - Good for new builds or those with existing hot water tanks where no installation needed - Could be a selling point for landlords	- Disruption involved with installation or space if user without existing hot water tank - Length of contract - Safety

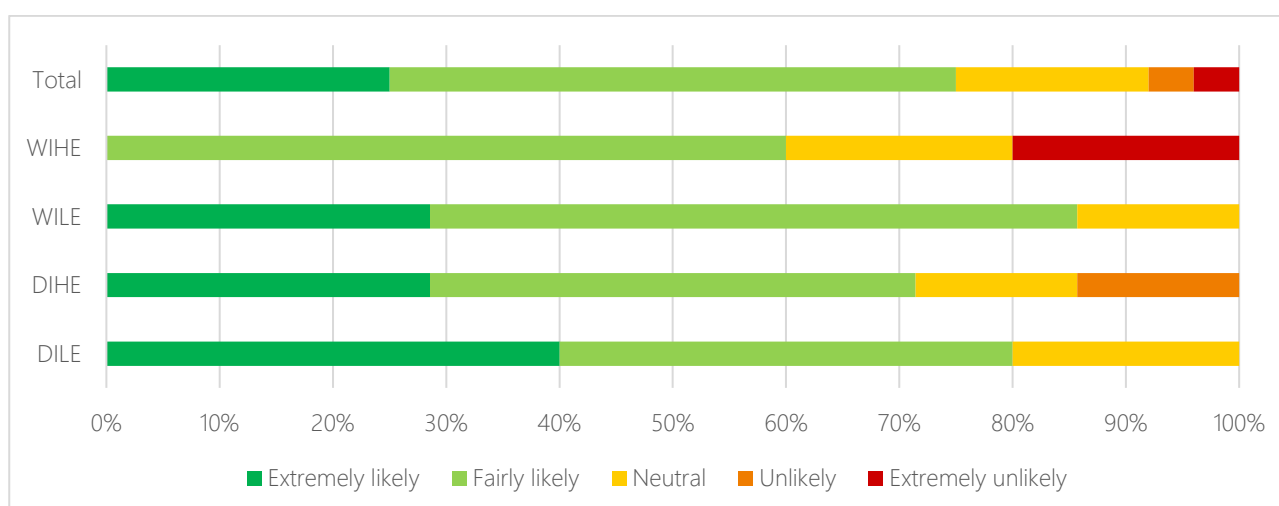
Flexibility service examples - by participant group

There were some differences in the benefits and concerns raised between flexibility groups.

HEAP

Figure 8 shows the proportion of each participant group (and total) who reported they were willing to take up the HEAP example.

Figure 8: Willingness to take up HEAP example by participant group and total



The HEAP example was most popular with participants from the DILE, DIHE and WILE groups.

Participants from these groups thought it would be a good option for saving money and liked the concept of receiving energy advice. This perhaps reflects the need to make savings on high energy costs (DILE and DIHE - the two high energy use groups), or a desire for flexibility services to be well-explained (WILE – the low digital confidence group).

I probably would participate in it. It seems like, obviously, it's just gonna give me ideas on what I can do and give the advice on how I can do it to cut down.

P1 DILE group

However, some participants from the DIHE group also reported they may be excluded from the benefits of a HEAP as they had not received an Economy 7 smart meter.

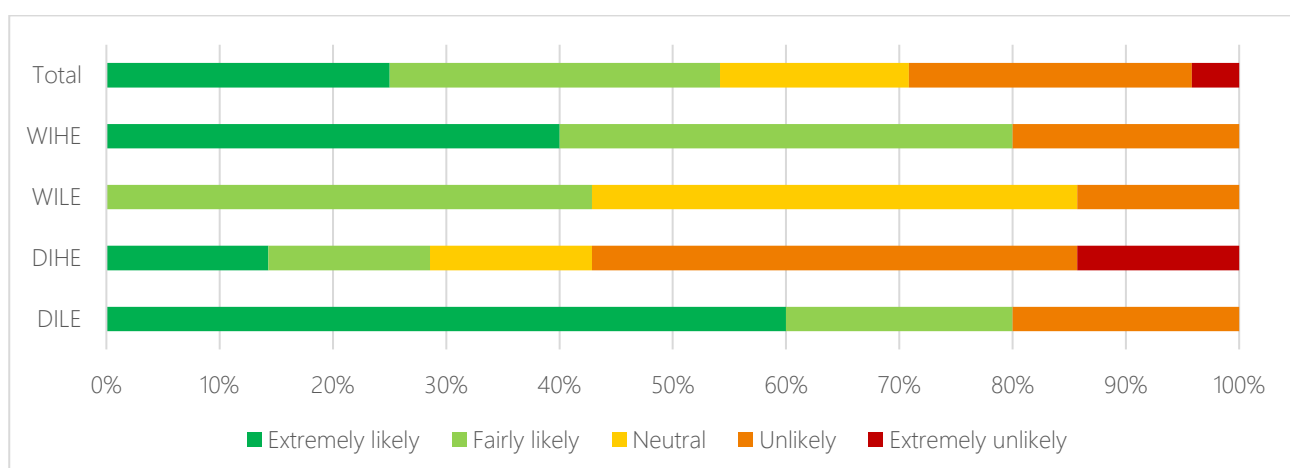
The WIHE group were generally more sceptical about whether a HEAP would be useful for them. Participants in this group felt they would be more likely to seek out other options independently first. Some participants in this group also feared that an 'energy check' might appear patronising. This suggests that people in this group need less support in accessing flexibility services. A participant in the WIHE group, enrolled in the DFS, reported that they had having a smart meter useful for energy monitoring.

There was some confusion in some participant groups about what constituted a HEAP. Some participants confused receiving a HEAP with signing up for a flexibility service.

Home battery

Figure 9 shows the proportion of each participant group (and total) who reported they were willing to take up the home battery example.

Figure 9: Willingness to take up home battery example by participant group and total



The WIHE and DILE groups were most likely to report being willing to take up the home battery. The DILE group were attracted to the prospect of reduced bills and a backup power supply – reflecting their high energy bills and need for electrical medical equipment at home.

Participants in the WIHE group were broadly happy to participate if it saved them money on their bills, although some did raise questions of whether end-users should be responsible for delivering flexibility. Other WIHE participants also raised concerns about complexity: for example, with the provider discharging the battery at their own discretion.

If you're talking about this being for flexibility – so it's to your benefit – it's not to my benefit to use this. So I want a guaranteed reduction in my bills, then I'd be interested in using it. If the risk is on me to use it then yeah...

P1 WIHE group

Participants in the DIHE and WILE group were the least enthusiastic about the home battery option. For the WILE group, contract length was a key issue. They felt a ten-year contract would be unfeasible for consumers with less settled living situations, like renters or younger people. This reflects the fact that all participants in the WILE group were renters. For the DIHE group, some participants had concerns about the level of financial reward being too low.

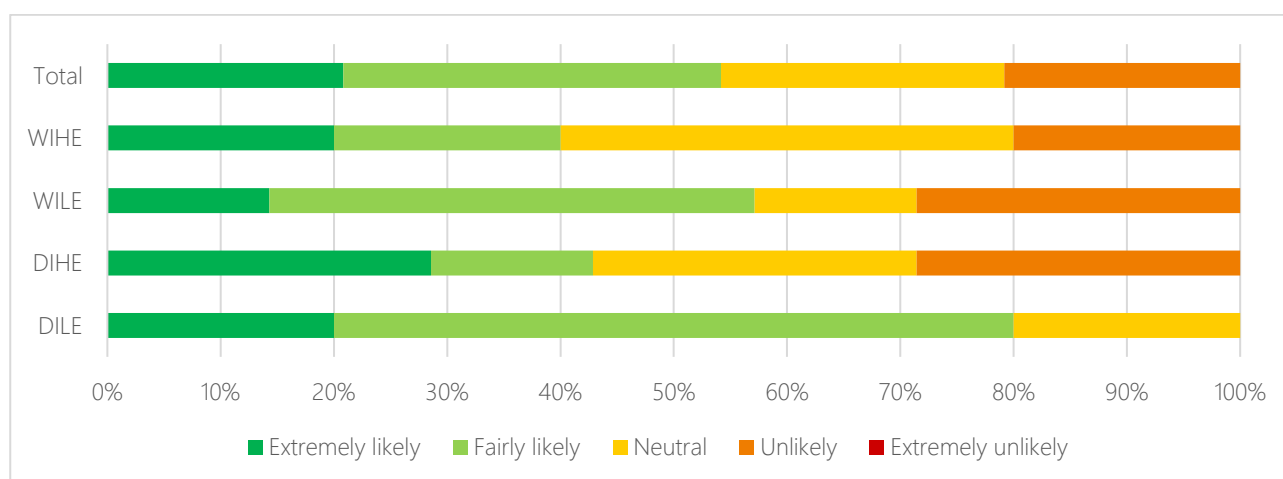
Concerns around the safety of a domestic battery, and having enough space, were common across all participant groups.

... 'cause I've got quite a small place, I genuinely don't feel like I've got the space for it. It'd probably just get in the way and get broken. **P2 DIHE group**

Community battery

Figure 10 shows the proportion of each participant group (and total) who reported they were willing to take up the community battery example.

Figure 10: Willingness to take up community battery example by participant group and total



Participants in the two groups with flexibility barriers (DILE and WILE) were keenest on the community battery example. They particularly liked the lack of direct responsibility for the battery (in terms of space, lack of disruption and not needing internet) and the socialised nature of the offer. This perhaps reflected their lack of digital skills or capability in managing a flexibility service independently. This evidence suggests that the community battery offer could be an ideal solution for widening access to flexibility services for these groups.

I think it's great that the battery doesn't belong to the tenant, but it belongs to the building, so to the owners of the building. Because at that point that's flexible, and it's really flexible for everybody. **P5 WILE group**

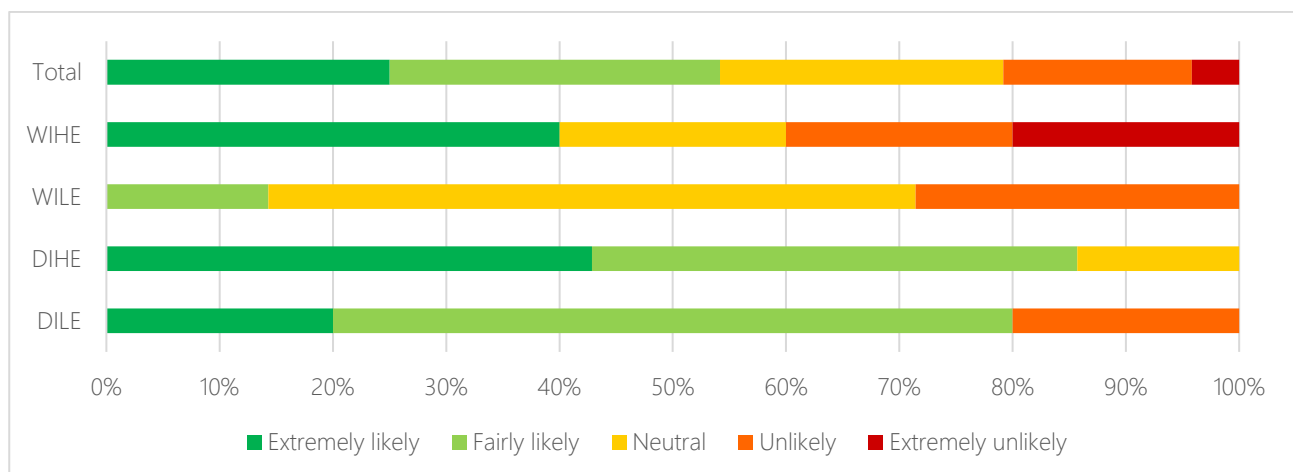
This being said, two participants from the DILE group also reported that they would rather have the greater control offered by the domestic battery. This might reflect their need for electricity for medical use.

Participants in the two groups with flexibility enablers (WIHE and DIHE) were a little more sceptical about the community battery offer. WIHE participants raised some doubts about how the offer would function and preferred the prospect of having more control with the home battery. This might reflect the high levels of digital confidence in this group. Some DIHE participants had concerns about the logistics of the offer: both in the case of larger buildings and where users didn't trust providers to control the battery effectively.

Surplus electricity

Figure 11 shows the proportion of each participant group (and total) who reported they were willing to take up the surplus electricity example.

Figure 11: Willingness to take up surplus electricity example by participant group and total



Participants in both high electricity use groups (DILE and DIHE) were most willing to take up the surplus electricity example. They reported that they felt the example could easily save them money. DILE participants also all had existing immersion hot water systems which would work seamlessly with this example. This reflects the views of the flexibility service providers around the potential of surplus electricity services to benefit certain vulnerable customers.

Participants in the WILE group were the least willing to take up the surplus electricity example. This may reflect the high proportion of private tenants (71%) in the group: a particular concern raised by this group was the length of contract for those not owning properties.

...if you're a property owner with a family, obviously that's ideal, but if it's a ten year commitment and something happens, I'm worried about the costs and the commitment timeframe, running costs, all of that. It's like the battery as

well, I'm sure it's all factored in; it's nice but what are the downsides of it in terms of commitment and all of that? **P3 WILE group**

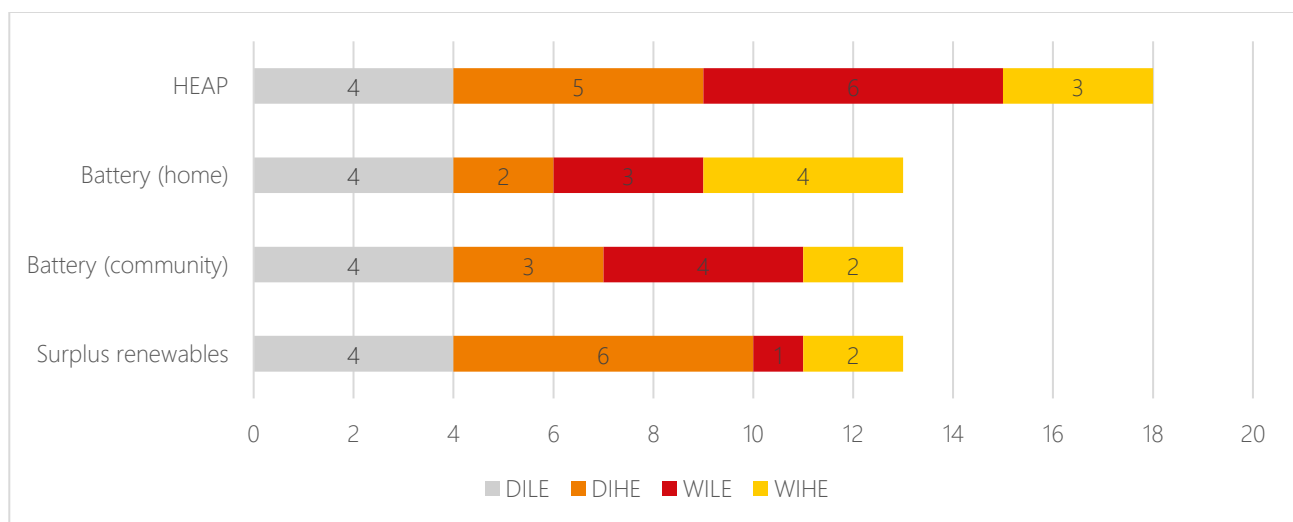
Participants in the two groups with flexibility barriers (DILE and WILE) raised concerns about the safety of the system if it was untested.

Participants in all groups felt the example would work best in new-builds or in properties with existing immersion tanks. They feared disruption and extra costs involved with retrofitting technology (e.g. hot water tanks) in other property types.

Summary by participant group

Figure 12 shows the number of participants in each group who reported they would be extremely or fairly likely to take each of the examples discussed.

Figure 12: Number of participants likely to participate in flexibility service examples



Some broad patterns are identifiable across the participant groups.

The Deep Impact groups, with high electricity usage, were together most interested in the options that they felt offered the most direct way of reducing their energy costs: the HEAP and surplus renewables examples.

The WIHE group were most willing to take up the home battery option – perhaps reflecting their high levels of digital confidence. Accordingly, they were less keen on being advised through the HEAP option, or the examples through which they felt they had less control (community battery and surplus renewables).

Conversely, with less digital skills, the WILE group were most willing to take up the HEAP advice or the community battery, for which they liked not having direct responsibility. Their lack of support for the home battery and surplus renewables might also be explained by the high levels of private renters in this group.

The DILE group returned similar results for all examples, which may suggest limited engagement. Nonetheless, qualitative evidence from the focus groups suggested they liked the security offered to them by having a backup power supply for their medical needs via a battery.

Flexibility service examples - other household groups

Participants were asked whether they thought the four examples of flexibility services would be appropriate and accessible to four household types, based on PSR needs codes.

Medically dependent on electricity

Several participants raised that the battery examples would benefit those medically dependent on electricity by offering a backup power supply. However, more generally, one participant also raised that having electrical medical equipment might prevent certain people from being able to shift their usage for particular flexibility services.

Low-income family with young children

One participant felt that the surplus electricity example was particularly well-suited to a low-income family with young children. As this group may have hot water needs that can't be changed, they would be able to benefit from free energy, especially if they had an existing immersion heater. This tallies with the opinion of flexibility providers regarding the potential of surplus electricity flexibility services.

I think reducing the cost of hot water, and then you want to bathe two young children after they've come from school or nursery and stuff like that, so that'll be a necessity that you can't change. So hopefully that scheme will be able to reduce the cost for low-income families. **P3 DIHE group**

Several participants also said that the battery would be suitable for this group if it could help them achieve savings on their energy bills.

One participant raised concerns about low-income households feeling pressured into taking up the HEAP example.

It can also potentially put people under pressure to feel that they would benefit from this if they are on a low income. I feel it could be [taken as] 'Well this is going to help us.' I'm not saying it might not. It's just sometimes it can be too good to be true. **P2 WIHE group**

Elderly person with mobility issues

Several participants raised that, in general, elderly groups may benefit from flexibility services, but may struggle if technology (e.g. apps) was involved.

We've talked a lot about having apps. That for us seems very simple but for an elderly person who uses a lot of electricity who's at home a lot I think they'd obviously benefit from it, but they'd also really really struggle. They'd need a lot of help to be able to implement it at home. **P7 DIHE group**

Another participant suggested that if the HEAP example required an internet connection it may exclude certain elderly groups. One participant suggested that the battery offer may need to be set up for an elderly user if they have mobility issues.

Communication difficulties (e.g. difficulties understanding English, impairment)

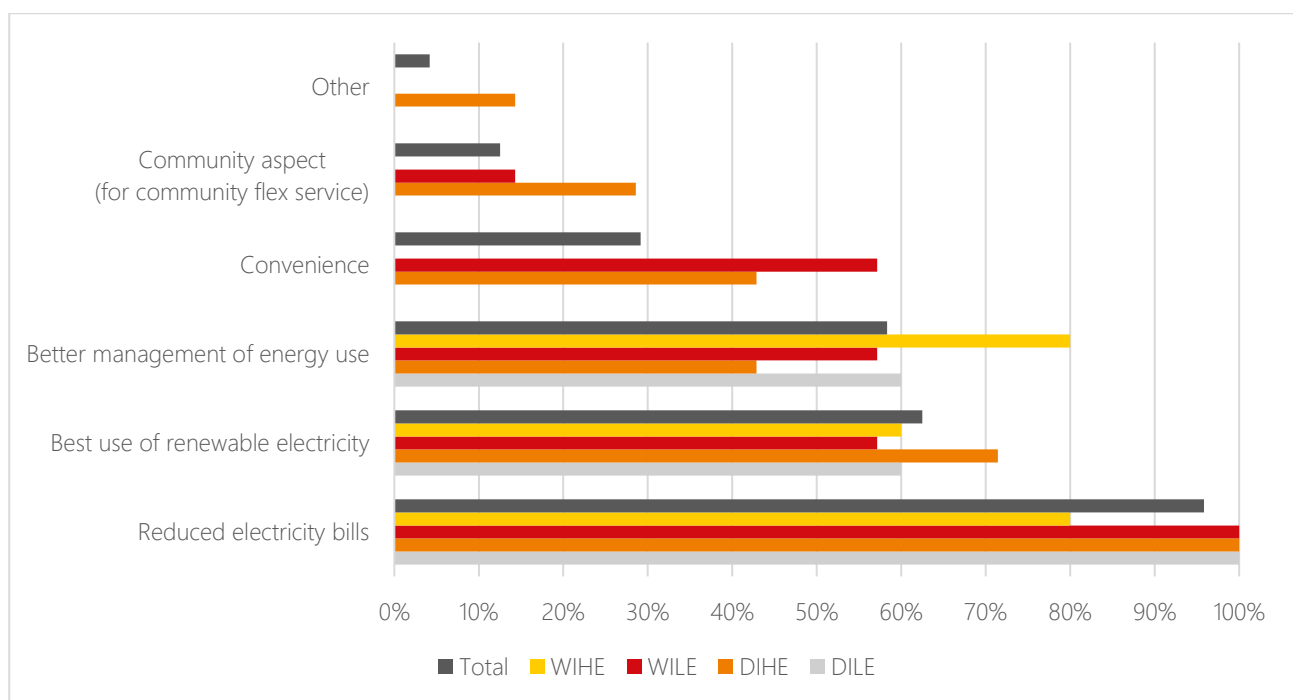
One participant (DIHE group) thought the HEAP may be challenging in terms of communication if there was reading involved.

General benefits and concerns around flexibility services

Towards the end of the focus groups, participants were also asked about their perceived benefits and concerns of flexibility services in general.

Figure 13 shows the proportion of participants who reported a range of benefits, both by total and participant group.

Figure 13: Benefits of flexibility services in general by proportion of participant group and total (n=24)



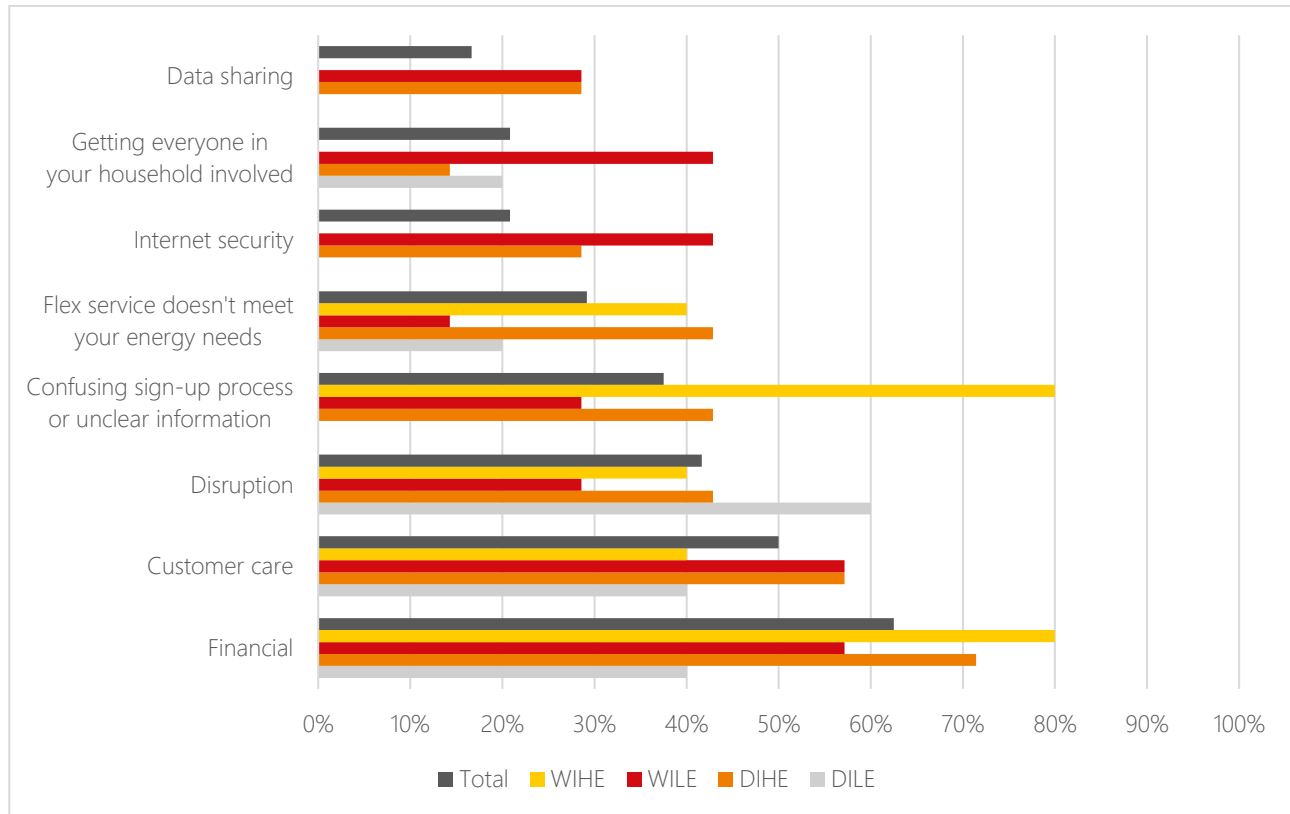
Reduced electricity bills was the benefit reported by the highest proportion of participants (96%). Other benefits raised related to the environment and energy security.

There's quite a lot of sustainably minded people out there. It doesn't really emphasise that benefit at all, it's good for the environment. And the other thing is, with war going on it's almost like it's everyone's responsibility to not be using energy at peak times, or not so reliant on foreign gas, so it's more evenly used across the day so there's less energy jeopardy to the country.

P6 DIHE group

Figure 14 shows the proportion of participants who reported a range of concerns, both by total and participant group.

Figure 14: Concerns about flexibility services in general by proportion of participant group and total (n=24)



Financial concerns were the most prominent overall: 63% of participants reported this was a concern. This reflects the importance that reducing bills held for most participants as a benefit of flexibility services. Specific concerns raised by participants around finance involved high upfront costs and rewards that were not 'worthwhile' the effort taken to participate in flexibility services.

These energy schemes and solutions have a bad reputation for upfront costs. I think a lot of people will dismiss such ideas straight away without even looking any further. I think that's going to be a barrier to overcome. **P6 DIHE group**

The DILE group were most concerned about disruption, reflecting their medical electrical needs.

Results indicated that data sharing, internet security and getting everyone in the household involved in flexibility services were minor concerns, a finding supported by recent research on the HOMEflex code of conduct.¹⁴

¹⁴ CSE. HOMEflex Qualitative Research Report. Domestic energy consumers' needs and concerns with regards to assurance and protection in flexibility markets. 2023

Building confidence

Flexibility service examples

Focus group participants were asked about what would increase their confidence in taking up the flexibility service examples discussed. More detailed information about potential financial savings and hearing reviews from other users were the two most common suggestions across all examples. A full breakdown of suggestions is given below.

HEAP

One respondent (WILE) suggested that more clarity on the service being provided would be important. The DIHE group also discussed the use of intermediary bodies (charities or governmental organisations) in delivering or endorsing HEAPs. These groups were seen as more trustworthy than energy suppliers. This emphasis on trusted intermediaries reflects the opinion of some flexibility providers.

An endorsement from a reputable charity organisations that's into sustainable living or environment protection. People like Ecologi for instance, a carbon offsetting scheme, having their stamp of approval. **P6 DIHE group**

More financial information was also raised by multiple participants in relation to the HEAP. Specifically, participants wanted evidence that suggested interventions had made a difference and more detail on any calculations made.

Home battery

Participants across groups felt that some testimony or evidence from other people using a similar offer would be key to increasing confidence in the home battery storage offer. Similarly, one participant also suggested that having the opportunity to test having the battery before committing for a ten-year contract would be useful.

Another participant from the WIHE group wanted a guarantee that they would achieve a certain extent of reduction in their bills. One participant from the DILE group said that they would want to find out more information about the safety of the battery.

Community battery

Participants made a few suggestions that could increase their confidence in the community battery offer.

Two participants from the DIHE group felt that using some of the electricity generated to help reduce communal or service charges might allay some of their logistical concerns.

Even if that electricity could be used for the lifts or the lighting in the hallway, if that reduced our service charge cause the electricity bills were cheaper, that would also help. **P7 DIHE group**

A WIHE participant felt that a guaranteed reduction in bills would help them feel better about not having direct control of the battery. One participant also wanted clear live information to use alongside the offer.

Surplus electricity

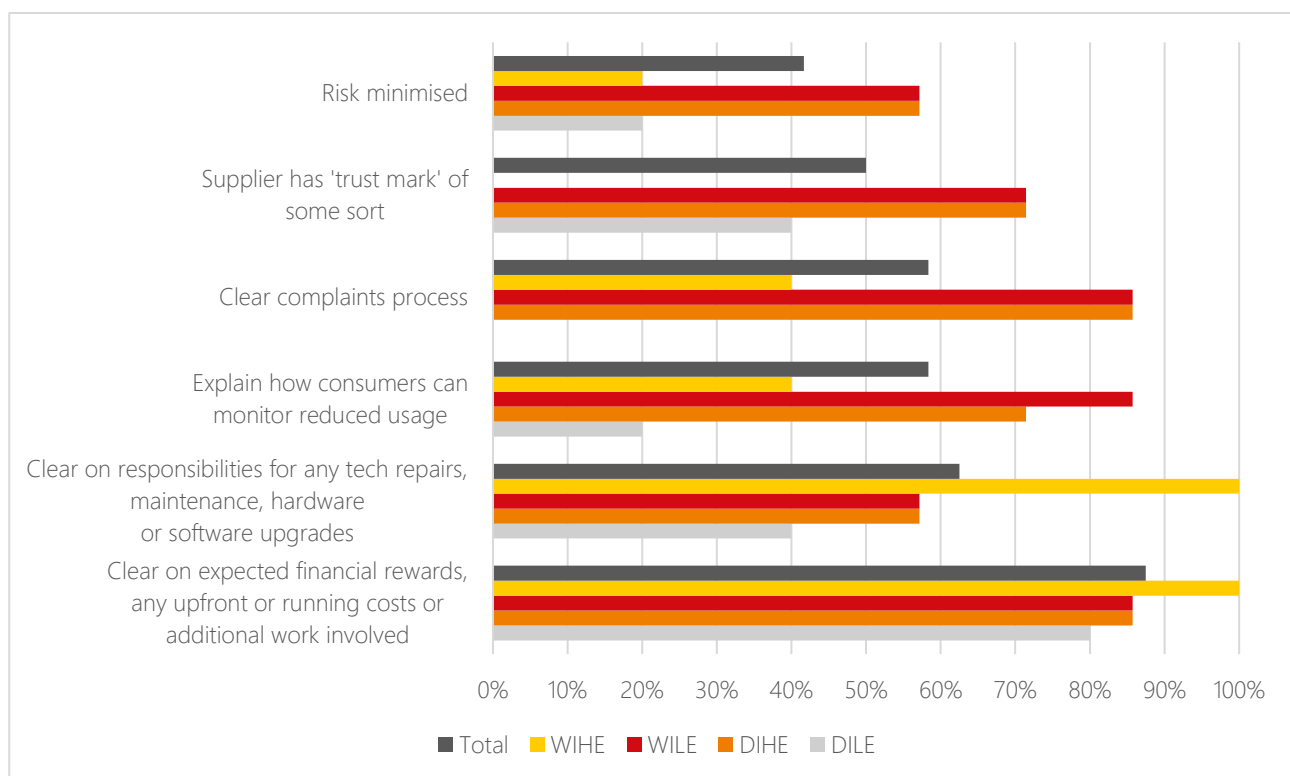
Participants in the two groups with flexibility barriers (DILE and WILE) said that further information on financial savings would give them more confidence in this flexibility service.

Reviews from others and see how they got on with it, and if it saved them money in the long run. **P5 DILE group**

Flexibility services overall

Towards the end of the focus groups, participants were also presented with a number of options for what would increase their confidence in taking up flexibility services in general. The first focus group raised 'Risk minimised' as another 'confidence enabler' which was added to subsequent polls. No additional suggestions were given by focus groups. Results are summarised in Figure 15.

Figure 15: What would help build confidence in flexibility services in general by proportion of participant group and total (n=24)



The DIHE and WILE groups selected the most options on this question (average of four selections per participant), followed by the WIHE group (three) and DILE group (two).

Clarity around finances was selected by the highest proportion of participants. This reflects the discussion around improving confidence for the specific flexibility examples. Participants in the

WIHE group were the most likely to privilege clarity on responsibility for repairs and maintenance.

Almost half (42%) of the participants wanted risk minimised. One participant thought flexibility services could be the next example of misselling.

It needs to be no risk because too often we find companies promising the earth and then....three or four times find people being hit by misselling on insurance. People being hit by misselling credit cards. Energy companies have had their own misselling and their own disasters. This is just lining up to be another misselling. P1 WIHE group

Summary and recommendations

This section pulls together findings from across this section for both the flexibility service examples and flexibility services in general and provides some recommendations for designing the design of a trial flexibility service with hard to reach or vulnerable consumers in a UKPN license area in 2023, and future flexibility services.

Summary of findings

Benefits and concerns

The HEAP was the most preferred example overall. This suggests that vulnerable customers would recognise the benefits of the enabling solutions favoured by the flexibility providers. Most focus group participants liking the opportunity to receive advice and potentially save money. Some participants in the WIHE group were less convinced: they would rather find out about flexibility opportunities themselves. Some DIHE participants also were concerned about not having Economy 7 smart meters.

The home battery was relatively popular with the DILE and WIHE – who liked the backup power supply and bill-saving potential. Nonetheless, a wide range of concerns were raised about this example. Space and safety were common issues. Some participants also had doubts about complexity of operation, financial reward and contract length. The complexity of flexibility services was also an issue encountered in the Urban Energy Club project¹⁵. One participant also felt it was unfair that users were being asked to deliver system flexibility.

The community battery was overall as popular as the home battery, but with different participant groups. Participants in the two groups with flexibility barriers (DILE and WILE) preferred the community battery, citing the lack of direct responsibility for the battery as a benefit. This also reflected the general preferences of these groups in relation to flexibility services: WILE groups privileged convenience and DILE groups wanted to avoid disruption. WIHE and DIHE participants had concerns about logistics and preferred the direct control offered by the home battery.

¹⁵ Socially Green Phase 3 Literature review, page 26.

Participants with high electricity usage (DILE and DIHE) were most keen on the surplus electricity. This reflected their need to reduce bills and the ease (for DIHE participants) with which the example would fit with their existing hot water system: this supports the view of some flexibility providers around the potential benefit of surplus electricity services. This finding also tallied with the broader perception that this offer would work well for low-income families with young children: most DIHE participants lived with children. Participants in all groups felt the example would work best in new-builds or in properties with existing immersion tanks. They feared disruption and extra costs in other property types.

Building confidence

To improve their confidence in taking up a HEAP, participants wanted more detailed information about what a HEAP would entail, including how any financial calculations were made. This reflects general concern around the finances of flexibility services. One participant also suggested delivering HEAPs via trusted intermediaries. This may help to address some concerns raised around certain household groups receiving HEAPs.

Case studies from other people were deemed important for raising confidence in the home battery, plus the opportunity to trial the example before committing to a long contract. Participants also wanted more safety information and guaranteed financial returns: reflecting the broader concerns around minimising risk for flexibility services in general.

DIHE participants felt that using the electricity to reduce communal charges might allay some of their logistical concerns about the community battery example. Other participants wanted guaranteed bill reductions and clear live information to use alongside the offer.

As with all other examples, participants reported that more detailed information on financial savings would give them more confidence in taking up the surplus electricity example. This reflects the broader importance of finances in relation to flexibility services in general for the participant group.

Evidence from participants also indicates a number of other options for increasing uptake of flexibility services in general amongst hard to reach groups.

Research found that transparency that financial benefits will be passed onto the customer would help to allay consumer mistrust of energy service providers, along with evidence of worthwhile financial savings. Use of trusted providers, for instance with a trust mark, would also provide consumers with reassurance. This supports the suggestion of some flexibility providers that an enforced code of conduct, like HOMEflex, would be a useful procuring solution.

The idea of flexibility was appealing to some participants as a way for people without solar PV or properties of their own to 'give something back to the grid'. This could be a useful message for engagement with tenants. Emphasising the environmental benefits of flexibility services may also be attractive to sustainably minded people. This could be a broad message to convey about

flexibility services, with special relevance to households likely to take action on climate change¹⁶. Taking action to protect energy security during a time of war and to avoid power cuts are further benefits of flexibility services to communicate.

Communication of flexibility services by trusted organisations (charities or the government, rather than energy suppliers) might be useful. A similar point was also made by some flexibility providers. This could be via recruiting local champions to run face-to-face campaigns, which was found to be a successful means to engage vulnerable customers in the Urban Energy Club project¹⁷. Endorsement of services by reputable environmental organisations would help build hard to reach consumer confidence in new offers.

Concerns around complaints and redress, data and cyber security were less prevalent, reflecting results from the HOMEflex research¹⁸. Nonetheless, in this research, the WILE and DIHE groups did register some concern around these topics. This suggests that incorporating this information into communications would give consumers reassurance, particularly emphasising this for DIHE and WILE customers.

Finally, some private tenants have no control over their energy supply: it is organised via their landlord. They are currently totally excluded from participating in flexibility schemes. This suggests that multiple pathways to communicate flexibility services with both tenants and their landlords is required, a finding supported by previous research.¹⁹ Private tenants may need assistance to negotiate with a landlord if they have choice of their energy supplier but their tenancy agreement prevents them from fitting a smart meter.²⁰ Further research is needed to determine what flexibility services could be attractive to private landlords who control tenant energy supply, possibly in relation to reaching minimum energy efficiency standards.

Recommendations

¹⁶ Adults aged 30-49 and 50-69 were more likely to report they had made changes to help tackle climate change. Those aged 16-29 and 70 or over were least likely to do so. ONS, Worries about climate change, Great Britain: September to October 2022.

¹⁷ Socially Green Phase 3 Literature review, page 26

¹⁸ CSE. HOMEflex Qualitative Research Report. Domestic energy consumers' needs and concerns with regards to assurance and protection in flexibility markets. 2023

¹⁹ Project InvoLVE recommended that innovations should enable tenants to access smart energy offers. It also recommended support for people with energy-related health conditions to benefit from smart energy offers. pg. 53. Department of Business Energy and Industrial Strategy (2021). How can innovation deliver a smart energy system that works for low income and vulnerable consumers? Project InvoLVE.

²⁰ Many private tenancy agreements are based on old 'pre-smart meter' templates which prevent tenants from changing energy meters. This presents a significant barrier to smart meter install in the private rental sector. Steve Crabb, Energy UK, private communication February 2023.

Table 5: All recommendations for designing flexibility services for HTR groups

HEAP	Home battery	Community battery	Surplus electricity	All flexibility services
Focus on smart meter installation (and subsequent use of In-Home Display for energy monitoring) as an enabling step, particularly with high electricity use households. Accelerate smart meter solutions (or work rounds) for those on	Target in-home battery storage at DILE households or low income families, particularly those with very high electricity use, multiple occupant need, in properties with ample installation space and broadband.	Provide a clear explanation of the logistics of the scheme, including how many households need to be involved, financial savings and how they will be accrued (reduced service charge, running cost, flexibility payment), and the 'use - sell / share' dynamic central to energy use in the scheme.	Design service(s) for high electricity users (particularly those with immersion heaters and electric heating), families with young children, and new build developers.	Clear financial information around expected costs and savings is crucial to building support.
Clearly explain flexibility services: how they operate, how financial rewards are calculated, how customers can check their energy data and optimise benefits. Share illustrative examples of financial savings from participating in a HEAP and flexibility service.	Build consumer confidence in battery storage by providing testimonies from existing users on financial savings, specification of space requirements and battery technology safety evidence.	Provide live electricity monitoring via an app or platform.	Design a service for private landlords, promoting energy efficiency, environmental, cost benefits, and usefulness for tenants and tenant retention.	Appropriately communicate with and support all hard to reach groups to learn about and engage in flexibility services.

	The logistics of installing batteries in individual homes is complex, suggesting that community battery storage could be a more scalable, manageable and resource-wise solution.	Emphasise the sharing aspect of selling or sharing back to the community pot, plus the wider energy system benefits in communications.	Indicate the practical requirements for set up and participation: space requirements, connectivity, and time commitment. Provide safety testing evidence.	Obtain endorsement of flexibility services from trusted organisations.
	Communicate the benefits of battery storage: financial savings (reduced bills and flexibility payments), reduced environmental impact, and of having back up power.	Use trusted providers (for management and flexibility services). Share examples of previous practice and outcomes.	Provide a clear explanation of the logistics of the scheme, with customer reviews and financial savings. Give details on insurance and maintenance of technologies.	Communicate the wider benefits of flexibility services: giving back to the grid; environmental benefits; energy security; continuity of supply.
	Free or discounted batteries with a running cost guarantee would enhance take up.	Provide reassurances and evidence of safety of community battery storage.	Indicate how system settings will guarantee a supply of hot water based on consumer preference.	Explore flexibility service design to engage with private tenants and landlords.
			Have an app that can integrate energy usage with a demand turn down service.	

Section 4: Conclusions

This final section combines the insights from research in focus groups with vulnerable customers and survey responses from flexibility service providers. It draws conclusions and brings together suggestions to inform the design of a trial flexibility service with hard to reach or vulnerable consumers in a UKPN license area in 2023, and future flexibility services.

Summary of results

Flexibility providers

Overall, there was some support for UKPN to create new procurement solutions to incentivise service provision to vulnerable and low income households. However, the enabling solutions and more consumer-facing solutions were seen as more effective. Other suggestions included engaging with innovators to develop novel solution areas and using service provider codes of conduct like HOMEflex, albeit with punitive measures if obligations were not met. The need to build trust and avoid false advertising were also stated.

Providers echoed consumers' concerns about provision of flex services to households already constraining their energy use. When considering extending flex services to vulnerable or low income households, providers suggested that turn up solutions like offering discounted electricity when there is surplus local renewable energy were more appropriate than turn down solutions. Providers also recognised the need to provide appropriate information and support. They proposed working in partnerships and collaborations with community energy groups / non-profits which are trusted by vulnerable consumers. A reciprocal desire for further collaborative working was expressed by a community energy group with flexibility expertise.

Currently, most of the surveyed flexibility service providers take account of customer digital and financial capability skills. However, none reported measuring uptake of services by vulnerable customers, pointing out that identifying hard to reach groups was a challenge. Flexibility providers wanted clear direction and guidance on how to identify vulnerable consumers and measure their uptake of services.

Vulnerable customers

In a poll, vulnerable consumers were most likely to participate in an enabling flexibility solution, the Home Energy Action Plan with flexibility advice (75%). They showed equal interest in battery storage (in home and community) and use of renewable electricity for hot water (54%). This evidence suggests that vulnerable customers would recognise benefits from the enabling solutions favoured by the flexibility providers. Evidence from the vulnerable customers gave further insight into how to deliver such services effectively. Customers would prefer to receive information via trusted providers – echoing the suggestions made by flexibility providers. Some

customers were also sensitive to being patronised with energy and flexibility advice when they have already cut electricity use to a minimum.

Feedback from vulnerable customers also aligned with that of flexibility providers around the surplus electricity example. Providers suggested this would be ideal for some households with high electricity demand and this was borne out by testimony from the customers.

Although some providers suggested batteries may help to tackle both flexibility and energy efficiency solutions, the battery examples split opinion amongst customers. Community battery solutions were seen as more scalable, manageable, and resource-wise solutions than in-home battery storage. However, the DILE group had a preference for the latter, to provide backup power supply. This in part was driven by this group's need to be resilient to power cuts due to medical dependency on electricity.

Vulnerable customers raised a number of areas that could increase their confidence in taking up the examples provided, and flexibility services in general. They need a clear explanation of flexibility services operation, take up requirements and ongoing commitment. Issues of space and safety are particularly important, as is transparency in how financial rewards are calculated and monitoring of electricity usage. They need reassurances of adequate supply of electricity or hot water in flexibility services. Flexibility provider accreditation or sign up to codes of conduct and endorsement of flexibility services by trusted organisations would further increase vulnerable customer confidence in flexibility offers. These findings support the suggestions of flexibility providers that an enforced code of conduct would be an effective procurement solution. They also confirm those of other research, for example the HOMEflex research report.

Communicating the community and wider benefits of flexibility services - giving back to the grid; environmental benefits; energy security; continuity of supply – could serve to engage these hard to reach groups. A particular need to explore flexibility service design with private tenants and landlords was identified to avoid exclusion of private renters.

Recommendations

Drawing on the analysis of vulnerable consumer and flexibility service provider research results, the following suggestions are made for the design of a trial flexibility service with hard to reach or vulnerable consumers in a UKPN licence area later in Phase 3, and future flexibility services.

1. Prioritise enabling solutions that will increase awareness, understanding and trust of flexibility services amongst vulnerable customers. Provide funding for a holistic suite of support for vulnerable customers to overcome multiple barriers to adopting flexibility services, including digital support.
2. Deliver advice about flexibility sensitively, acknowledging that many customers are already doing all they can to manage and limit the energy use due to poverty.
3. Support community energy groups or other intermediaries to act as trusted messengers to vulnerable groups.

4. Clearly explain all aspects of in-home flexibility services: space requirements; safety of technologies; connectivity; installation; how financial rewards are calculated; means to check live electricity use; how customers can optimise financial savings via time of use tariffs. Reassure consumers of protections for adequate electricity or hot water supply.
5. Communicate the community and wider benefits of flexibility services: giving back to the grid; environmental benefits; energy security; continuity of supply.
6. Consider how to manage financial barriers by offering free or discounted technologies. Provide a running cost guarantee, to minimise risk and appropriately reward domestic customers for flexibility services.
7. Explore flexibility service design to support engagement with private tenants and landlords.
8. Identify appropriate solutions that fit with consumers' needs, appliance replacement timeframes and dependence on electricity supply, e.g. trial the delivery of in-home battery storage solutions that provide resilience to those medically dependent on electricity, replace immersion heaters with smart hot water tanks, or enable automation of electric heating. Consider turn up solutions as well as, or instead of turn down solutions.
9. Specify adoption of HOMEflex as a requirement of all flexibility providers UKPN procures from. Establish penalties in contracts aligned with HOMEflex, particularly to prevent false advertising, and enforce if obligations are not met.
10. Give flexibility service providers clear direction and guidance on how to identify vulnerable consumers and measure their uptake of services, such as via use of UKPN vulnerability mapping tool.
11. Share learning from trials with flexibility providers to establish best practice and build an evidence base to inform future service design. Engage with innovators to develop trial options and explore new solution areas.

Next steps

Suggestions can be utilised to inform the procurement and design of a trial flexibility service with hard to reach customers in a UKPN area in 2023 and future services.

Appendix 1: Methodology

Literature review, long list and short list of flexibility service options

A literature review conducted by Sia Partners in February 2023 established a long list of 24 potential flexibility solutions for future trial in the UKPN area. The long list was divided into three main areas: Enablers, Network Solutions and Customer Solutions (Figure 16). A short-list of four solutions which combined different elements from the long-list of solutions was produced for a workshop on 16th February 2023 with UKPN to promote discussion on potential flexibility solutions to trial. The short-listed 'working' solutions were:

1. Battery pack for Priority Service Register (i.e. for customers medically dependent on electricity or for other high need 'PSR needs code') alongside information and advice on flexibility services.
2. Home Energy Action Plans alongside flexibility education (and targeted trial i.e. behavioural change on energy usage for set periods).
3. Consumption turn-up solution (i.e. diverting excess renewable generation to fuel poor homes) – drawing inspiration from the [EnergyCloud](#) project in Ireland
4. Social Constraint Managed Zones approach (vulnerability data integrated with UKPN's DSO flexibility procuring approaches) alongside a targeted trial (e.g. energy efficiency installations in areas with high cluster of inefficient homes and low knowledge of energy services helping to mitigate the need for future flexibility tenders in the chosen area in the future).

This short-list was used as the basis for development of four hypothetical flexibility service examples to use in focus groups as topics for discussion.

- Home Energy Action Plans alongside flexibility education
- Home battery
- Community battery
- Using surplus renewable generation to heat hot water in fuel poor homes

Figure 16: Long-list of potential flexibility solutions

1) Enablers		2) Network Solutions	
#	Solution / Mechanism	#	Solution / Mechanism
1	Improving awareness/education about Flex services to H2R Customers - only Information provided	5	Procuring flexibility services in a Constraint Managed Zone from small community groups
2	Improving awareness/education about Flex services to H2R Customers - information plus in-depth 1:1 support via community energy group	6	Digital platform enabling aggregated flexibility services within a community
3	Improving awareness/education about Flex services to H2R Customers - then connected directly to UKPN trial/solution	7	Incentives to provide uptake of Flex proportions from hard-to-reach sources
4	Integration of vulnerability mapping data to DSO Flex tendering process	8	Making network service procurement from 'hard-to-reach' customers a common standard
		9	Updating UKPN prioritisation rules for flex tenders or specific flex products
		10	Updating policy requirements on flex proportions from hard-to-reach sources
3) Customer Solutions			
11	Time of Use Tariffs - standalone to those who already have a smart meter and classified as hard-to-reach	17	Supporting the installation of new battery storage devices for hard-to-reach customers
12	Time of Use Tariffs - medically dependant on the reliable supply of electricity (peak management tariff)	18	Supporting the installation of battery storage to households with existing PV
13	Time of Use Tariffs - targeting new installations and encouraging the uptake for those who meet hard-to-reach criteria	19	Supporting Energy Turn down during selected windows with incentives
14	Time of Use Tariffs - plus battery installation	20	Energy Turn down during selected windows with incentives (heat-specific)
15	Time of Use Tariffs - with energy shifting device (plug)	21	Targeted interventions for hard-to-reach customers in UKPN licence area to participate in National Grid ESO's DFS
16	Locational and dynamic price signals for EV charging (both time of use and capacity-based price signals)	22	Community energy storage scheme shared residential energy storage
		23	Supporting the roll-out of Smart Home Energy Management systems for hard-to-reach customers

Demand turn up, such as to discount or use surplus renewable electricity was added as Solution 24.

Focus groups

Sampling framework and recruitment

A sampling framework for focus groups was created informed by Socially Green Phase 1 consumer segmentation (Figure 17) and CSE's Smart & Fair Consumer Capability Lens (Figure 18). These approaches both explore consumer capabilities – personal, social, and temporal factors – and how these impact on consumer engagement and exclusion in the energy market.

Figure 17: Socially Green Phase 1 Consumer segmentation – drivers of exclusion²¹

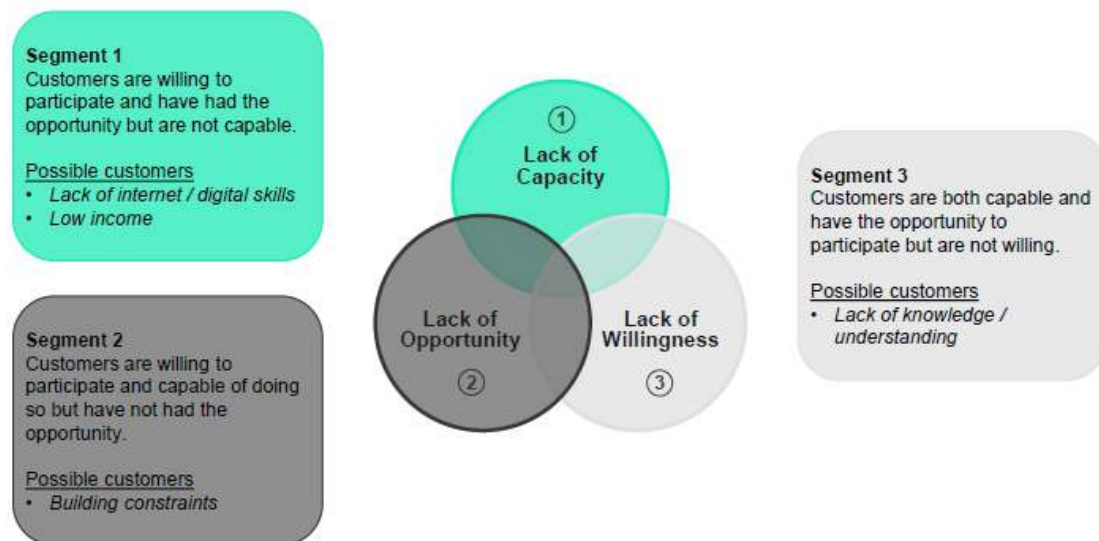
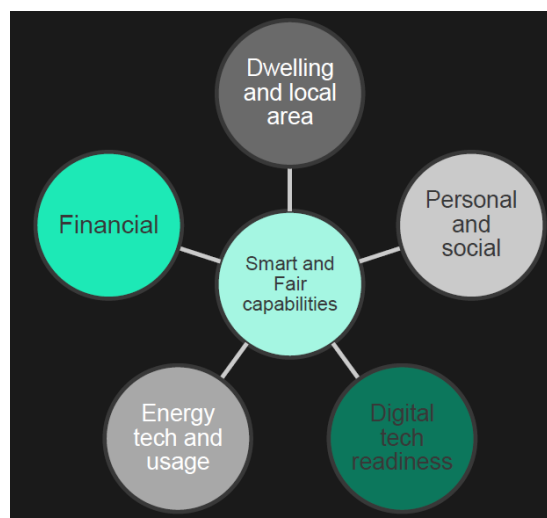


Figure 18: Smart and Fair consumer capabilities lens



For example, some consumers may **lack opportunity due to their dwelling** to participate in flexibility services. Some private rental agreements prevent tenants from changing meter so an electric smart meter cannot be installed. Some consumers may lack the **capability, willingness**

²¹ UK Power Networks Socially Green Project Customer Segmentation Report Figure 8, pg. 24

and opportunity to install flex-enabling technologies e.g. a low-income social housing tenant who has no information on those technologies.

To explore the different opportunities that customers have to benefit from flexibility services, we created four groups of vulnerable or hard to reach customers based on:

1) The depth or breadth of financial or social impact of flexibility services

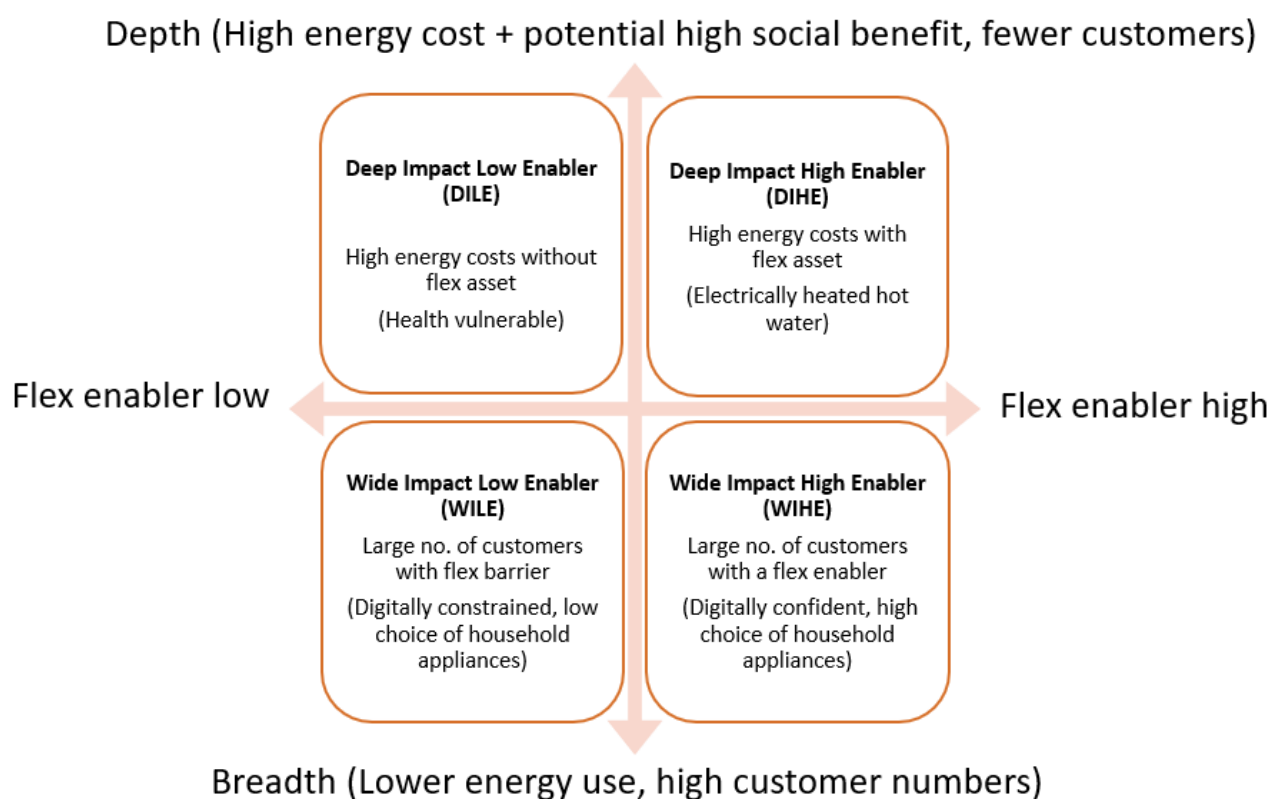
- Depth – consumers with high amount of shiftable load (ability to benefit financially) and / or high social benefit, for a small proportion of customers in UKPN license areas. High depth groups stand to significantly benefit through reducing costs.
- Breadth – consumers with lower amount of shiftable load, with a high proportion of customers in UKPN license areas.

2) Enabling factors for flexibility - high or low:

- High – e.g. consumers with high digital confidence, with choice of household appliances for flexibility.
- Low – e.g. consumers experiencing digital constraint, with little or no choice of household appliances.

The four groups were:

1. Deep Impact Low Enabler (DILE). Participants had health vulnerabilities.
2. Deep Impact High Enabler (DIHE). Participants had electric hot water (and heating).
3. Wide Impact Low Enabler (WILE). Participants were digitally constrained with low choice in household appliances.
4. Wide Impact High Enabler (WIHE). Participants were digitally confident with high choice in household appliances.



The rationale for the focus group sampling framework is summarised in Table 6 below.

Table 6: Summary of rationale for focus group sampling framework

Group	Depth	Breadth (Proportion of consumers in UKPN area)	Rationale
Deep Impact Low Enabler (DILE) Health vulnerable customers	High electricity use. Unknown / variable ability to shift load.	Low	Flexibility services not accounting for differing needs and abilities to flex. Lack of commercial viability.
Deep Impact High Enabler (DIHE) Electric hot water and heating	High electricity use. High ability to shift load.	Low. 13-39.7% of homes heated electric only in some areas of East of England and London ²² .	High social impact if coupled with rented sectors. High fuel poverty as electricity more expensive than gas. Association between electric heating & low income.
Wide Impact Low Enabler (WILE)	Low / variable	High. 88% of UK adults have	Reluctance to use data to participate or infrequent

²² [ONS map How homes are heated in your area](#), Census data 2021, Electric only

Digitally constrained (no home broadband), little or no choice of household appliances.		smartphone ²³ . Low-income users (< £25,000 pa), 31% will ration mobile data use ²⁴ .	access to internet e.g. via library. Secondary factor of low choice of household appliances - private renters. High risk of fuel poverty.
Wide Impact High Enabler (WIHE) Digitally confident, choice of household appliances.	Low / variable	High. 17.4% households in UKPN area are social housing tenants ²⁵	Social housing tenants have control over household appliance purchases. Often in homes of good energy efficiency, sometimes with LCTs. High risk of fuel poverty due to low income.

Recruitment of focus group participants via a recruitment agency used the following selection questions for the four groups (Table 7). Each participant was offered an incentive to attend the focus group.

Table 7: Selection questions used for focus groups

Group	Selection questions (Responses indicated as required for 1 or more questions per group)
Deep Impact Low Enabler (DILE) Health vulnerable customers	Do you, or someone you live with and care for, rely on electricity for any medical dependency? Yes - I have refrigerated medication or a reliance on refrigeration Yes - I have medical equipment (Dialysis, Ventilator etc...) Yes - I have mobility equipment (A Hoist, Mobility Scooter etc...) Yes - I require a phone line for Medical Care and Support Yes - Due to a medical condition I use more electricity to stay warm or power equipment I need.
Deep Impact High Enabler (DIHE) Electric hot water and heating	How is your property heated? My home has electric heating - storage heating, electric panel radiators, or portable electric heaters And / or: Do you have an electric immersion heater in your home for hot water? Yes – main heater for hot water Yes – back up heater for hot water
Wide Impact Low Enabler (WILE)	Do you have internet access at home? No, I rely on mobile phone data at home

²³ <https://www.uswitch.com/mobiles/studies/mobile-statistics/>

²⁴ Institute for Development Studies, Digital Poverty in the UK, 2022

²⁵

<https://www.ons.gov.uk/peoplepopulationandcommunity/housing/bulletins/housingenglandandwales/census2021>

Digitally constrained (no home broadband), little or no choice of household appliances.	No, I rely on other places for internet access (Internet café, Library, Local places etc...) No, I use the internet rarely anyway No, other In the last year, for a mobile phone or tablet, have you rationed your mobile internet use to avoid running out of data or run out of data and been unable to top up until your contract renews? Yes – regularly (three times or more) Yes – occasionally (once or twice)
Wide Impact High Enabler (WIHE) Digitally confident, choice of household appliances.	Which of the following best describes your housing situation? I rent my property via social housing Do you own, or have chosen some of your house hold appliances? Yes, I own or have chosen all or some of the appliances in my property (Fridge, Washing Machine, coffee machine etc...) Do you ever need help with online tasks? e.g. booking appointments, banking and paying bills No, I never need help with this I sometimes ask a family member or friend, but I can do most things myself When downloading and using a new app, which of the following applies to you? I wouldn't need any help with this I would only need to be shown once then I could do it by myself It would take me a few tries but once I have the hang of it, I would feel confident using it alone

In addition, we included other relevant factors in recruitment by specifying that each focus group needed to include households with a mix of tenures, incomes, ages, genders, meter type, and property energy efficiency rating. All participants had to reside within UKPN license areas. These additional sampling factors are listed in Table 8 below.

Table 8: Additional sampling factors

Factor	Number
Income < £30,000 pa	At least 4 in each group
Property EPC band D-G	At least 2 in each group
Live with person aged 0-24 years	At least 1 in each group
Chronic health issue	At least 1 in each group
Prepayment meter	At least 2 in each group
Location	All from UKPN license areas
Renters	1 or 2 renters in each group
Gender	50% female across all groups

Summary of participants

Table 9 summarises key characteristics of participants in each focus group.

Table 9: Key characteristics of recruited workshop participants

Group	Deep Impact Low Enabler (DILE) Health vulnerable customers	Deep Impact High Enabler (DIHE) Electric hot water and heating	Wide Impact Low Enabler (WILE) Digitally constrained little choice of household appliances.	Wide Impact High Enabler (WIHE) Digitally confident, high choice of household appliances	Total count	%
Total	5	7	4	5	24	100
Income < £30,000 pa	5	3	6	1	15	63
Property EPC band D-G	3	4	1**	4*	12	50
Live with person aged 0-24 years	4	6	1	1	12	50
Chronic health issue	5	2	1	2	10	42
Prepayment meter	3	2	3	3	11	46
Renters	5	3	7	5	20	83
Female	4	3	3	2	12	50
Average age	43	35	42	42		
Age range	31-64	28-44	24-63	29-60		

* indicates one EPC was unknown; ** indicates two EPCs were unknown

Focus group structure

One workshop structure was used with all focus groups. All focus groups were facilitated by two or three researchers and lasted 90 minutes. Discussion was recorded and transcribed.

The focus group gave participants information on flexibility services and shared three examples of types of flexibility services based on current or trial services. It was designed to ascertain whether consumers would participate in each flexibility example, to elicit their concerns, perceived benefits and to learn what would increase their confidence in these examples. Table 10 summarises the structure of the focus group.

Table 10: Focus group structure

Time	Activity
15 minutes (00:15)	Welcome and introductions
10 minutes (00:25)	Wider context: energy flexibility and polls
10 minutes (00:35)	Example 1: Home Energy Action Plan with flexibility information and advice
15 minutes (00:50)	Example 2: Battery with grid services package – home installation
5 minutes (00:55)	Example 2+: Battery and solar PV – community installation
5 minutes (01:00)	Break
15 minutes (01:15)	Example 3: Use of surplus renewable electricity to heat hot water
5 minutes (01:20)	Flexibility services for different households
8 minutes (01:28)	Poll on take up of example flexibility services, concerns, benefits and what would give more confidence.
2 minutes (01:30)	Close

Below are the presentations of the three examples used to explain flexibility services to consumers.

Figure 19: Slide explaining Home Energy Action Plan with flexibility advice for focus groups

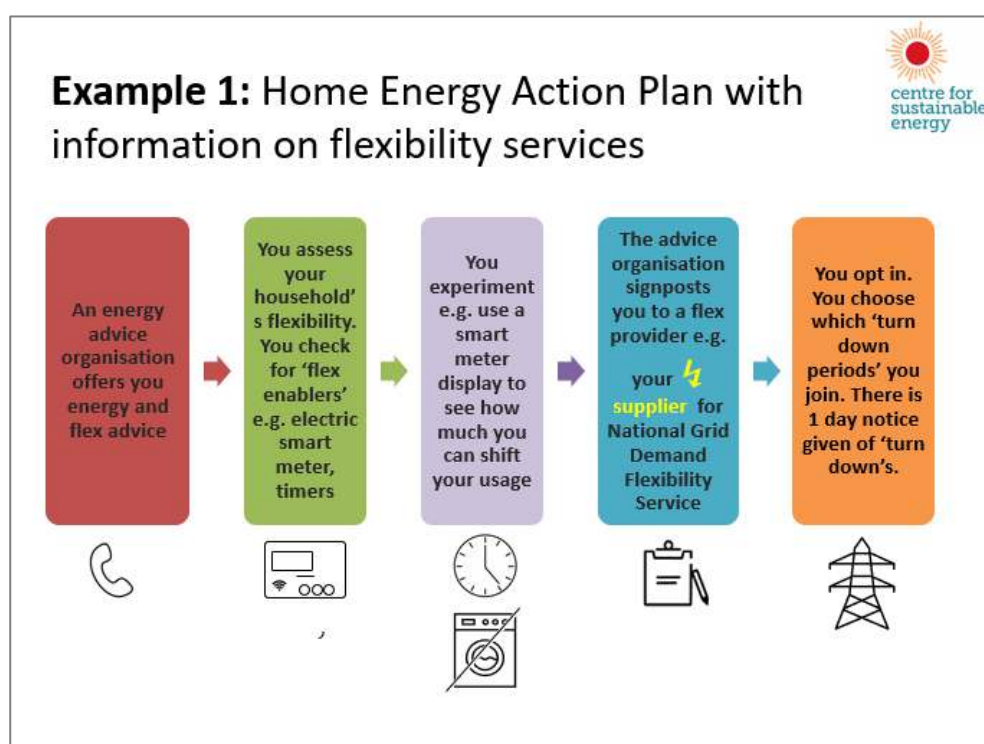


Figure 20: Slide explaining battery with grid services offer for focus groups

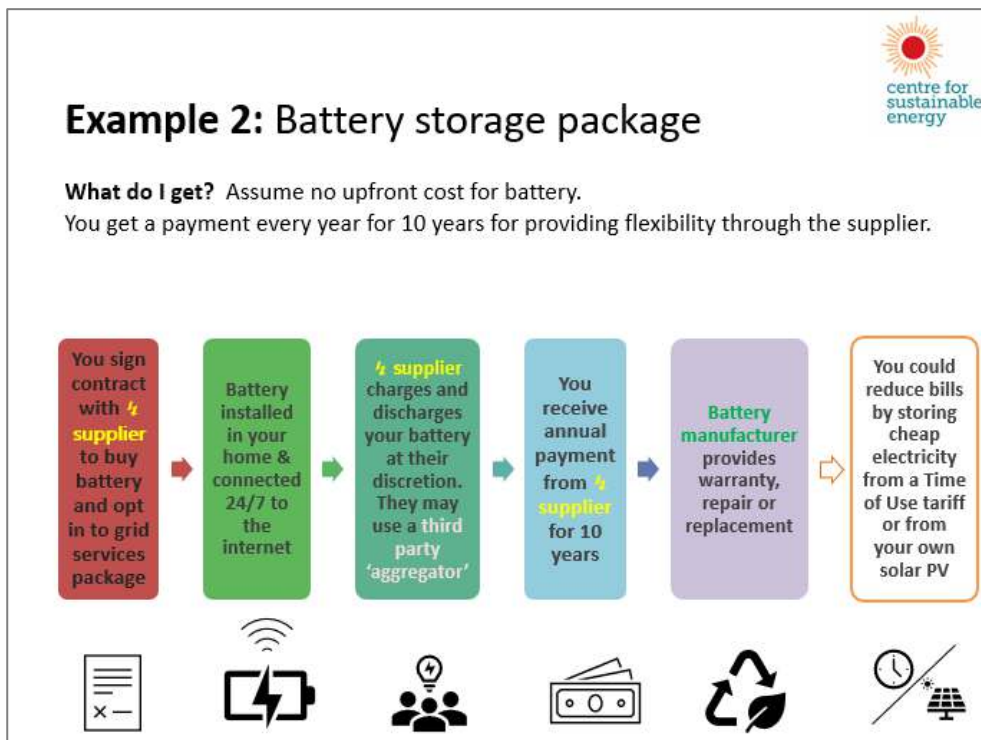
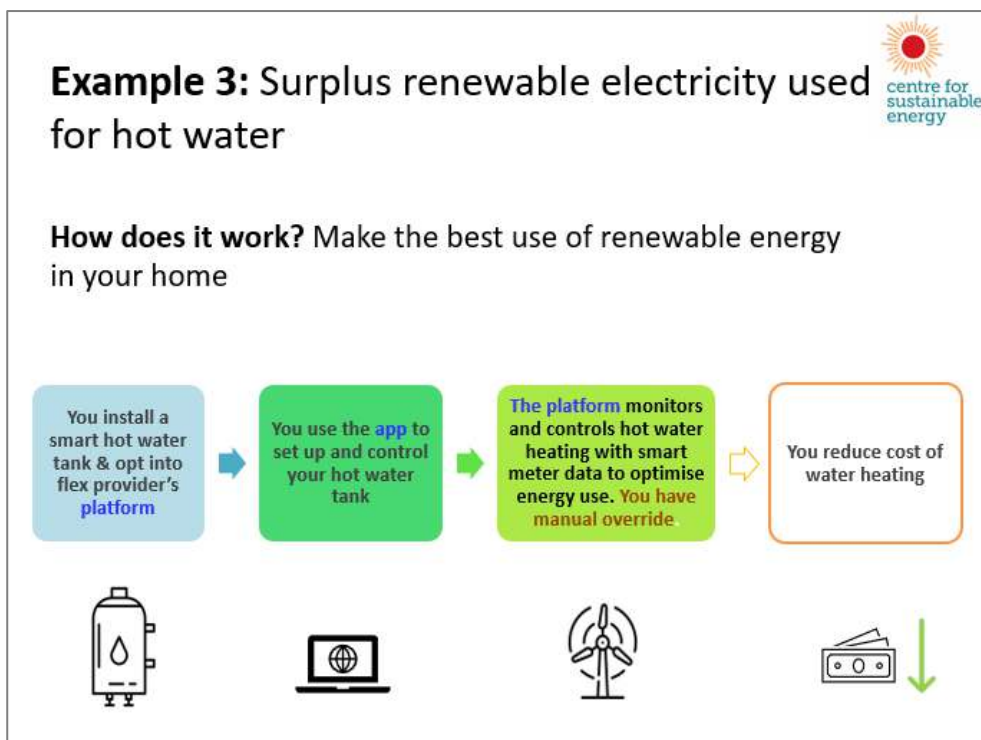


Figure 21: Slide explaining use of surplus renewable energy for hot water for focus groups



Data analysis

Transcripts were analysed in NVivo QSR International software. Thematic analysis was carried out by one researcher using deductive and inductive approaches. Deductive coding utilised the workshop structure. Inductive coding recorded emergent themes in comments raised by

participants which were outside of the workshop structure. Similarities and differences between groups were reported on.

Online survey

An online survey was created to collect information from flexibility service providers and community energy groups known to be interested in potentially delivering flexibility services in UKPN license areas. The survey included questions in four main sections: organisation type; current and potential future provision of flexibility services; widening access of flexibility services to hard to reach consumers; flexibility service solutions. The survey included a mix of Likert scale questions and open comment boxes. The survey was administered in SmartSurvey.

The survey link was emailed to a list of 52 flexibility service providers and community energy groups identified in desk research and from UKPN contacts. It was also emailed by the Association of Decentralised Energy to their flexibility service provider contact list in an e-newsletter, and by private communication. Survey reminders were sent three times during the 20 days (15.03.23-03.04.23) for which the survey was open. Personal email requests were sent to some partial respondents for additional information on vulnerability questions. No incentive was offered for completing the survey.

After data cleansing a total of 17 survey responses were received - four complete survey responses and 13 partial responses of varying completion - as summarised in Table 11. Analysis of survey results was conducted in Excel by two researchers. Comments to questions were summarised and quotes extracted.

Table 11 Summary of survey responses

Survey sections	No. of responses	Organisation
Organisation type	17	2 energy suppliers; 4 CE groups; 2 energy supplier & aggregator; 4 tech companies; 4 aggregator & tech companies; 1 Other (smart meter energy app).
Current / future flexibility services	13	2 energy suppliers; 3 CE groups; 2 energy supplier & aggregator; 2 tech companies; 4 aggregator & tech companies.
Consumer vulnerabilities	9	1 energy supplier & aggregator; 2 CE groups; 2 tech companies; 4 aggregator & tech companies.
Flexibility service solutions	4	4 aggregator & tech companies.

Appendix 2: Coding reference count for thematic analysis by focus group

Table 12 gives a summary of the coding reference count for thematic analysis by focus group as an indication of the relative contributions on different topics made in discussions. Any comments that didn't relate to a specific example were coded under Other. Codes with four or more customer comments are shaded blue. The topics with the highest number of total coding references were concerns about home battery storage (31), participation in a Home Energy Action Plan (24) and concerns about using surplus renewables (13). The WIHE group had fewer coding references (i.e. discussed the topic slightly less) compared to other groups.

Table 12: Summary of coding reference count for thematic analysis by focus group

Code	DILE	DIHE	WILE	WIHE	Total
Example 1: Home Energy Action Plan and flexibility information					
a) Participation	7	6	6	5	24
b) Concerns	4	4	3	1	12
c) Benefits	2	3	4	2	11
d) More confident	2	7	1	1	11
Example 2: Battery storage (home install)					
a) Participation	1	4	6	2	13
b) Concerns	9	9	8	5	31
c) Benefits	3	2	0	1	6
d) More confident	2	1	0	0	3
Example 2+: Battery storage (community install)					
a) Participation	2	3	2	2	9
b) Concerns	2	4	1	0	7
c) Benefits	6	1	2	1	10
d) More confident	0	1	0	0	1
Example 3: Surplus renewables					
a) Participation	3	1	1	5	10
b) Concerns	2	4	4	3	13
c) Benefits	1	4	3	0	8
d) More confident	2	0	1	0	3
Other					
Concerns	2	5	1	3	11
Benefits	1	0	0	0	1
More confidence	0	1	0	0	1
Total	51	60	43	31	185

Appendix 3: Focus group poll results

Opening poll

An introductory poll at the start of focus groups with three questions ascertained participants' current behaviours around controlling heating, the types of metering and electrical appliances in their home and their perceived ability to shift household electricity use out of peak time. The poll was used to open discussion around flexibility services, after an introduction to the topic.

How do you normally switch your heating on/off?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Manually	4	5	6	2	17	74
Automatically	1	2	0	3	6	26

Do you have any of the following devices in your home?

Response	DILE	DIHE	WILE	WIHE	Total count	% (n=23)
Smart meter	3	2	3	4	10	43
Economy 7 meter		5		1	6	26
Electric immersion tank		2	1	1	4	17
Smart plug	2			1	3	13
Smart lighting	2			1	3	13
Timer plug				1	1	4
Smart heating controls					0	0
Solar PV					0	0
Battery storage					0	0
Electric Vehicle					0	0
None of the above	1	1	2	0	4	17

Would your household be able to shift the time you do any of these activities outside of peak time (4-8pm)?

Response	DILE	DIHE	WILE	WIHE	Total count	% (n=23)
Laundry: (use of washing machine or tumble-dryer)	5	4	4	3	16	70
Kitchen washing up	3	4	5	2	14	61
Cooking	3	2	4	3	12	52
Entertainment: (e.g. TV, gaming etc)	4	0	4	2	10	43
Bathing (e.g. using shower)	3	2	4	1	10	43

Heating your home	1	1	4	3	9	39
Already doing what I can	0	3	4	0	7	30
Lighting	1	1	3	1	6	26

Final poll

In a closing poll with seven questions at the end of the focus groups, participants were asked to indicate whether they'd take up the flexibility service examples shared. They also indicated any concerns, perceived benefits and 'confidence enhancers' for flexibility services. Poll selection lists of starter concerns, benefits and confidence enhancers were created based on research for the HOMEflex code of conduct.

How likely would you be to participate in Example 1: the Home Energy Action Plan with information on flexibility?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Extremely likely	2	2	2	0	6	25
Fairly likely	2	3	4	3	12	50
Neutral	1	1	1	1	4	17
Unlikely	0	1	0	0	1	4
Extremely unlikely	0	0	0	1	1	4

How likely would you be to participate in Example 2: Battery storage, assuming no upfront cost?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Extremely likely	3	1	0	2	6	25
Fairly likely	1	1	3	2	7	29
Neutral	0	1	3	0	4	17
Unlikely	1	3	1	1	6	25
Extremely unlikely	0	1	0	0	1	4

How likely would you be to participate in Example 2+: Community battery storage, assuming no upfront cost?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Extremely likely	1	2	1	1	5	21
Fairly likely	3	1	3	1	8	33
Neutral	1	2	1	2	5	21
Unlikely	0	2	2	1	4	17
Extremely unlikely	0	0	0	0	0	0

How likely would you be to participate in Example 3: Using surplus renewable electricity to heat hot water, assuming no upfront cost?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Extremely likely	1	3	0	2	6	25
Fairly likely	3	3	1	0	7	29
Neutral	0	1	4	1	6	25
Unlikely	1	0	2	1	4	17
Extremely unlikely	0	0	0	1	1	4

Poll – Do you have any concerns about any of these types of flexibility services?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Financial: e.g. not saving enough money	2	5	4	4	15	63
Customer care e.g. dealing with queries, appliance care and repair	2	4	4	2	12	50
Disruption e.g. it take up your time, installation process	3	3	2	2	10	42
Confusing sign-up process / unclear information	0	3	2	4	9	38
Flexibility service doesn't meet your energy needs	1	3	1	2	7	29
Internet security	0	2	3	0	5	21
Getting everyone in your household involved	1	1	3	0	5	21
Data sharing	0	2	2	0	4	17

Poll - What do you think the benefits of these types of flexibility services might be for your household?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Reduced electricity bills	5	7	7	4	23	96
Best use of renewable electricity	3	5	4	3	15	63
Better management of energy use	3	3	4	4	14	58
Convenience	0	3	4	0	7	29

Community aspect (for community flexibility service)	0	2	1	0	3	13
Other	0	1	0	0	1	4

What would make you feel more confident about these services?

Response	DILE	DIHE	WILE	WIHE	Total count	%
Clear on expected financial rewards, any upfront or running costs or additional work involved	4	6	6	5	21	88
Clear on responsibilities for any tech repairs, maintenance, hardware or software upgrades	2	4	4	5	15	63
Explain how consumers can monitor reduced usage	1	5	6	2	14	58
Clear complaints process	0	6	6	2	14	58
Supplier has 'trust mark' of some sort	2	5	5	0	12	50
Risk minimised	1	4	4	1	10	42
Other*	0	0	0	1	1	4

*The 'digitally confident' group (the first focus group held) named 'Risk minimised' as an "Other" factor which would enhance confidence. 'Risk minimised' was then added as a choice to the three subsequent focus groups. For the Digitally confident group one count has been added into the 'Risk minimised' row.

Appendix 4: Flexibility service provider survey

Section 1: Consent

This research is being conducted by the Centre for Sustainable Energy (CSE) and Sia Partners on behalf of UK Power Networks.

If you are willing to participate, please provide your consent by ticking each of the boxes below.

Taking part	Tick
I confirm that I am aged 18 or over.	
I understand that my taking part is voluntary and that I can withdraw from this research at any time.	
Use of information for this research only	
I understand that any information shared will be used by researchers solely for the purposes of this research.	
I understand that comments I make in survey responses may be anonymously quoted in publications, reports, web pages, and other research outputs. No comments that include personal identifiable information will be published.	
I understand that CSE and Sia Partners will only use information in accordance with all applicable laws and regulations. Under data protection legislation, information is being used in the category of 'legitimate interest' – this means use of information provided is necessary to achieve the outcomes of the research. Data will be stored by CSE as detailed under the Data Protection Act 2018 for up to a year from the final date of project closure (31.07.2024) on a secure server with password protection. CSE will ensure protection of all information held and recognises its obligations in maintaining a system that meets the requirements of GDPR.	

Section 2: Introduction

Thank you for interest in this survey.

This research is being carried out as part of [Socially Green](#) – a project exploring how UKPN can help **vulnerable domestic** customers to access the benefits of energy flexibility. We would like to hear about how your organisation is currently involved with energy flexibility and what you think about some potential solutions to help vulnerable customers access energy flexibility services. We are also interested to know what market changes, if any, could be made to make obtaining flexibility from vulnerable consumers easier going forward.

RIO-ED2 requirement

This project specifically addresses UKPN's [Strategy for ED2 \(2023-28\)](#), which includes a commitment to keep costs down by taking a 'flexibility and energy efficiency first' approach. To achieve this, UKPN intend to ensure that the DSO's approach to procuring flexibility services is inclusive by design and no customer is left behind in the energy transition.

Section 3: About your organisation

1. Name of organisation (*textbox*)
2. Your email address (*textbox*)
3. Organisation type (*multi-select*)
 - Energy supplier
 - Aggregator
 - Tech company
 - Other private company
 - Community energy group
 - Other (please specify):

Section 4: Your current flexibility services

For the purposes of this section and following sections, please define flexibility services as any product, technology or service that aims to enable domestic customers to shift or optimise the way they use energy to help deliver system balancing.

4. Which of the following flexibility services does your organisation deliver in the **domestic sector**? Please provide a response for each service. (*matrix of options*)

Flexibility service	Have done previously	Deliver currently	Planning to in future	No / not considered it
Electricity storage				
Heat storage				
Heat pumps				
EV charging				
Smart home technologies or smart enabled appliances				
Home energy optimisation platforms or software				
Smart tariffs				

Demand Flexibility Service				
Advice				
Other (please specify)				

5. Which services does your organisation provide to UKPN or plan to provide? Please give a response for each service. (*matrix of options*)

Service	Have done previously	Provide currently	Planning to in future	No / not considered it	Provide currently, but not in UKPN area
Sustain					
Secure					
Dynamic					
Restore					

6. What has prevented your organisation from delivering any or more flexibility services? Please select all that apply. (*multi-select*)

- Limited revenue potential
- Complexity of tendering process
- Complexity of procurement rules
- Lack of standardisation across DNOs
- Minimum asset size requirements
- Lack of skills or expertise
- Lack of capacity or resources
- Market conditions
- Other (please specify):
- Please use this space to make any relevant comments on your selection(s):

Section 5: Supporting wider access to your flexibility services

This section asks some questions about your current flexibility services and vulnerable consumers.

For the purposes of this section and following sections, please use the definition of vulnerable consumers provided in UK Power Network's latest [Consumer Vulnerability Strategy](#). This states: 'We define 'vulnerability' as a situation that can arise when aspects of the energy market combine with someone's personal circumstances or the characteristics of their environment to

create conditions where they are more likely to suffer detriment.’ An individual could be considered vulnerable if they fall into any area of the diagram below.

The emerging [HOMEflex](#) code of conduct for domestic flexibility services includes ethical considerations, such as providers considering different households’ circumstances, capabilities, and preferences in their service design.

7. Do you take into account any of the following circumstances, capabilities and preferences that can indicate consumer vulnerability when designing your services? (*matrix of options*)

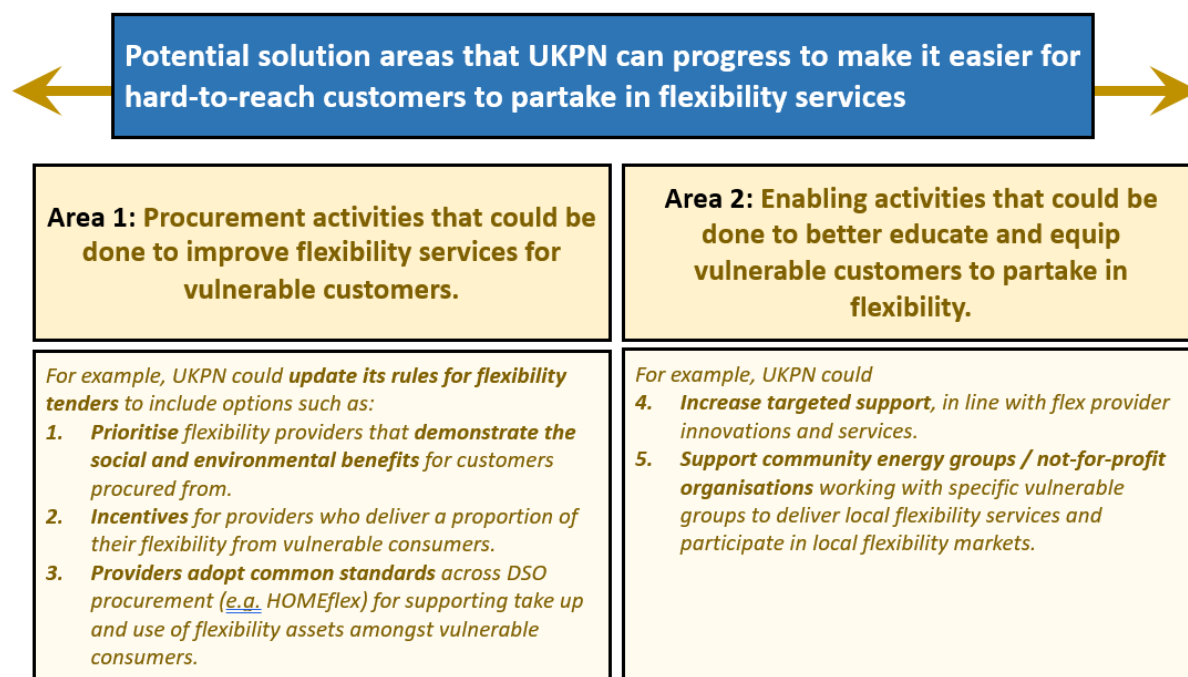
Category	Yes	No	Don't know
Physical capabilities and needs (e.g. eyesight, health need for warm home)			
Mental capabilities (e.g. ease to understand and use a product or service)			
Financial capability skills (e.g. ease to understand and achieve financial benefits of product or service)			
Digital skills (e.g. ability of consumer to engage with product or service with variable IT access and know how)			

- Please use this box to comment on any specific responses:

8. Do you measure uptake of your services amongst vulnerable consumers? Please give any details of methodology and the current extent of uptake. (*comment box*)
9. What do you see as the main opportunities for delivering flexibility services targeted at vulnerable consumers? This could be for your organisation and / or the energy sector more generally. (*comment box*)
10. What do you see as the main barriers to delivering flexibility services targeted at vulnerable consumers? This could be for your organisation and / or the energy sector more generally. (*comment box*)
11. What support or incentives would your organisation need to engage more vulnerable consumers with flexibility services? (*comment box*)

Section 6: Potential solution areas for increasing accessibility of flexibility services for vulnerable consumers

The rest of this survey will focus on two potential solution areas for increasing accessibility of flexibility services for vulnerable consumers within the UKPN service area. We would like to find out what you think about these and if there are other solution areas you think UKPN should consider.



Area 1: Procurement activities

12. Would solutions in **Area 1: Procurement Activities** help your organisation to obtain flexibility from vulnerable consumers? Please use this box to comment and provide suggestions:
13. What are the main barriers you see in using Procurement activities to help increase the accessibility of flexibility services for vulnerable consumers? (*comment box*)

Area 2: Enabling activities

14. Now focusing on **Area 2: Enabling activities**, would solutions in this area help your organisation to obtain flexibility from vulnerable consumers? Please use this box to comment and provide suggestions:
15. What are the main barriers in using Enabling activities to help increase the accessibility of flexibility services for vulnerable consumers? (*comment box*)

Other activities

16. Do you have any comments about how these solution areas would complement or challenge other existing transformations in the energy sector: e.g. energy efficiency (*comment box*)
17. Are there other solution areas, in addition to Area 1: procurement and Area 2: enabling solutions that could be helpful in widening access to flexibility services for vulnerable consumers? (*Please provide suggestions in the comment box*)