RiDC

CATAPULT Energy Systems

EMERGING VULNERABILITIES:

Potential impact of decarbonisation for disabled consumers

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Introduction: Potential impact on disabled consumers of the increasing electrification of heat and transport

The energy system is changing, with a move towards greater electrification of heat and transport. By 2050 demand for electricity will almost double[1]. Renewable energy use will increase alongside electrification of heat, transport and industry. Energy generation will move from a controlled constant to peaks and troughs that reflect the nature of renewable generation. These changes will come with different ways of paying for energy, such as time of use tariffs, that reflect the variable nature of generation to manage usage, reduce reliance on fossil fuels, and manage network capacity. The aim of these changes will be to match supply with demand, by reducing peak demand that we currently have. The combination of these factors could lead to times when electricity supply may be reduced or become unaffordable for some consumers.

These changes to the energy system will affect us all, requiring us all to make changes to the ways we currently use energy in our homes. Up until now, little is known about how these changes could impact disabled consumers, many of whom have a greater reliance on and use of energy to meet their specific needs. There will also be a need for the design and development of products and services to enable the future energy system to work. Because these changes will affect us all, it's important to make sure they're designed for everyone. However, two thirds of the disabled consumers we surveyed as part of this research agree that the design of products and services can exclude people from using them. For example, one respondent told us:

> *Consider those with hand function problems & other physical disabilities. Over the years designers have paid no attention to this. They assume every physically disabled person lives with someone to cater for their needs. NOT SO. Don't know why they don't consult the people with the problems.*

Whilst District Network Operators (DNOs) have strategies in place to support consumers in vulnerable situations during a power cut, careful consideration is needed now to ensure that future energy products and services are inclusive and accessible to all. It is essential to involve disabled people from the start so that new services and solutions meet their needs.

This report outlines a project that worked with disabled people to understand the ways in which the changing energy system might affect them. It discusses findings from a survey conducted with over 450 people with different disabilities and a series of co-design workshops with disabled consumers. The workshops generated some ideas for solutions to overcome the problems and issues we identified.

The project was a collaboration between Energy Systems Catapult (ESC) as part of their Fair Future programme, and the Research Institute for Disabled Consumers (RiDC). Between them they have extensive experience of consumer research, design and innovation in the energy sector, and conducting research with disabled consumers. This project is supported by the Energy Redress Fund (administered by the Energy Savings Trust).

Who this report is for: This report is intended to help District Network Operators, Energy Service Providers, policy makers, and those innovating in the energy sector understand the energy needs of disabled consumers. It highlights some issues that may emerge for disabled consumers with the increasing electrification of heat and transport, and makes suggestions for how these could be addressed.

Overview of key findings, insights, and recommendations

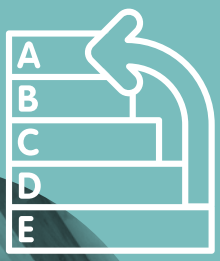
The key findings from this research are summarised below and expanded on in the rest of the report:

- **The changing energy system could create new challenges for disabled consumers, who would struggle to manage without or with restricted access to energy even for short periods of time.** We all need energy in the home for health, well-being and hygiene, food preparation and communication. However, these requirements can be more crucial for disabled people. Additionally, many disabled consumers rely on power for mobility and for life-critical medical equipment.

- **Expensive peak-time energy prices could disproportionally affect disabled consumers** who may not have the option to shift their use of energy for things like life-critical medical equipment to cheaper times.

- Co-design workshops generated some initial ideas for solutions that appealed to the participants we spoke to and highlighted some of the aspects of future solutions that are key to them. **The solutions disabled consumers came up with included planning aids, protected access to energy, price protection and home efficiency improvements.** DNOs, energy service providers and energy innovators should take these themes into consideration when designing and implementing any new features of the future energy system.

- **DNOs, energy service providers and energy innovators should engage with as many people as possible, including disabled consumers, when making any changes.** Doing so will ensure that no-one is left behind, and could in fact create more robust and better solutions for everyone. For more information on how to do this, see our sister report, Trialling with Disabled Consumers.[2]



How the changing energy system might impact disabled consumers

Energy is needed to keep people alive and well. It can be required to keep homes, and their occupants, warm; provide hot water for washing; and is essential for cooking. For some people it is also needed to power medical equipment. The survey was completed by over 450 disabled consumers who are members of the RiDC panel. Their responses and the co-design workshops enabled us to understand more about what disabled people rely on energy for, and therefore what would most concern them or could most impact them in a future energy system where access to energy at certain times was restricted or expensive.

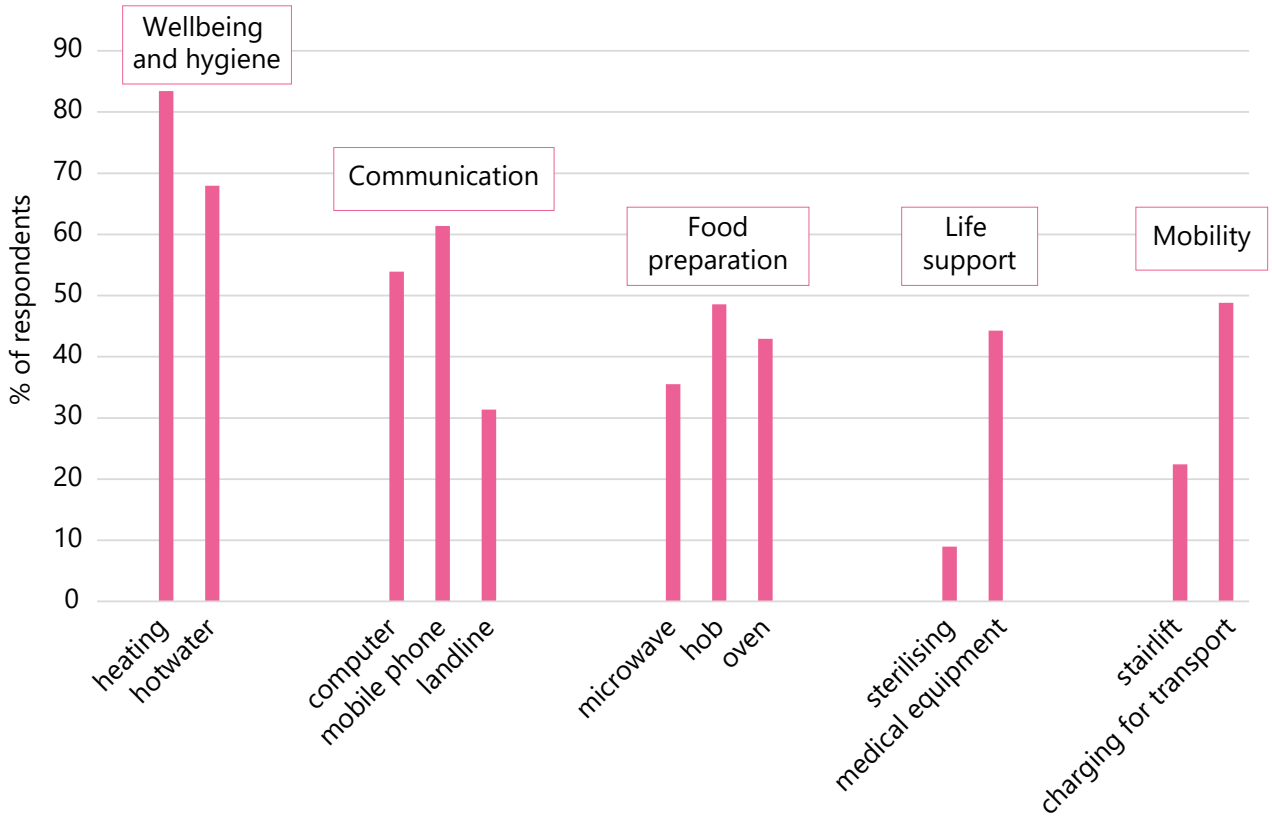
Restricted access to energy could have significant implications for the health and dignity of disabled people

We all need energy in the home for health, well-being and hygiene, food preparation and communication. However, the survey identified that disabled people are reliant on energy to fulfil basic needs that many take for granted. Without power for mobility aids, some disabled consumers cannot toilet independently. Those with limited mobility may rely on electronic devices to communicate and connect with the outside world. In these, and other, instances disabled consumers are reliant on energy to live independently and live fully. In addition, many are reliant on energy for life-saving medical devices.

We identified five broad functions that disabled consumers are reliant on energy for:

- Wellbeing and hygiene
- Food preparation
- Mobility
- Life support
- Communication

What respondents could not manage without, or would find it difficult to manage without, for a period of 2 - 5 hours



Wellbeing and hygiene

Between these functions, the greatest reliance is upon energy for heat and hot water. 88% of the RiDC panellists surveyed could not manage, or would find it difficult to manage, without energy for heat for 24 hours. 75% those surveyed could not, or would find it difficult to, manage without energy for hot water for 24 hours.

For the people we surveyed, being cold can have severe ramifications for their health, worsening health conditions, causing breathing difficulties, pain or difficulty moving. Many have health conditions limiting their mobility or their ability to keep warm in the way others do. They told us they would just have to take to their bed if their house got too cold.

> *My breathing is difficult, and breathing cold air makes it worse*

> *I feel the cold intensely and prolonged low temperatures cause my body to spasm and lockup.*

Access to hot water is also essential to many who require it to soothe skin conditions or joint pains, to stay hygienic/clean up after personal accidents or to wash medical equipment.

> *cold water has a painful effect as the result of my condition*

> *I use a catheter and I am wheelchair dependent. I require daily bathing*

Microwaves and hobs were also used for heating heat-packs essential for pain relief, or to sterilise medical equipment.

Food preparation

Most participants told us they could manage without a microwave, hob or oven for a few hours – it would just mean they'd have to do without hot food for a while. However a few people rely on regular access to hot food, or need to be able to prepare food freshly for health reasons.

> *As a diabetic, access to a cooking facility is important (every 2 to 4 hours)*

> *I use the hob two to three times daily to prepare fresh food as it's important to my diet requirements*

Many rely on carers who come in at certain times for their one hot meal of the day – if cooking facilities were unavailable at this time, they wouldn't get their hot meal.

> *A helper comes in to cook a meal for me and only uses the oven and hob so if I don't have access to it then I don't eat*

Mobility

Although fewer respondents told us they rely on energy to power mobility aids, those that do would be significantly impacted if they were unable to power them. This includes fears around not being able to go to bed due to reliance on electronic chairs and beds, so having to sleep in the chair or not being able to go to the bathroom. For those with mobility issues, these fears were combined with the thought of falling and not being able to contact anyone for help.

> *I fell from chair and couldn't reach phone. Had to wait until my husband returned lying on the floor.*

For people with mobility disabilities, reduced access to electricity generated fear around being trapped in their home. Many of the participants have electronic doors which lock closed when power is cut off. There was also concern around the length of the time and frequency of these events.

> *When I have a power cut, my electric front door (enabling her to leave her home in her wheelchair) locks and I can't get out, and no one can get in.*

The online survey reiterated this reliance on energy for mobility. 1 in 4 RiDC members could not manage, or would find it difficult to manage, without energy for a stairlift for 24 hours. The same proportion could not manage without the stairlift for a shorter period of 2-5 hours. Reliance on mobility aids permeates these individuals lives and cannot easily be paused even for a short period of time.

Similarly, of the 64% who need energy to charge mobility devices (electric wheelchairs, scooters etc), 58% could not manage without for a short timeframe of 2-5 hours. A further 17% would manage for a short time but with difficulty.

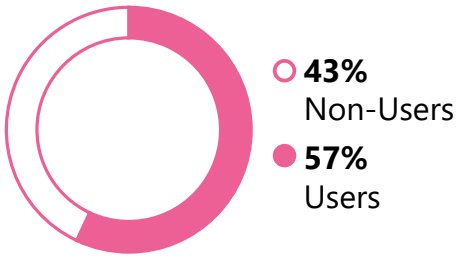
A key element of mobility devices is to give the immobile person independence, so that they can function without intervention or assistance. If electricity was insufficient to power their mobility devices, it would be necessary to involve a person to help them in the absence of their essential mobility aids. Therefore, everyone that took part in the workshops had their mobile phone to hand at all times.

1 in 4 RiDC members could not manage, or would find it difficult to manage, without energy for a stairlift for 24 hours.

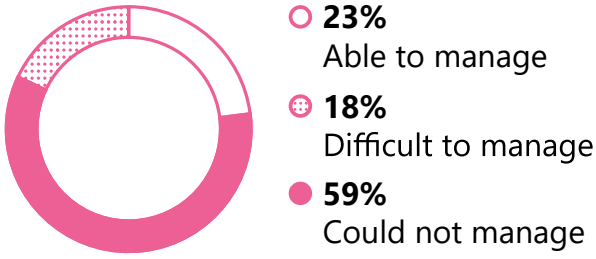
Life support

Just over half of those completing the online survey need energy to power medical equipment. For many of these people, powering their equipment is essential at all times. Of those needing to power medical equipment 59% could not manage without it for even a short window of 2-5 hours. A further 18% would manage but with difficulty for a short time. In addition, many were concerned about keeping medications cool.

Proportion using medical equipment



Ability to manage without energy - medical equipment (% of respondents who require electricity for medical equipment)



Communication devices

Communication is another important function that many disabled people rely upon energy for. 1 in 3 are reliant upon a mobile phone for communication and 56% are reliant upon a computer. For many these devices are their main link to the outside world, and how they order their food and work. They would feel cut off and lost without access to them for a few hours.

> *As I'm mainly housebound, I depend completely on my computer and the Internet to interact with the outside world.*

These devices are also essential in case of emergencies. Everyone that took part in the workshops told us they had their mobile phone to hand at all times. In the event of an emergency, they all had series of people that they call for assistance. This included family members that lived with them or elsewhere; carers, friends and neighbours that check in on them. Survey respondents also told us they needed their mobile phone for emergencies.

> *I have my mobile with me at all times it's the only way family / friends can communicate if I'm stuck in my bed with my disabilities*

Expensive peak-time energy could disproportionally impact disabled consumers

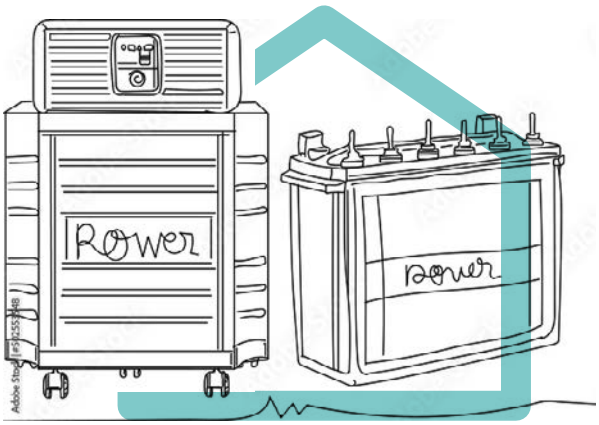
Many disabled people are reliant upon energy whatever the cost. As outlined above, these groups have equipment that they are unable to reduce or turn off without significant implications for their day-to-day life. At best, shifting usage or ensuring batteries for essential equipment are charged at times when energy is affordable would be inconvenient. However, it could lead to difficult decisions about putting up with severe discomfort or paying more. Many simply wouldn't have the option but to use energy when they needed to. One workshop participant with COPD who was heavily reliant on energy for her life saving oxygen machine told us:

> *I am reliant on my oxygen machine; I can't imagine not being able to afford to breathe.*

Co-designed solutions for the future

Case study 1

Scenario: Meet Rik, he lives with his wife in a first floor flat with lift and has Parkinson's disease so is reliant on his electric wheelchair. He uses Alexa to operate electrical devices. Power cuts are frightening because they are unexpected, and length of time is unknown. Unable to charge his wheelchair Rik is stuck at home. If his phone battery has died he's unable to get help.



Example solution generated by participants: Stand-alone large capacity battery and control system – permanently in home/integrated into the house, always charged, ready to take over in a power cut

- Should be set up with your preferences in advance - help you budget your power.
- Show you how much there is/what's left so you can prioritise how to use it.
- Should completely shut off power to devices not essential or being used at the time.
- Control via an app, or with voice control.

The system should be tested during a planned power cut to make sure it works. It should be supplied by government or energy company. Shouldn't be a fee, but could be a minimal rental cost.

To explore implications of reduced access to energy and generate potential future solutions, we ran a series of co-design workshops with small groups of disabled consumers. In these workshops we introduced them to elements of a future energy system in which we have greater reliance on electricity for heating and transport, and presented each group with a different scenario based on survey data. They used these as a basis to understand issues and generate possible solutions.

Planning aids

Throughout the groups, it was clear that many disabled people are planners. They organise their trips out in advance. They think about different scenarios and solutions to problems. This can be mentally exhausting, but it gives them the confidence to operate independently. Therefore, a number of the solutions they proposed centred around supporting their planning, for example through tools to help them think through in advance what to prioritise or how to cope during periods of reduced access to energy. Other suggestions were centred around access to better information, allowing people to make choices when energy costs are rising and enact plans if supply will be reduced.

Protected access to energy

Some disabled consumers simply cannot manage without electricity for life saving medical equipment or to live independently. Participants therefore suggested a number of solutions that could ensure they would always have enough energy, at least for what they considered essential. One solution proposed was to prioritise access to energy for anyone with a medical need for electrical devices. Many groups proposed solutions centred around the idea of back-up battery power – either to seamlessly provide for all their energy needs or to cover essential use.

Price protection

Many participants were concerned about the possibility of expensive peak-time electricity prices in the future having a disproportionate impact on disabled consumers who are unable to shift their use of energy for essentials to a time when prices are lower. They suggested some ways to make these costs fairer.

Home efficiency improvements

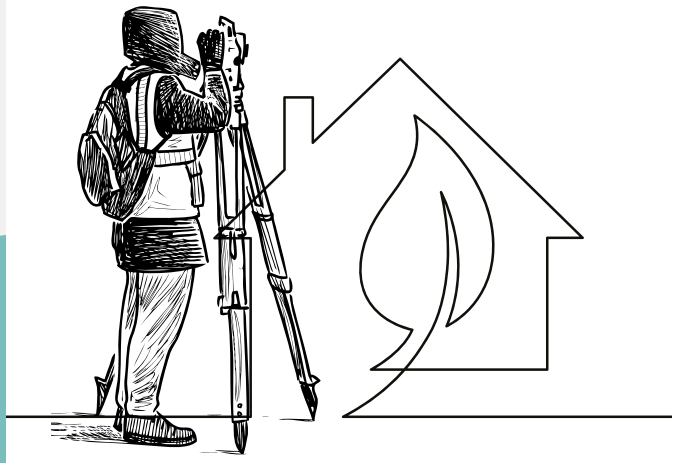
Those that have disabilities or illnesses which mean that they feel cold or struggle to maintain their core body temperature, are reliant on heating, often all year round. Many solutions were suggested as ways to help people stay warm during periods of reduced access to energy e.g. back-up batteries to provide emergency heat to at least one room, protected prices, or protected access to energy even during peak times for those who really need it. Participants also suggested efficiency measures, such as improved home insulation or off-peak heat storage, as being ways that disabled consumers could manage to maintain a healthy home temperature without drawing on peak-time energy.

Proposed solutions	Examples
Planning Aids *"They (the electricity company) could just text a schedule of energy prices so that I can plan my day."*	**Energy plans:** These would be bespoke and shared with family members, neighbours and carers. It would cover how to deal with new situations, in particular cases of reduced energy supply, enabling them to cope and ensure that any needed help is on hand in the event of an emergency. A standard template of things to consider shared by key services could be a starting point. **Low-power plan app:** One group talked about setting up a low-power plan via an app that would automatically turn off everything in their home leaving only essential items working for periods of reduced access to energy. **Electricity pricing notification system:** During electricity restrictions times, a text or app notification would be sent detailing the times and the level of restriction. This would also be mirrored for high priced electricity. Times of 'no' or 'low' use can then be planned for, just like the other things going on during the day.

Proposed solutions	Examples
Protected access to energy	**Priority service:** At time of electricity restrictions, those reliant on electricity for life saving medical equipment or mobility devices are given priority access to electricity. This would involve all such homes being on the priority services register (PSR). One suggestion was the PSR is directly linked to your medical notes so always updated. **Back-up battery:** One solution proposed was a battery that could run the whole house during times of reduced access to energy. One group proposed the idea of a battery to power essential items, integrated with a control system to ensure power is directed to what is most needed at the time. Batteries should ideally be installed (even provided free of charge to disabled consumers) in the house and always have enough charge stored for when needed. **Battery powered heating:** To ensure there is always a warm space in their house, this suggestion was for a battery to supply power to heat at least one room when electricity is inaccessible.
Price protection *"If people can't afford it, they should be given help. But if it's affordable they shouldn't need financial support."*	**Means-tested subsidies:** Those constantly reliant on medical equipment to receive financial support or reduced electricity prices to help meet any costs associated with expensive peak-time energy use. The subsidy level would be relative to income as well as disability or illness.
Home efficiency improvements	**Home insulation:** Insulate homes so that they stay warm for a few hours even when the heating isn't on. **Off-peak heat storage:** Heating systems that heat homes with off peak electricity so they don't need to use heating when prices are high or electricity is restricted. This could be something like a storage heater.

Case study 2

Scenario: Meet Alan, he lives with his partner. He is suffering from cancer and has recently had successful treatment for his illness. The effect of the illness plus the treatment means that he feels cold and often can't get warm. He is therefore very reliant on his home heating. In a future where all heating is powered by electricity, any power restrictions due to availability or cost impact Alan's ability to use his heating.



Example solution generated by participants: to fully insulate Alan's home so it holds the heat for a couple of hours even when Alan is unable to use the heating.

- Improve the insulation of his home – provide a full package on how to do so.
- People on the priority services register should be offered an assessment. Advice should be offered without people having to ask. This service needs to be offered via a reputable source (like GPs, information on council bills or via Energy companies).
- A surveyor visits and makes recommendations as to what needs to change and how it could be funded. Might be fully funded or via loans depending on ability to pay.
- Thermal imaging could show improvement in insulation level, and data could show how long home will stay warm for to reassure.

Involving disabled consumers in the design of future solutions to benefit everyone

Inclusive design is essential to good product design

Many advocate taking an inclusive design approach to developing new products and services, including those in the energy sector[3]. This requires involving a wide variety of users in the design process, from initial ideation through design to testing. Our project highlights this too.

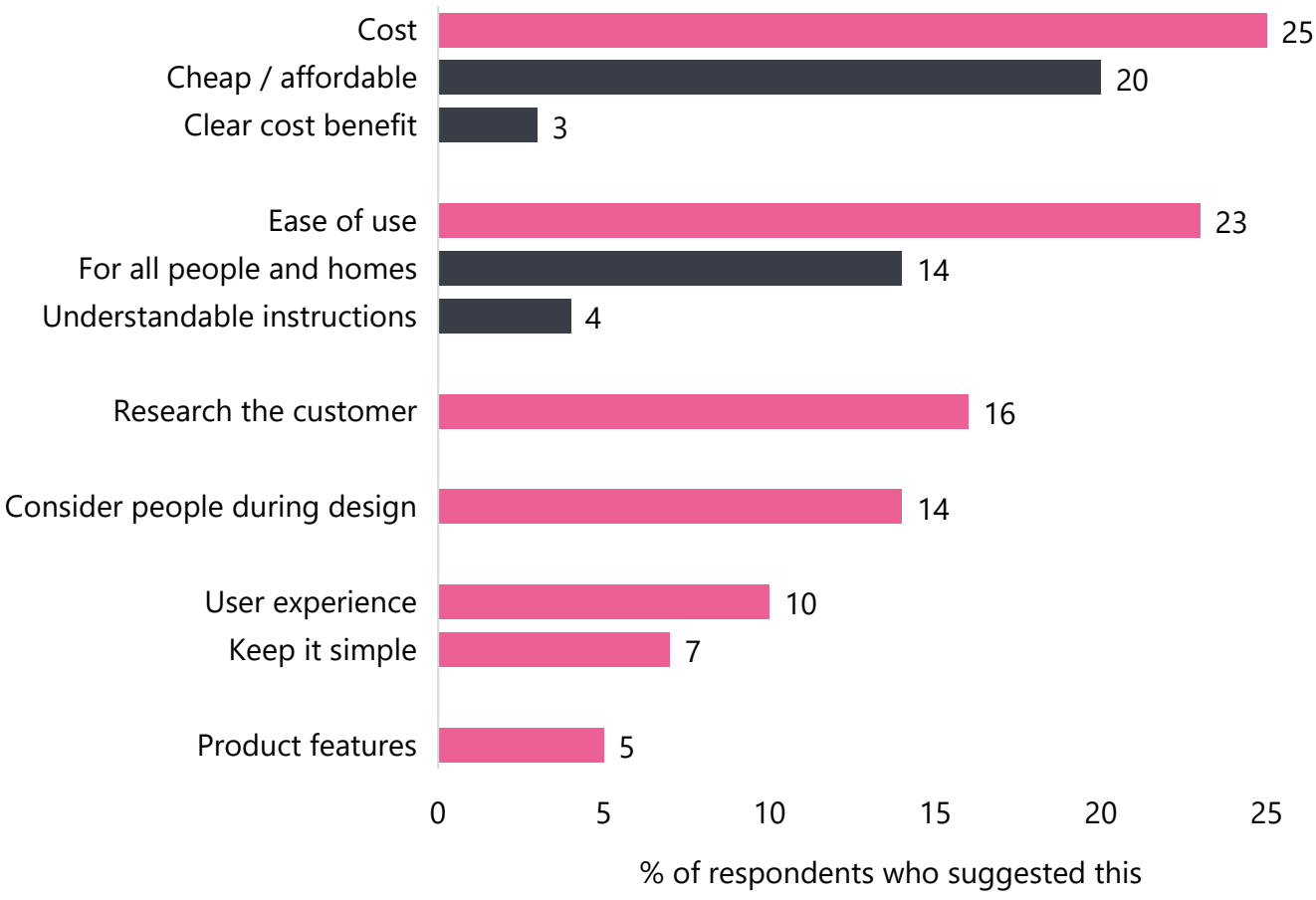
Survey respondents shared with us their views on the most important elements of products that work well for them, including being affordable, being simple and easy to use, being designed with their users in mind and offering a good user experience.

They told us that they felt it is important to involve disabled and other consumers during the design and testing of new ideas, and many volunteered to take part in this research as a way of making sure disabled consumers' voices were being heard:

> *Adhere to the principles of inclusive design at all times and consult disabled people throughout the design process.*

> *Make sure it is accessible to everyone. Get it tested by lots of different types of people and households before launching it.*

Considerations for innovative design



Co-design workshops enabled participants to use their own unique experiences and perspectives to generate solutions

Those that took part in the workshops had varying disabilities so brought different views and perspectives to the workshop. The use of the scenarios enabled each group to focus on the same problem whilst enabling them to draw on their own experiences to understand the issues the person in the scenario would face and to consider solutions that might help them. We found that asking them to think about power-cut situations was a useful way of prompting them to think about some of the problems and issues which could be faced by disabled consumers in a future energy system with restricted access or expensive energy at certain times – a concept they had not yet experienced.

> *"It was a pleasure to take part and so nice to pick up ideas from likeminded people."*

Ideas revealed aspects of future solutions that are key, and would appeal, to disabled consumers

The solutions or ideas generated in these short workshops often did not go much beyond things currently done, or measures put in place by DNOs to make sure consumers in vulnerable situations are protected during times of a power cut. For example, price protection could be likened to disability allowance or warm home grant; and back-up batteries a future version of back-up generators or alternative-fuel heaters. However, they also reveal some of the main concerns disabled consumers might have about a future energy system, and the kinds of solutions that would appeal to them. These should be treated as a starting point for considering the potential consequences of changes in the energy system going forward, as well as initial ideas for how to protect them. For example, participants gave quite specific examples of ways that energy supply could be protected for those that really need it: whilst ensuring energy is available for these essential uses is key, there might be many ways that this could be achieved. A more extended, iterative co-design process could help generate and develop practical solutions that would really work for disabled consumers.[2 3]

Solutions proposed would benefit everyone, not just those with disabilities.

Throughout there was an understanding that some uses for energy were more critical than others, and that some people had a greater need to have access to it than others. Whilst it was felt that people with disabilities should always be able to afford the energy they need, it was also suggested that only those that needed it should receive help with costs. Many of the solutions proposed are not just things that would benefit disabled consumers. Everyone could benefit from clear and well-designed communication of energy pricing and availability information, embedded in plans for how to respond to it; better insulated homes that reduce our need to heat during peak-times; or in-home batteries to allow us to continue to use the energy we need even at times when it's less available or more expensive from the grid. Taking an inclusive innovation approach will ensure that disabled consumers needs are met, but could result in better, more robust solutions for everyone.

References

[1] Operating the future energy system and enabling smarter and more flexible energy systems. ESC publication, https://es.catapult.org.uk/report/enabling-smarter-and-more-flexible-energy-systems/

[2] Trialling with Disabled Consumers: Enabling energy innovation to be inclusive. https://es.catapult.org.uk/report/trialling-with-disabled-consumers-enabling-energy-innovation-to-be-inclusive/

[3] How can innovation deliver a smart energy system that works for low income and vulnerable consumers? https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/994845/project-involve-smart-energy-system-low-income-vulnerable-consumers.pdf

Enabling Inclusive Innovation Project

The Research Institute for Disabled Consumers (RiDC) is working in partnership with the Energy Systems Catapult (ESC) to support the development of innovative, accessible smart and low carbon energy products and services, and inform consumer and policymaker decision making. Over the course of the 2 year project they are working with disabled consumers to investigate the accessibility and usability of Electric Vehicles (EV) home charging; the accessibility of consumer information about renewable home energy & heating options and funding; and investigate emerging vulnerabilities of de-carbonisation for disabled & older consumers.
This project is supported by the Energy Redress Fund (administered by the Energy Savings Trust).

CATAPULT Energy Systems

The Energy Systems Catapult (ESC) was set up to accelerate the transformation of the UK's energy system and ensure UK businesses and consumers capture the opportunities of clean growth. The Catapult is an independent, not-for-profit centre of excellence that bridges the gap between industry, government, academia and research. We take a whole-systems view of the energy sector, helping us to identify and address innovation priorities and market barriers, in order to decarbonise the energy system at the lowest cost. Energy Systems' Catapult has extensive experience of running trials of energy products and services, and boasts a unique 'Living Lab' research network of over a 1500 consumers with connected homes. Through their Fair Future programme they are harnessing innovation to better understand and reduce vulnerability to fuel poverty, designing smarter policies, products, services and consumer protections. https://es.catapult.org.uk/

LIVING LAB

RiDC

The Research Institute for Disabled Consumers (RiDC) is a UK charity providing independent research to create accessible and inclusive products and services. As an organisation led by disabled people, it matters to us that the insights from disabled and older consumers are listened to. https://www.ridc.org.uk/

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