

Home Energy Saver: Demographic Research

Research conducted for Sia Partners as part of the UKPN
Home Energy Saver research project.

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Key messages

This report presents the results of demographic research, conducted as part of the UK Power Networks (UKPN) Home Energy Saver research project. The goal of the project is to conduct research and engagement with customers to develop online tools which can improve support services, ensure equitable access to energy, and reduce barriers to entry in participation in the energy transition.

Through desk-based research incorporating quantitative and qualitative approaches, the research aimed to:

- Define vulnerability in the context of the sustainable energy transition
- Identify the key needs and challenges faced by these vulnerable groups in the transition
- Determine the demographic profile of vulnerable customers in the UKPN license area
- Explore the effectiveness of current support services and identify areas for improvement, to support vulnerable customers' engagement with them.

This report is in four parts. The first chapter defines vulnerability, using the CSE Capabilities Lens. The following chapter sets out the methodology for the research, and then details the needs and challenges faced by each group of vulnerable customers, and their prevalence compared to national averages. This results chapter is in five sections, corresponding to five capabilities that determine whether a group or individual may be left behind in the energy transition. The third chapter summarises findings on the effectiveness of support services and the areas we have identified for improvement. The final chapter presents our recommendations and next steps.

Key findings:

- Vulnerability should be underpinned by the capabilities an individual or household has to participation in the energy transition.
- Vulnerabilities rarely exist in isolation. There is often an intersection of multiple vulnerabilities, such as health conditions and disability with low income and/or the elderly, low income with low energy usage, and lack of digital skills with the elderly, low income, and health difficulties.
- Certain vulnerabilities are overrepresented in the UK Power Networks (UKPN) license area, compared to the nation as a whole. These groups should be a priority for customer engagement research, including:
 - Households with young children
 - Social renters and private renters
 - Those in energy inefficient housing

- Many vulnerabilities are distributed unevenly across the area. For instance, the majority of households with young children are located outside of Central London, particularly in the surrounding suburbs. Those in fuel poverty are more heavily concentrated in the central and northern parts of the UKPN area. Private and social renters are both concentrated in and around Central London.
- Non-English speakers are overrepresented in the UKPN area, particularly in London. This group runs a distinct risk of being left behind in the energy transition, and of being excluded from online tools and their development, since customer engagement would require dedicated translation resources.
- Households with limited access to the internet are widespread across the area outside London. Although this very factor will make it challenging to involve in this customer engagement, it highlights that a large proportion risk being excluded from online tools and their development.
- Support services for vulnerable households must be tailored to their needs. The information provided should be simple and accessible, but providing enough detail on the costs, benefits, and risks involved in various smart energy options. They could also benefit from acting as a 'one-stop-shop' that signpost to other essential services, such as financial support.

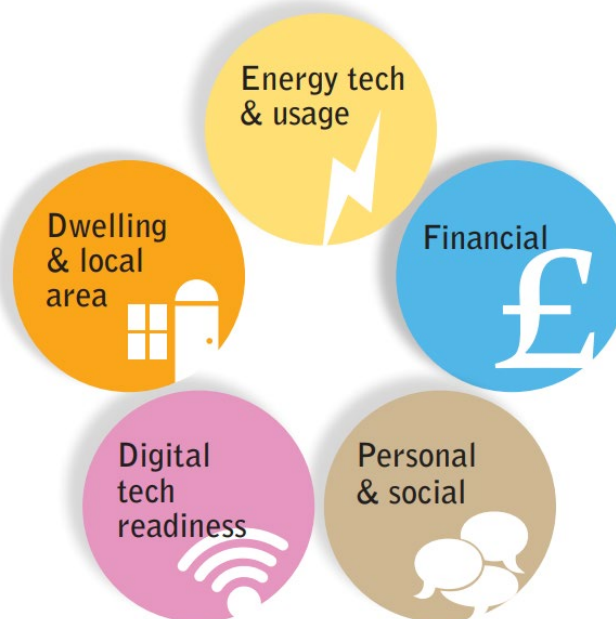
Defining vulnerability

'Vulnerability' in the energy transition is complex and multifaceted: it may be static or transitory, whilst some people may be characterised by multiple, intersecting vulnerabilities. There is an increasing recognition of the importance of understanding, recognising and tackling vulnerability in an intersectional way (Rainard et al, 2025).

UK Power Networks (UKPN) also emphasise 'leaving no-one behind' when considering vulnerability, describing those who are unable to fairly benefit or participate in the low carbon transition, due to economic, geographic, or societal factors. The 'leaving no-one behind' definition includes those who cannot afford low-carbon technologies such as Electric Vehicles or heat pumps; renters or those in inefficient homes with less control over energy efficiency measures; those with lack of digital access; and those with increasing costs of energy during the transition.

Since such definitions can apply to a very wide range of customers, further narrowing down of key indicators of vulnerability is needed. The Centre for Sustainable Energy's (CSE) 'Capabilities Lens' categorises the factors that influence people's ability to participate and engage with energy market offers and developments, including technological advancements. Figure 1 shows the five capabilities that determine whether a group or individual may be left behind in the energy transition.

Figure 1: CSE's Smart Energy Capabilities (CSE, 2024)



In this report, 'vulnerability' combines UKPN's understanding of a vulnerable customer, 'leaving no-one behind', and the Priority Services Register (PSR) criteria. The Capabilities Lens is then used to better delineate the demographic indicators that define a vulnerable household. In brief, vulnerability can be understood as:

'Any household that is unable to fully participate or benefit in the low carbon transition due to any combination of dynamic and intersectional characteristics and circumstances.' (CSE, 2023a)

Table 1 presents a set of indicators of vulnerability, grouped under the corresponding Capabilities Lens (CSE, 2020). Using these indicators, combined with demographic mapping for the UKPN license area, we identify potential priority groups for engagement when developing online tools which can help us to reach vulnerable groups, or those with limited capabilities. We also highlight groups for whom multiple vulnerabilities intersect.

Table 1: Vulnerability indicators grouped under the Capabilities Lens

Capability	Vulnerability indicator
Personal and social	Physical/mental health conditions and disability (including electricity-dependent equipment)
	Elderly individuals
	Families with young children (under age 5)
	Limited English skills
	Temporary events e.g. bereavement, illness, redundancy
Financial	Low income
	Type and length of tenure
Dwelling and local area	Energy inefficient house (EPC rating under E)
	Lack of space
	No smart meter / smart meter issues
Energy tech and usage	Low energy user
	Don't own any energy efficient technology (includes electric vehicles (EV) and smart appliances)
Digital tech readiness	Lack of digital skills, knowledge and confidence
	Limited / no Internet access
	Don't own a smartphone

Needs and challenges

This chapter presents the quantitative and qualitative analysis of the demographic research, where key indicators of vulnerability are discussed against the needs and challenges that these groups may experience. These are broken down according to the Capabilities lens they fall under, so that the capabilities approach runs throughout this report.

The sections below describe the key challenges and needs of each vulnerable group. The ways that these needs should be accounted for in support services is considered here, as well as in the following chapter on 'improving support services' (p.26). These needs and challenges can explain why some people risk being left behind; identifying them can enable ways of overcoming or working alongside them to mitigate this.

Several vulnerabilities intersect with other vulnerabilities. Where this is the case, the text is highlighted in bold.

For each group, we compared the percentage of households meeting this characteristic in the UKPN license area with national averages (where publicly-available data was available). Since national average data is collected differently depending on the topic, some national averages are for Great Britain, whereas some are for England & Wales, or just England; where possible, we have included both. This shows us which groups are generally overrepresented in the UKPN area, and thus which groups may constitute a priority demographic to inform the development of online tools. A full table of statistics and data sources is presented in Table 10 in the Appendix.

Previously, CSE worked with Sia Partners on UKPN's Socially Green project, which ran from 2020 to 2023 (CSE 2023e). As part of this, UKPN developed an online [vulnerability mapping tool](#), which we use here to demonstrate the geographic distribution of the vulnerability indicators in the UKPN license area for 2025. Where a suitable and comparable indicator exists in the mapping tool, we include screenshots of the maps it creates, to visually demonstrate the distribution of particular groups throughout the license area, at Lower Layer Super Output Area (LSOA) scale. Each figure consists of two maps: the lefthand panel highlights the top 20% LSOAs with the highest levels of the vulnerability indicator (i.e., the most vulnerable), and the righthand panel illustrates the proportions of the vulnerability indicator across all the LSOAs. Note that the colours in the righthand panel are sometimes impacted by the dense concentration of LSOAs in the Greater London area, occasionally appearing darker. It is also important to note that the 2025 data in the UKPN mapping tool is a forecast, and therefore should not be taken as a precise representation of current demographic data (UKPN 2021; UKPN 2025).

In the following sub-sections, we take each of the five capabilities in turn, breaking it down into vulnerability indicators as shown in Table 1 above, and detailing the particular needs and challenges of each group, as well as how support services might be improved.

Personal and social

This lens includes the personal factors, mindset, values, and social connections that enable engagement. An analysis of the PSR criteria is also included [here](#).

Physical/mental health conditions and disability

The challenges faced by those with a health condition or disability may include: having a **below-average income**, higher energy needs, being at greater risk of unemployment, and being more likely to be on a prepayment meter (Snell, Bevan and Thomson, 2014). They are also more likely to experience **fuel poverty** (ibid.). The intersection of health conditions with financial status means that this group risk facing additional financial barriers, such as having to invest in certain appliances and equipment (see 'Low income').

Being on a prepayment meter can increase the likelihood of self-disconnection to help with energy costs (CSE, 2020). This places themselves in potential danger, so support should be offered to deter this activity and suggest safer ways to reduce energy consumption. Disabled people and those with a health condition are advised against prepayment meters due to this risk of running out of gas or electricity, so support should be offered to either deter intentional disconnection or encourage switching payment method (Citizens Advice, 2025).

The higher energy needs of those that rely on electricity for medical and disability-related equipment can make it harder for them to benefit from demand-shifting schemes and time-of-use tariffs. Mobility issues can also limit their ability to manually adjust usage, if lacking automated approaches such as smart plugs. Research has shown that those with long-term health conditions are more likely to have worse experiences and outcomes of demand-shifting services (CSE, 2023b; Sia Partners, 2021).

Within this group, mental health and conditions such as dementia are often excluded from research around vulnerability (Sia Partners, 2021). These conditions, including neurodivergence, may also make demand-side flexibility challenging due to the greater need for routines or trouble remembering. People with mental health conditions can also find engaging with their energy supplier more challenging (Gaffney, 2019). As a result, they may be missing out on key information to support their participation in the energy market.

Finally, this group may also face barriers to their uptake and successful use of support services tools due to lack of accessible resources. Engagement must be tailored to the need, including a consideration of whether in-person visits would be more valuable for certain energy opportunities. Online tools could highlight and signpost services that offer in-person support.

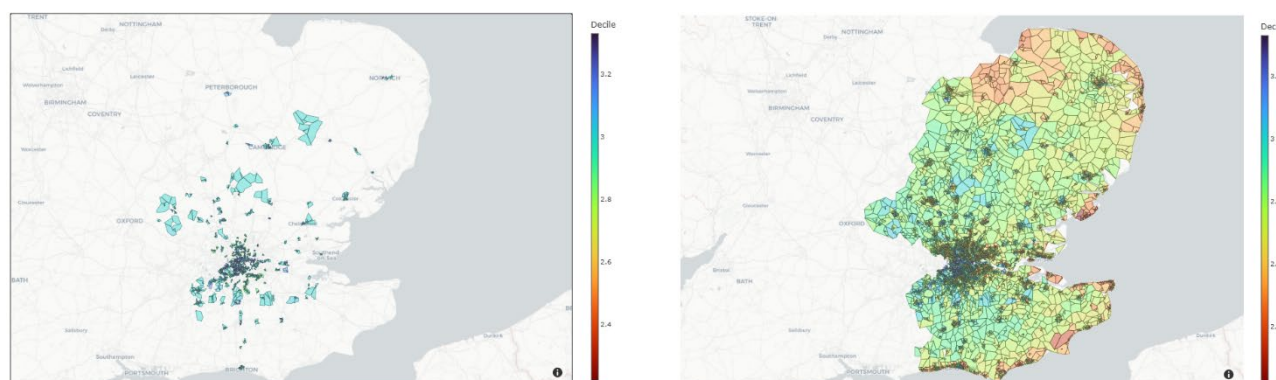
Table 2 shows that this group is marginally under-represented in the UKPN area, compared to national averages. The lefthand panel in Figure 2 shows the top 20% of LSOAs in the UKPN area

with the highest numbers of health conditions and disabilities. For this indicator, the most vulnerable in the UKPN area are concentrated in and around London, as well as the centre-East.

Table 2: The proportions of people not in good health and disabled

	% in UKPN	% in England and Wales	% in Great Britain
Not in good health¹	15.66	17.70	18.00
Disabled under the Equality Act²	15.30	17.53	18.08

Figure 2: The geographic distribution of the population characterised by a health condition or disability. Areas with higher levels of health conditions/disability are represented by blue/green, whilst areas with lower levels are represented by orange/red. Lefthand panel shows top 20% of LSOAs for this indicator; righthand panel shows all LSOAs, colour coded by decile.



Elderly individuals

Elderly individuals are often characterised by the following challenges and needs: spending a larger proportion of their time in their homes, consuming more domestic energy, requiring more warmth, and susceptibility to fuel rationing due to fixed incomes. They also are more likely to face physical barriers that could impact their interaction with equipment (Sovacool et al., 2017).

Whilst spending more time at home and consuming more energy could make demand shifting flexibility schemes and time-of-use tariffs easier due to greater capacity to shift their consumption, it could also cause greater resistance to ‘flexing’ their consumption habits. Research supports this, with residents preferring to prioritise their expenditure on heating their home to a comfortable level as this is where most of their time is spent (CSE 2023c).

¹ This is a binary measurement, scoring either ‘in good health’ or ‘not in good health’.

² These figures are aggregated from ‘day-to-day activities limited a lot’, and ‘day-to-day activities limited a little’.

An increase in **health complications** with age means that this group may face the **financial barriers** similar to those identified above, limiting their options of energy installations and alternative tariffs. Health challenges such as sight issues, hearing issues, and dementia, must be considered when engaging and communicating with this group. Face-to-face support from trusted actors can help with engagement and uptake of energy tools and offers (CSE, 2023c).

Elderly individuals are more likely to be digitally excluded than their younger counterparts, **lacking the digital skills and confidence** required of many smart energy developments (Age UK, 2023). Support must aim to increase digital skills to ensure that they are able to sufficiently act on the advice provided to them.

Table 2 shows that this group is generally under-represented in the UKPN area compared to national averages. Figure 3 shows that the areas with the highest proportions of elderly people live outside of London, whilst figure 4 shows that areas with the highest proportions of people claiming pension credit are in fact based in London.

Table 3: The proportions of people over the age of 66

	% in UKPN	% in England and Wales	% in Great Britain
Population over 66	15.50	17.54	17.64

Figure 3: The percentage of households with elderly people (over 66) living at the address. Areas with higher percentages are represented by lighter greens, whilst areas with lower levels are represented by darker blues and purple. Left-hand panel shows top 20% of UKPN LSOAs for this indicator.

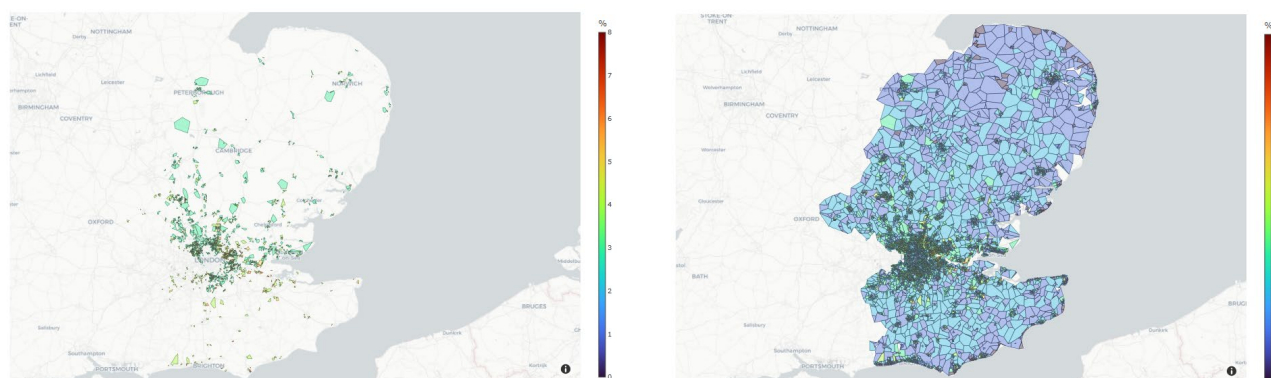
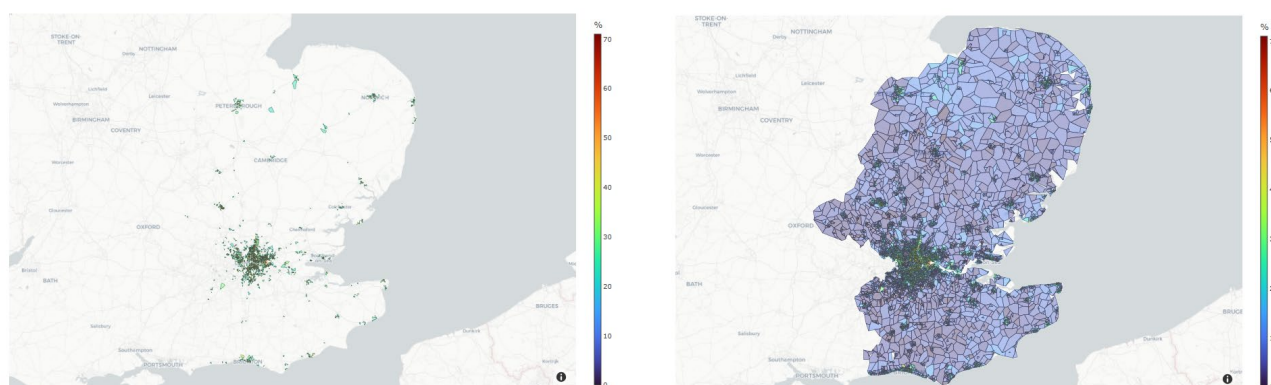


Figure 4: The percentage of adults claiming pension credit. Areas with higher levels are represented by lighter greens, whilst areas with lower levels are represented by darker blues and purple.



Families with young children (age 0-4)

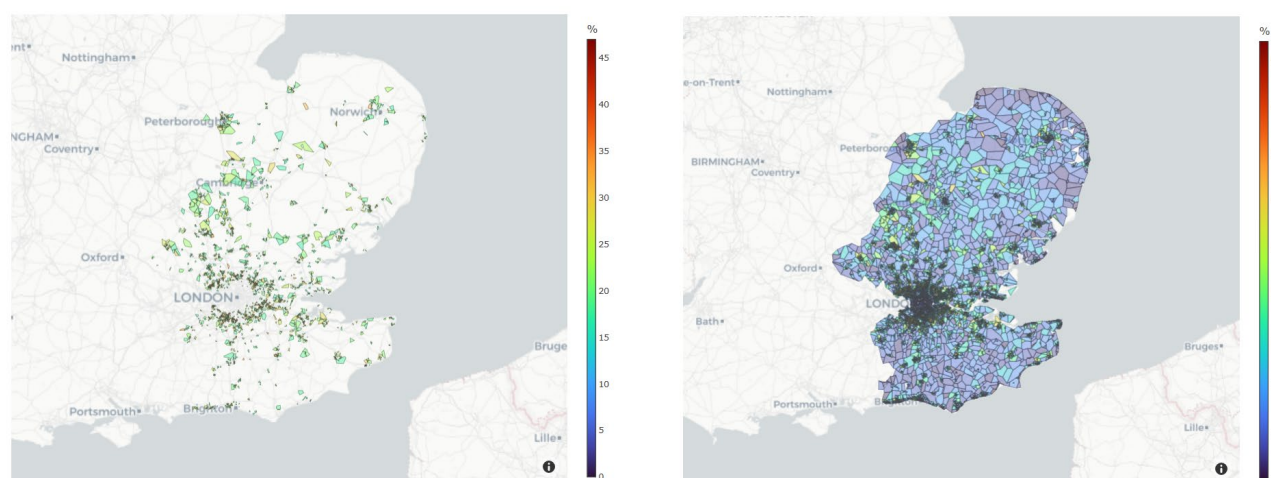
The key challenges faced by this group include having higher energy demands than those without children, and lack of flexibility in routines (Citizens Advice, 2019), which in turn may impact multiple other capabilities. The need to adhere to routines, such as feeding, cleaning and bathing, may make participation in demand shifting events more challenging. Research suggests that ensuring these needs are met can be challenging with particular low-carbon technologies, including adjusting heat pump controls to ensure that there is hot water for bathing (CSE, 2023a). This **lack of confidence** may deter uptake of new technologies, and the financial demands of young children may also deter them from decisions to invest, particularly if already on a **low income**.

Table 3 shows that this group is overrepresented in the UKPN area, and therefore may constitute a priority demographic to understand the barriers they face and inform the development of online tools. Figure 5 shows that the top 20% of LSOAs where there are the most families with young children are generally dispersed throughout the UKPN area, although there is distinct lack of this group in Central London, with a higher concentration in London's surrounding suburbs.

Table 4: The proportion of households with a child aged 0-4.

	% in UKPN	% in England and Wales
Households with a child aged 0-4	11.33	10.60

Figure 5: The percentage of households with children under the age of 4. Areas with higher levels are represented by lighter greens, whilst areas with lower levels are represented by darker blues and purple.



Limited English skills

This group may face challenges to participation in energy offers if there is a lack of translatable resources that are designed to increase understanding. Consequently, they may fall behind in the building of the **digital skills and knowledge** required to participate in offers, such as flexibility schemes. They also may be unaware of the services and measures that are available if unable to communicate with their energy supplier and external organisations in the first place (Sia Partners, 2021).

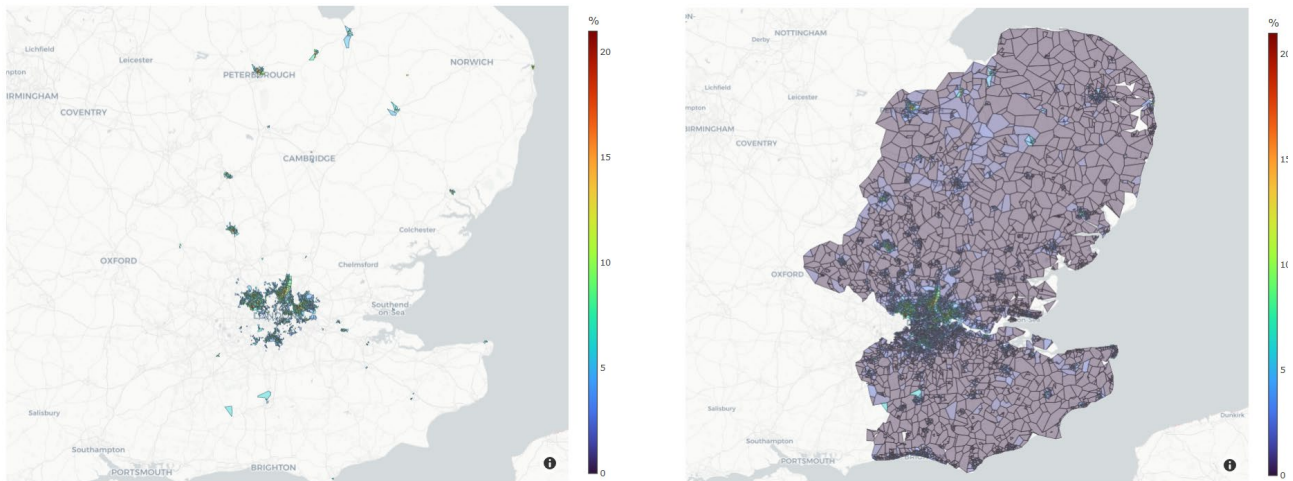
These individuals also risk exclusion from in-person engagement events, including at-home visits, if interpreters are not available. This could also be relevant for retrofit installations and post-installation support.

The figures in Table 4 show that this group are substantially overrepresented in the UKPN area compared to national averages. However, including them in any research going forward will be impossible without dedicated resources for linguistic and cultural translation services. Figure 6 shows that the vast majority of the UKPN area are English speakers (righthand panel), with non-English speakers highly concentrated in London (lefthand panel).

Table 5: The percentages of individuals who speak limited or no English

	% in UKPN	% in England and Wales	% in Great Britain
Cannot speak English	0.34	0.28	0.27
Cannot speak English well	2.02	1.52	1.48

Figure 6: % of the population that cannot speak English. Areas with higher levels are represented by lighter greens and blues, whilst areas with lower levels are represented by darker blues and purple. Note that the colours in the righthand panel are impacted by the dense concentration of LSOAs in the Greater London area; the lefthand panel shows the top 20% of UKPN LSOAs for this indicator.



Temporary events

Temporary events may substantially impact someone's level of vulnerability and their capability to participate in energy services and tools. Such temporary events include, but are not limited to: temporary illness, bereavement, new baby, divorce, bankruptcy, and moving home. Experiencing one of these events can make someone eligible for the PSR, and so are considered temporarily vulnerable. Many of these temporary events could also increase energy consumption, due to more time spent at home.

Such groups may be challenging to target and sample, for many reasons: low numbers in the population as a whole; the short-term nature of the events; and the fact that these events might make people less able to participate in research activities. However, research could ask participants about any of these events they may have experienced, and how it impacted their energy use and feelings around engagement with energy market offers.

Financial

This lens describes the financial status and money-management skills required to engage in energy market opportunities.

Low income & fuel poverty

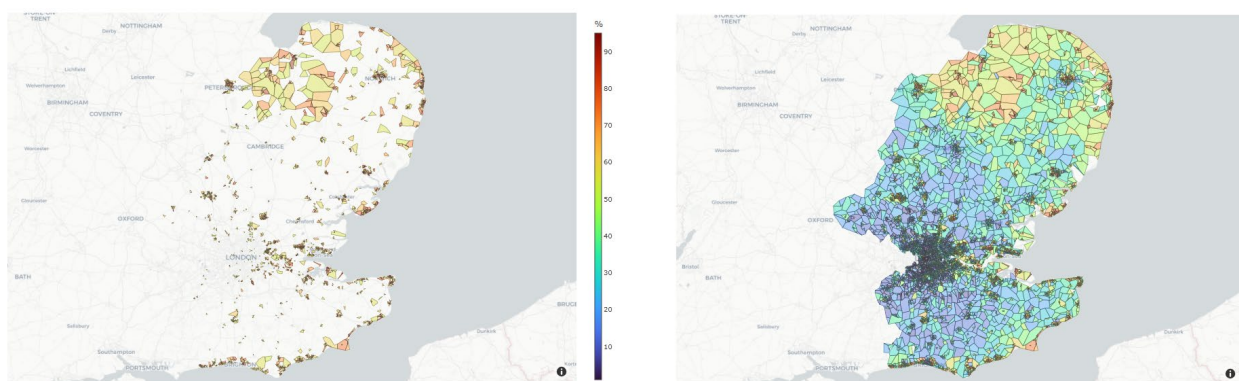
Financial status, including size and reliability of income, may substantially impact participation in the energy transition. Low income is also a key driver of fuel poverty, so these households may also be more likely to have **inefficient homes**. The financially vulnerable could be limited in their ability to invest in equipment and retrofits due to large upfront costs, as well as **lacking the confidence** to take up long-term offers (CSE, 2020).

This group can struggle to benefit from demand flexibility services and the financial rewards gained from reducing their energy consumption (CSE, 2023b). This is because they might already be **low energy users**, having reduced their consumption to a minimum in order to keep their bills down. Financially vulnerable people may also be unable to afford a battery to support demand shifting, further excluding them from participation (Citizens Advice, 2020).

Support should ensure that these households are receiving any financial support they may be eligible for. Awareness must be raised on the support they might be eligible for and signposting to services to help 'income maximisation', such as Citizens Advice. This has found to be particularly helpful for those with additional vulnerabilities, such as those with chronic illnesses and **physical or mental health conditions** (Simcock and Bouzarovski, 2023). The intersection of financial vulnerability with other vulnerabilities such as the aforementioned **low energy usage, health challenges, and being elderly**, must also be considered as this will impact their ability to uptake any offers that simply target financial barriers.

Financial status is measured in a variety of ways, including income and being in receipt of particular benefits. However, data on people's income was not publicly available, meaning that we were unable to make a demographic comparison for this indicator. Figure 6 shows the percentage of the population in UKPN license area with a personal income of less than £20,000 (one measure of financial vulnerability, although by no means the only one). This shows that those on a low income are concentrated in coastal LSOAs and in the north of East Anglia.

Figure 6: % of the population with a personal income of less than £20,000. Areas with higher levels are represented by yellows and oranges, whilst areas with lower levels are represented by green, blue, and purple.



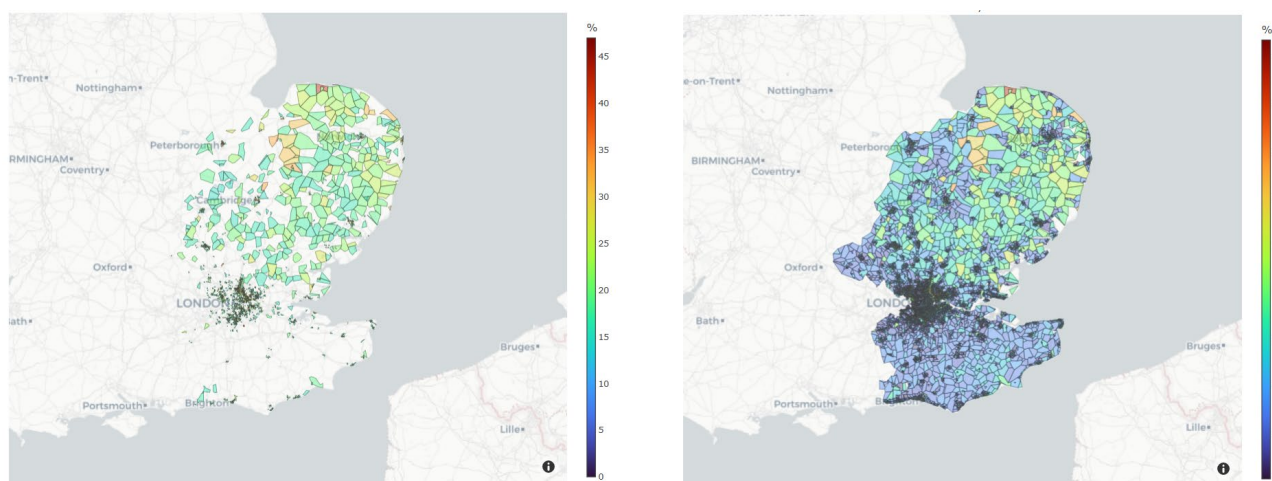
Similarly, there are multiple ways of measuring fuel poverty, with UKPN combining low income with those living in energy inefficient homes. The latter is covered in more detail in the 'dwelling and local area' section. Table 5 shows that fuel poverty is substantially underrepresented in the UKPN area in comparison to the national average. However, as shown in the lefthand panel of Figure 7, fuel poverty occurs widely across the whole of the UKPN license area, and particularly in East Anglia, the north-east of the license area, and coastal areas. This broadly maps onto the areas highlighted in the 'low income' indicator, although there is a higher concentration of fuel poverty in London.

Table 6: The percentages of households in fuel poverty

	% in UKPN	% in England ³
Households in fuel poverty	9.62	11.40

³ Only data for England is used here as differing definitions of fuel poverty by nation makes comparisons difficult.

Figure 7: % of the population living in fuel poverty by comparing the 'Low Income' (personal income of less than £20,000), 'Low Energy Efficiency' indicators. Areas with higher levels are represented by lighter greens and yellow, whilst areas with lower levels are represented by darker blues and purple.



Type and length of tenure

Both private and social renters are likely to be constrained by the lack of autonomy that will limit their ability to take up certain offers. Tenants might be restricted in their choices on fabric measures and equipment that require structural changes, including solar PV. The need for consent, and potential negotiation, before making any decisions, may be a deterrent in itself, particularly if there is poor relationship characterised by a lack of trust in their landlord.

Renters' opportunity to participate may also be impacted by their tenancy length. Long-term contracts are sometimes offered as part of flexibility schemes (such as battery storage), which can risk excluding renters with short tenancies (CSE, 2023d). There may also be a **lack of confidence** to take up longer-term offers or measures. With some energy efficiency measures requiring a larger investment in order to see the benefits later down the line, those on a shorter rental contract will lose out here as well.

Social renters are often characterised by a number of other vulnerabilities, although they may be more likely to have long and stable tenancies. They are more likely to be a single occupant (and so **low energy user**), **retired**, and have **lower income** than private renters (Department for Levelling Up, Housing and Communities, 2024). They are also more likely to have a household member with a **long-term illness or disability** – in a 2021 UK government survey, this characterised more than 50% of social renters (Gov.uk, 2023).

Table 6 shows that all types of renters are overrepresented in the UKPN area in comparison to national averages, therefore may constitute a priority demographic to understand the barriers

they face and inform the development of online tools. Figures 8 and 9 show that the areas with the highest proportions of private renters align to those with the highest proportions of social renters, largely falling in and around London.

Table 7: The percentage of private and social rental tenants

	% in UKPN	% in England and Wales	% in Great Britain
Private renting	23.17	20.27	19.59
Social renting	18.18	17.06	17.56
Renting combined	41.35	37.33	37.15

Figure 8: % of households that privately rent their home. Areas with higher levels are represented by lighter greens, blues and yellow, whilst areas with lower levels are represented by darker blues and purple. Note that the darker colours in the righthand panel are impacted by the dense concentration of LSOAs in the Greater London area; the lefthand panel shows the top 20% of UKPN LSOAs for this indicator.

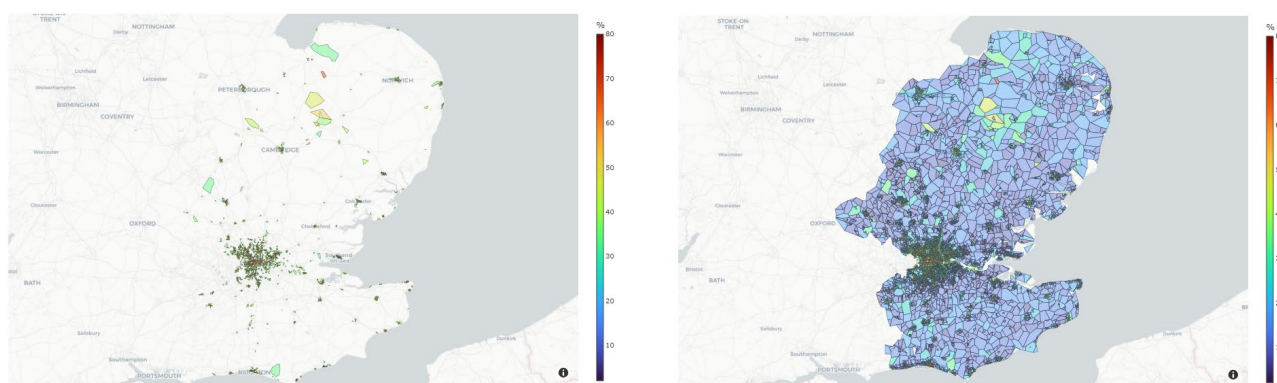
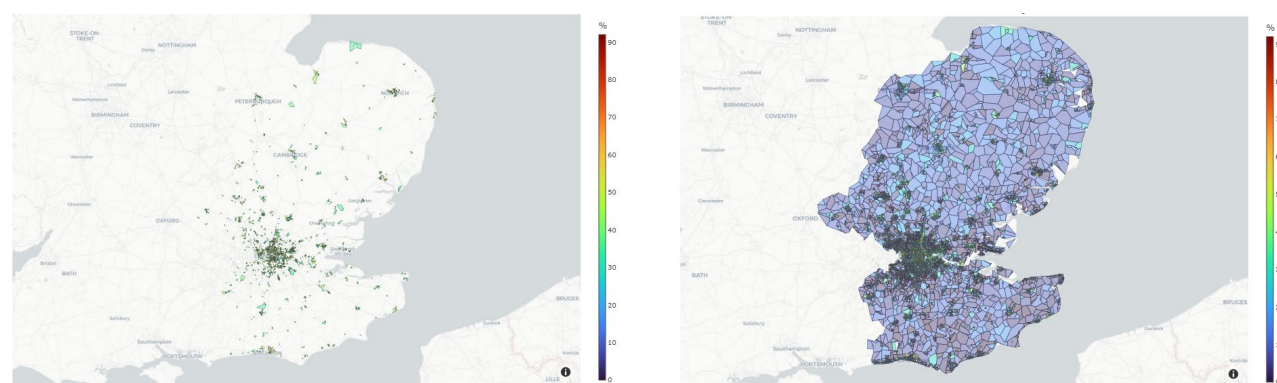


Figure 9: % of households that live in socially rented accommodation (includes both council and housing association social housing)



Dwelling and local area

This refers to the suitability or readiness of a dwelling in its location for the occupant to participate in an opportunity which offers electricity system benefits.

Energy inefficient house

Houses that are energy inefficient will consume more energy to keep it warm. This means that participation in energy offers may not be as rewarding if it is only possible to reduce consumption and expenditure so much whilst maintaining safe levels of warmth and dryness in the home.

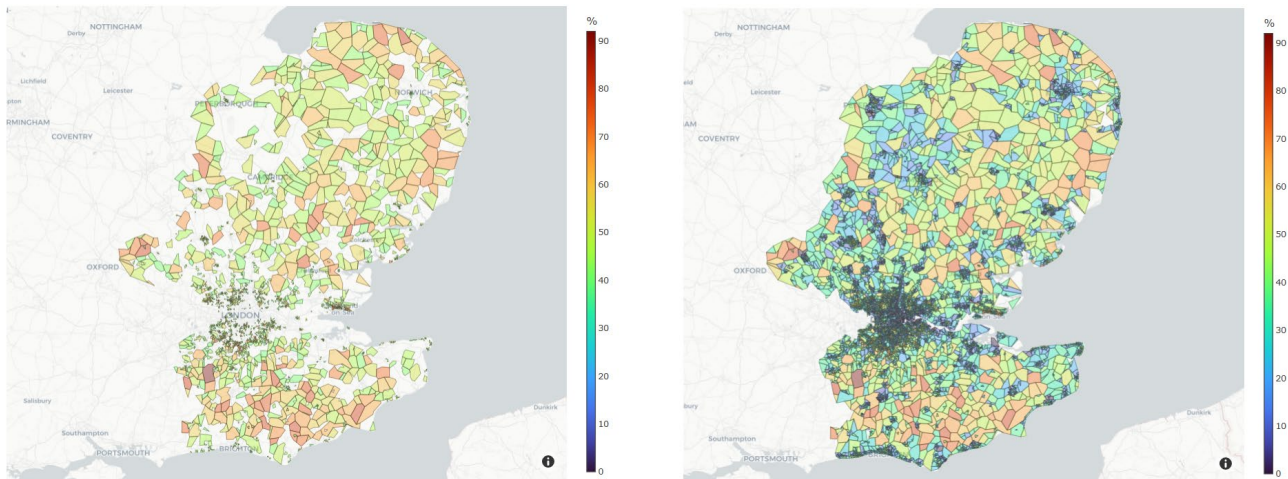
Inefficient households that are also financially vulnerable may struggle to pay their bills, and will be more at risk of fuel poverty (see '**Low income**' section). Financial support as well as energy efficiency measures should be the first point of intervention. 'Small' energy efficient measures, such as LED lightbulbs and draught-proofing strips are often recommended and can help reduce energy consumption. However, larger measures are needed to make more substantial savings, which are often unaffordable for people in fuel poverty. The access to finance can be supported by directions to available funding and referral to services that provide discounted or free repairs and upgrades (Ambrose et al., 2019). Support on the suitability of larger measures for the property can also enhance understanding of the reasons why their property may not be suitable for certain measures. Yet, this group may still face barriers to engagement as criteria for benefits, including free repairs, can sometimes exclude 'functioning' appliances, even if inefficient (Simcock and Bouzarovski, 2023).

The figures in Table 7 show that highly energy inefficient houses – defined as a household with an Energy Performance Certificate (EPC) rating of lower than E – are overrepresented in the UKPN area compared to national averages, therefore may constitute a priority demographic to understand the barriers they face and inform the development of online tools. Figure 10 shows that inefficient homes are an issue across much of the UKPN license area.

Table 8: Percentage of households with an EPC rating lower than E

	% in UKPN	% in England and Wales
EPC rating lower than E	2.68	1.94

Figure 10: The percentage of the population living in a home with an EPC band lower than E. Areas with higher levels of dwellings with EPC under E are represented by lighter greens, yellow and orange, whilst areas with lower levels are represented by darker blues and purple.



Lack of space

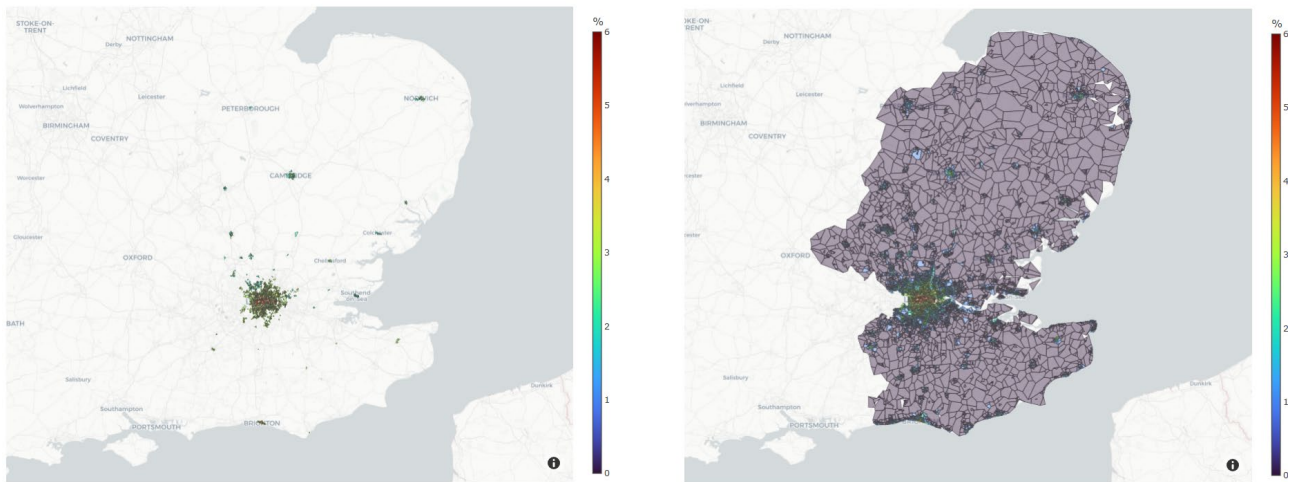
Those without sufficient space inside their home may be limited in their choice of certain technologies, including batteries, heat pumps, and any in-home displays. This has been shown to influence negative attitudes towards installing certain technologies and measures (CSE, 2023d).

A lack of outdoor space may restrict the ability to purchase electric vehicles if a charger cannot be installed, or fitting solar panels if there is a lack of roof space. Consequently, they will be excluded from the bolt-on tariffs commonly used with these technologies. Properties in more urban and built-up areas may be disproportionately disadvantaged in comparison to larger detached and semi-detached homes in towns, villages and suburbs (CSE, 2020).

These dwellings may benefit more from some demand-side energy offers, which will not require space-consuming structural changes. However, wall insulation measures can take up floor space in a building.

Figure 11 shows that the top 20% of this group are highly concentrated in Central London.

Figure 11: % of the population living in a small residency



No smart meter/smart meter issues

Smart meters are increasingly essential to almost all market offers, to ensure that both the household and energy supplier are able to monitor their energy usage and so make dynamic pricing possible (CSE, 2020). However, smart metering is still a major obstacle in the energy transition, with widespread negative attitudes towards smart meters arising from data privacy concerns and the view that they benefit energy companies more than households (CSE, 2023c). Negativity may be exacerbated by connectivity issues, which may arise in blocks of flats if the smart meter is placed at a distance from their in-home display. These issues are causing concern over the functioning of smart meters, leading to mistrust and potential disengagement with the smart energy transition (CSE, 2023c).

Smart meters can help households better monitor their energy usage, observing when levels may be high and so reduce their usage accordingly. Therefore, houses without a smart meter may be facing higher bills than those with smart meters, due to this inability to closely monitor and control their energy consumption.

Some people may require adjustments, including those with **health challenges** such as sight problems. The availability of accessible in-home displays must be communicated to support uptake among these groups (Citizens Advice, 2019).

Increasing the take-up of smart meters must tackle the **digital skills** required to use and understand them, a possible reason underpinning non-ownership. Information must be provided to bust any myths, alongside their benefits to the customer and importance in the ability to participate and benefit from emerging energy offers. A level of energy literacy is also required to read the in-home displays, so support should target this to help increase confidence (Citizens Advice, 2019).

Table 8 shows that households without a domestic smart meter are slightly underrepresented in the UKPN license area, compared to Great Britain as a whole. Data for this indicator was not available via the UKPN vulnerability mapping tool, so no maps are presented here.

Table 9: Percentage of households without a smart meter

	% in UKPN	% in Great Britain
No domestic smart meter	37.13	40.00

Energy technologies and usage

This lens refers to the appropriateness of household's energy usage profile and existing technologies for participating in smart energy offers.

Low energy user

This group are likely to face barriers to participation in demand services that reward households for reducing their consumption, with research confirming that they are more likely to have negative experiences of these services (CSE, 2023b). Low energy users may face challenges participating in schemes for turning down their energy demand without resorting to unsafe practices such as turning off essential lights, heating, appliances or even medical equipment. At the same time, however, they may also struggle to participate in demand turn-up schemes if they lack high-energy-consumption appliances to switch on. Again, the reason behind low energy usage is important here. If low energy consumption is due to financial challenges, then they may be facing financial barriers to other offers, such as the investment in costly equipment and technologies (see '**low income**').

On the other hand, not all low energy users will be vulnerable; for example, a household may have a lower baseline due to a highly efficient home. This reiterates the importance of exploring the intersecting vulnerabilities when determining research samples.

This review did not find publicly-available data on household energy consumption, likely due to the sensitive nature of this information. This indicator is not included in the UKPN vulnerability mapping tool, so no maps are presented here. For future research, low energy users could be an important group to target, since they may be increasingly left behind by the growing development of flexibility services and offers.

Don't own any energy efficient technology

'Energy efficient technology' here includes electric vehicles and smart appliances, such as washing machines and fridges. The disadvantage here is being unable to benefit from the tariffs offered alongside these technologies, and the ability to control energy usage remotely through a smartphone. See also '**energy efficiency**'.

The reason for not owning these technologies is important in understanding how to encourage their uptake. Whether it is due to a **lack of digital skills, financial issues, or renting constraints**, the barriers faced by each characteristic must be considered first. However, data on this vulnerability is highly granular and extremely complex, since a household might own one type of energy efficient technology but not another, and household-level data on appliance ownership is not available. This indicator is also not included in the UKPN vulnerability maps. For this reason,

we cannot include any data here, and would also find it challenging to sample for this group in customer engagement research.

Digital technology readiness

This lens considers a household's digital skills, hardware, and connectivity that could impact their ability to participate in energy offers.

Lack of digital skills, knowledge and confidence

Individuals lacking digital skills, knowledge, and confidence risk facing digital exclusion and disadvantage, and may be less able to participate in many smart energy developments. This group may be less inclined to take up smart energy offers and equipment if they have negative perceptions of smart technology, including smart meters (see '**no smart meter/smart meter issues**'). There are also more likely to find online switching services more confusing, meaning they may not be on an optimal tariff or with a supplier that best meets their needs (Citizens Advice, 2022).

A lack of digital skills may also risk the customer using technologies, offers, or retrofits incorrectly, which consequently could undermine the benefits they bring (CSE, 2023c). Not only may the user end up losing out financially (for instance, if misunderstanding Economy 7 rates), but they might put themselves in danger if prioritising potential cost savings over technology safety (ibid.). This highlights the need for robust advice services in explaining how to use energy efficiency measures safely and effectively. Enough time should be provided before a particular instalment or change to allow the individual to read, process, and consider any information they are provided.

This vulnerability intersects with several other vulnerabilities; those on a **low income, disabled, and the elderly** are likely to have lower digital skills (Citizens Advice, 2022; Lloyds Bank, 2021). Those with **mental health problems** may also lack some essential digital skills and knowledge if struggling to communicate with suppliers and services (Gaffney, 2019).

This group may not know where to access this information and knowledge, so there should be better signposting to particular sites and resources. These resources should have use simple language and be accessible to those with disabilities and limited English or speakers of other languages (CSE, 2020). The educational information provided in such resources should also emphasise and dispute misleading claims about smart technologies.

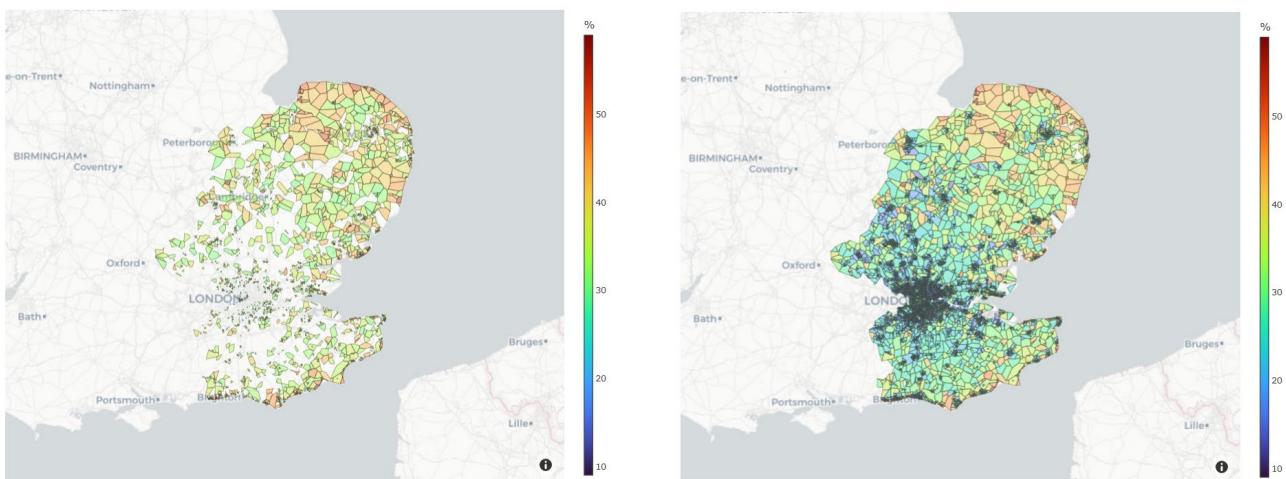
Limited or no Internet access

Many energy market offers are delivered through apps or online, meaning reliable broadband and/or mobile data is needed to participate in them (Citizens Advice, 2019). Limited Internet access could risk generating or exacerbating an existing scepticism or lack of confidence in smart technology if faced with recurring connectivity issues.

Meanwhile, smartphones are required for some smart devices, such as smart plugs and smart thermostats. Those with **no smartphone** will be unable to use these technologies and receive the financial benefits of being able to control household energy usage remotely cannot be achieved. Whilst an increasing proportion of the population own a smartphone, the **elderly** population have lower levels of ownership (Statista, 2025). The reason for not owning a smartphone is again important here. For instance, if it is due to a **lack of digital confidence**, they may be even further removed from the smart energy environment and so knowledge building and skill development must be the first step.

Figure 12 shows that many parts of the UKPN license area have a considerable number of homes with limited access to the internet, particularly in northernmost East Anglia and coastal areas. This suggests that a large proportion risk being left even further behind if their connectivity cannot be improved. However, this group will also be limited in their ability to utilise online tools, so they cannot be the focus in this research, despite constituting an important group in terms of vulnerability. Digital inclusion and inequality issues must be emphasised throughout this research, even whilst engaging with customers who do have access to the internet and therefore can benefit from online tools.

Figure 12: The percentage of the population with limited or no access to the Internet



Improving support services

This chapter draws on previous research exploring customers' experiences and attitudes towards existing energy support services to identify how online tools could be improved. A short overview will be presented here, as empirical research with focus groups in the next stage of this project will be used to investigate this in greater detail.

The challenges people may experience in navigating the smart energy market include the lack of descriptive information on the offers available and their functions, the capabilities required, and the financial consequences (CSE, 2024). The benefits of equipment and offers can also be difficult for people to visualise, therefore they may not fully grasp the advantages of various options (CSE, 2023a). These challenges risk being magnified for those with certain vulnerabilities, such as the elderly, disabled, those lacking digital skills or confidence, and those such as families with young children who may lack the time to learn about available offers.

Many vulnerable individuals and households will be accessing support on smart energy offers for the first time, so the balance between technical language and ease of understanding is important (CSE, 2024). Understanding can be supported by the provision of simple information sheets on each offer type, containing a short description and the key benefits and incentives of offers. The financial information should differentiate between the upfront costs and energy bill savings to help customers to gauge returns on investment. Risk, disruption, and trade-offs should also be highlighted for transparency, as well as the capabilities required by the offer or those capabilities that would help to maximise any benefits (ibid.). These are also worth exploring through research with vulnerable groups themselves, to understand from their perspective how and why they may face barriers to participation.

Support services and plans might also benefit from understanding the customer's individual stage in the energy transition, considering their knowledge and skills, to ensure they are getting the level and depth of information that they need. This could also avoid overwhelming a vulnerable individual with overly complex information when currently tackling hardships or challenges in their personal life (CSE, 2024).

Available information and terminology must be standardised to help customers make comparisons between the available options. Resources should be frequently reviewed and updated to account for a rapidly changing energy market, to avoid people receiving out-dated or incorrect advice (CSE, 2024). Additionally, smart energy advice should communicate the interaction of various products, services and tariffs, to ensure that the customer understands how to receive the maximum benefits from a particular offer (ibid.).

Any support should target uptake of smart meters where there is resistance, since lacking a smart meter is rapidly emerging as a key obstacle to uptake of many smart energy offers. Research has shown that interest or scepticism towards smart meters may be one route into smart energy

advice (CSE, 2024), therefore providing support here can help people to understand their benefits and the opportunities that having a smart meter opens up to them.

The presentation of information is also important to support users' understanding and experience. Research by Citizens Advice (2020) highlighted that comprehension around smart devices is best achieved when information is presented through visual elements and Frequently Asked Questions. People's consumer rights and protection should also be emphasised.

Regarding behavioural advice, research has shown that energy advice can be particularly effective when focusing on the correct usage of technology, such as heating controls (Simcock and Bouzarovski, 2023). As some measures can be complex and confusing, particularly for those with low digital competency and confidence, support services should prioritise the informational element; the 'how' beyond the 'what'. This will help increase confidence as well as alleviate the problems occurring from incorrect usage.

Learnings can also be taken from research that has targeted the improvement of customer engagement through in-person interventions. Research with 'hard-to-reach', vulnerable households on improving engagement with energy advice and retrofit-focused interventions illustrated that the most effective engagement combines having a trusted and approachable retrofit liaison officer with signposting to wider, longer-term support (CSE, 2023c). In-home visits and post-installation support is key, so online tools could highlight and refer to services that might be able to offer this.

Other limitations of current advice services can lie in the size and timescale of support offered. In part due to resource constraints, support is often short-term and may produce relatively marginal improvements in people's circumstances (Simcock and Bouzarovski, 2023). The most effective support for the most vulnerable households requires repeated consultation rather than one-off visit or phone call, yet most energy support is short-term in nature which is unlikely to result in sustained reduction in energy bills and improvements in home comfort. Continual engagement is also important for the retention of information and for maintaining energy saving practices. Crucially, advice and support services are often unable to tackle the systemic societal issues which cause vulnerability in the first place, leaving them tackling the symptom rather than the cause, and creating a risk that energy offers only make a marginal improvement or that vulnerabilities simply resurface later on (Simcock and Bouzarovski, 2023).

Advice services that act as intermediaries to other support services can increase awareness of opportunities that can help overcome barriers, including financial barriers. They can also chase up any delays, which might be more effective than the individual doing so, although this relies on the advice service being adequately resourced and funded. This coordination with other advice, similar to a 'one-stop shop' can bring strong benefits particularly to those facing multiple barriers (Bertoldi et al., 2021). Online tools can be used to direct vulnerable customers toward additional advice and support services, thus performing a sort of intermediary role in their own right.

Recommendations and next steps

This report has defined 'vulnerability' in the context of ongoing research to develop tools to better reach and support vulnerable customers. Using CSE's Capabilities Lens, we present a framework of vulnerability indicators, within five overarching Energy Capabilities. Using this framework, we conducted desk-based research into the specific needs and challenges faced by vulnerable groups to ensure support services and tools can achieve better outcomes for them. We have also highlighted areas of intersecting vulnerabilities, since vulnerability is usually multifaceted and there is an increasing recognition of the importance of taking an intersectional approach.

In addition, the report quantifies vulnerabilities in the context of the UKPN license area, giving us a better understanding of the geographic and social distribution of vulnerable groups. By comparing UKPN license area figures with averages for Great Britain (or England & Wales where GB data is unavailable), we can identify whether particular vulnerabilities are over- or under-represented in the DNO area. This will help us to ensure that these groups are adequately represented in the next stage of this research, where we will engage directly with vulnerable customers to help develop online tools which can support their needs.

From this research, we present the following recommendations to take forward into the next stages:

- A. The overrepresented demographic groups identified above should be the first target for recruitment for customer engagement research. In addition, we may consider groups with multiple intersections with other vulnerabilities, such as social renters.
- B. Engagement research should focus on the geographical areas where the 'most vulnerable' are concentrated. However, recruiting households further afield from these areas may provide useful insights into how their experiences may differ.
- C. Empirical research with focus groups will help to further develop our understanding of how support services and tools can be designed to achieve better engagement and outcomes for vulnerable groups.
- D. Support for vulnerable groups should be tailored to their needs, considering how methods of engagement, communication, and resources might need to differ. In all cases, information should be simple and comprehensible without sacrificing detail on the implications, benefits, and any instructions.

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Appendix

Table 10: The proportions of the vulnerability indicators in a particular area. The sources are hyperlinked to each indicator.

Vulnerability indicator	Proportions in a particular area (%)			
	UKPN	England and Wales	Great Britain	England
<u>General health</u>	15.66	17.70	18.00	-
<u>Disabled under the Equality Act</u>	15.30	17.53	18.08	-
<u>Population over 66</u>	15.50	17.54	17.64	-
<u>Households with a child aged 0-4</u>	11.33	10.60	-	-
<u>Cannot speak English</u>	0.34	0.28	0.27	-
<u>Cannot speak English well</u>	2.20	1.52	1.48	-
<u>Households in fuel poverty</u>	9.62	-	-	11.40
<u>Private renting</u>	23.17	20.27	19.59	-
<u>Social renting</u>	18.18	17.06	17.56	-
<u>Renting combined</u>	41.35	37.33	37.15	-
<u>EPC rating under E</u>	2.68	1.94	-	-
<u>No domestic smart meter</u>	37.13	-	40.00	-