

SMART & FAIR

Working with the smart energy capabilities lens

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Foreword

We started the Smart & Fair programme in 2019 with CSE to put inclusion and fairness at the centre of our approach to the low carbon transition and our commitments to customers in vulnerable circumstances. The idea of ‘no one be left behind’ was being widely discussed by energy sector actors at the time and, in response the Smart and Fair programme was developed to understand what that could look like in practice. The Smart Energy Capabilities framework helps understand how diverse households face different opportunities and challenges in participating in the low carbon transition. The analytical tools and datasets developed through the Smart and Fair programme helped to turn this approach into action. As a result, we’ve sought to embed fairness into our consumer vulnerability strategies for our 2023-2028 business plans.

The work outlined in this report show how we are turning the principles of Smart and Fair into action. At SSEN, one of our priorities has been to build confidence in the market for new flexibility services, developing the HOMEflex code of conduct to promote wider participation. At NGED, we have been piloting the delivery to customers of new forms of smart energy advice, which are based on assessing household capabilities and identifying appropriate support mechanisms. We’ve also welcomed new partners and collaborators into the Smart and Fair Programme, Northern Powergrid and ESO for example, widening the stakeholders who use a smart energy capabilities approach to understanding consumer engagement with the low carbon transition.

We are now almost one year into our new business plan, RII0-ED2 (2023-28) and it is a good time to take stock of what we’ve achieved and scale what we know is working. We want to rapidly increase our delivery of support for all customers to engage successfully with the low carbon transition and share in the benefits of creating a greener, more secure and more affordable energy system. We want to use our procurement of flexibility services as a driver for inclusive growth of the domestic flexibility market. The insights discussed in this report, and the recommendations made, will support these ambitions. Smart and Fair data analysis can help us monitor and map the uptake of new smart offers, support capabilities-based advice tools and crucially create a feedback loop for networks to better understand what is working for different types of consumers and respond positively.

We will continue to champion fairness in the energy transition and support our diverse customers.

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We would also like to thank our advisory board:

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Russell Jenkins, Head of Demand Side Response Policy, Smart Energy, Department for Energy Security and Net Zero.

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Sarah Honan, Demand Flexibility Policy Manager, Association for Decentralised Energy.

Jacopo Torriti, Professor of Energy Economics and Policy, University of Reading.

In addition, the projects discussed in this report are the result of collaborating and learning from a range of expert stakeholders, academics, advice teams, advice clients, and research participants who generously gave their time and insights to inform the work.

Thank you

Executive Summary

Vulnerability is changing as the energy market changes and action is needed now. In 2019, CSE published the first Smart & Fair report warning about the emergence of a two-tiered energy system that works well for some but leaves other behind. Last winter we saw evidence of this becoming a reality. Some people were earning incentives from flexibility services, while others were coming off supply and visiting warm spaces, unable to keep their homes habitable.

CSE's Smart & Fair research programme focuses on working with stakeholders to improve understanding of emerging inequalities and how to mitigate them. We have seen some good progress. For example, the concept of 'no one left behind' has been fully embedded into distribution network operator (DNO) business plans, and we have seen the launch of different DNO advice and support services that aim to widen access to the smart energy transition. The development and launch of the HOMEflex code of conduct sets out a capabilities-based approach as best practice for flexibility service providers to engage with domestic consumers. We have seen the Smart Data Communications Company (DCC) successfully co-ordinate a request to Ofgem across academia, industry and the not-for-profit sector to facilitate smart meter data sharing. These initiatives show willingness on the part of industry to start evidencing and mitigating the uneven impacts of the smart energy transition. However, we still lack oversight of whose needs are being well served by the emerging market for smart energy products and services, and whose needs are being ignored.

In this report we summarise the work we have been doing with our supporting partners and funders to improve market monitoring, develop smart energy advice, and evidence how different consumers are able to participate in and benefit from the transition to a smarter, greener energy system.

Market Monitoring

Consumers need to have confidence to take up smart energy offers and trust that when they actively engage in a more dynamic and flexible energy system they will receive the expected benefits, such as cost savings, carbon reductions or comfort gains. We see two key mechanisms for building this confidence. First, consumers need accessible and impartial evidence about the ways smart energy offers work for different types of households. Second, they need reassurance that the market will deliver options for all consumer groups and that any emerging gaps or inequalities will be identified and mitigated.

To this end we have been working to monitor and describe the range of smart energy products and services available to domestic consumers. We have used CSE's smart energy capabilities lens to classify and profile offers according to the capabilities they require of consumers, allowing us to gauge how well different segments of the population are being served. We have also worked with Flex Assure and SSEN as they have developed the HOMEflex code of conduct. A key principle

outlined in the code of conduct is the requirement that Flexibility Service Providers will identify the most appropriate service for a domestic consumer, and assess the benefits that households can expect to see from the service being offered (Flex Assure and SSEN, 2023). We had the opportunity to use the capabilities lens in our evaluation of household engagement with the Electricity System Operator (ESO)'s Demand Flexibility Service (DFS) to contribute evidence on what worked for whom. CSE's research showed the DFS achieved low barriers to participation, but also that households struggling financially and with long-term health impacts had slightly worse experiences and outcomes (CSE, 2023a).

Through our market monitoring we developed a simple taxonomy of smart energy offers that allowed us to profile the types of offers available to UK consumers and understand the capabilities that are required to effectively take up the offers. We profiled 24 offer types and ran some analysis with our smart energy capabilities dataset (GB wide household level dataset) to determine which consumer segments are able to take up the different offer types.

This work demonstrated a number of key points that require further work:

There is a lack of clear terminology to describe smart energy offers, making it hard to compare similar offers, or understand the differences between offers. In addition to confusing terminology, there is also little descriptive information or transparency about expected costs and benefits. This impacts people's ability to navigate the market and makes it hard to know which products and services work together. Research from Citizens Advice has flagged the importance of testing messaging about smart energy offers and the risk that different demographics will interpret information provided differently (Citizens Advice, 2020). They have also argued for a national information campaign, independent net zero advice service and public information on smart tariffs (Citizens Advice, 2023a).

Our research suggests that in addition to these factors, we need to mandate standardised information that flexibility service providers and manufacturers of smart energy products publish, and agree a simple methodology to produce costed examples for smart energy offers which will allow households to understand how products, services and tariffs combine to affect household running costs. This will aid consumers, but also allow more effective oversight of the market by consumer advocacy organisations.

Through our work we have also seen that industry recognise the benefits of taking a smart energy capabilities approach. In outlining best practice for flexibility service providers, the HOMEflex Code of Conduct advises that flexibility service providers offer a range of options that work for different consumer groups. The code recommends that if a flexibility provider assesses a household as unlikely to benefit from their offer, the provider either makes recommendations that might increase a household's suitability, or suggests an alternative offer that is more suitable. A smart energy capabilities assessment of offers could be helpful in supporting Flexibility Service Providers assess how well they meet this ambition. There is a real opportunity to embed a capabilities approach in how the domestic flexibility market evolves.

A final issue raised through the work is the need for an overview of up-to-date market offers.

Currently the team at CSE are continuing to monitor for new smart energy offers and update information on new and existing offers by manually profiling them. To automate this process and create a publicly available offers database we would need cross sector standardisation of offer metadata. There is a balance to be struck between ensuring standardised terminology across stakeholders and enabling a competitive market, but there are a number of initiatives that are laying the groundwork for this. The HOMEflex code of conduct is one, the Energy Smart Appliance Standards and Flexibility Provider regulations are others. However, it will require concerted effort by regulators, government, consumer advocacy organisations and flexibility procuring organisations (networks) to articulate the need and benefit of this approach and for industry to comply.

Through the market monitoring work carried out in phase 2, it is clear that there is still work to be done by industry to standardise terminology used to describe smart offers, create more transparency around the expected financial impacts and be more explicit on the consumer requirements that underpin the expected benefits. In general, more evidence is needed. We therefore recommend that

- A.** Organisations that procure flexibility (Networks) ask flexibility service providers to complete a template layperson summary of their offer covering the capabilities required to take it up and transparent examples of expected benefits. This can be published by the procuring organisation. This is the approach used by ESO for the DFS providers. It offers a way to standardise information about offers, and help consumers and advice organisations to make comparisons and take decisions about offers.
- B.** Government and industry work with consumer advocacy groups to improve terminology and meta data required for comparing smart energy offers. The smart offer taxonomy and profiling guidelines provide a template for this. More research is required to understand the terminology that resonates best with consumers and results used to develop good practice recommendations with industry and consumer bodies.
- C.** All energy system actors widen access to smart energy capabilities data and track change over time by:
 - Creating a public evidence base of diverse household experiences of smart energy offers.
 - Establishing an annual review of smart energy offers available for domestic consumer groups and progress in offer comparison for industry, advice providers and government/regulator.

Smart energy advice

Access to impartial, reliable and high-quality advice is critical for ensuring fairness in the energy system. Currently the advice sector is under enormous pressure, with demand for services reaching unprecedented levels. The cost-of-living crisis and turmoil in the energy market mean that advisors are in crisis response mode. In this context, it is hard for advice organisations to widen their advice services to cover smart energy advice. This challenge is only going to grow as the need and complexity of smart energy advice grows and the range of smart energy offers and the types of demand side response (DSR) services increase.

To respond to this challenge, we have created the online Energy Choices Tool that can be used by an advisor to gauge a client's smart energy capabilities and match these to an offer's requirements. We developed this with energy advisors and piloted the tool with five advisors and 23 clients. We ran qualitative research with experts to understand the drivers for bringing the tool to a wider audience. We have also been working with National Grid Electricity Distribution to develop and pilot Smart Energy Action Plans which provide tailored recommendations for households. We have been trialling this as part of NGED's Customer Vulnerability Strategy and its delivery of low carbon transition support services.

Overall, these two pilots have shown the need for smart energy advice that is designed specifically for consumers segments that are at risk of being left behind. In user testing advisors, clients and energy experts stated that an Energy Choices Tool which supported advisors or the public to make wise, informed decisions about smart offers was timely and necessary. Developing a self-serve tool – as CSE is now doing with support from NGED and Northern Powergrid – can widen access to the tool, potentially stimulating greater take up of low carbon technologies and smart offers, whilst reducing demand on advisors. The two pilots have also shown the opportunity that exists currently to work with DNOs as they develop and scale their provision of ED2 Low Carbon Transition services. However some outstanding questions remain: The difficulty of providing advice on cost impacts of smart energy offers; accommodating different consumer journeys, in particular for those without smart meters; establishing standardised, widely available smart energy advice and training for advisors.

Through this work we recognise and recommend the following actions for developing and scaling the provision of smart energy advice:

- D.** DNOs to support training and knowledge sharing on smart energy advice for advice organisations and referral partners across and between DNO license areas.
- E.** DNOs to convene a 'what is working' forum to share insights from piloting of LCT services and tools under the ED2 incentive mechanism. This forum should feed relevant insights and recommendations to stakeholders that can support and influence the provision of smart energy advice, including consumer advocacy groups, government and industry bodies such as HOMEflex and Smart Energy GB.
- F.** Government to develop a strategy for the long term funding and provision of smart energy advice across the UK.
- G.** Government to improve public information about the smart energy transition including the role that smart meters play in decarbonisation.

Smart energy capabilities data analysis

The ability to take insight from monitoring smart energy offers and carry out detailed analysis on which types of households are finding it increasingly easy to access and benefit from the low carbon transition is a fundamental goal for the Smart & Fair programme. To that end, we have constructed a household level dataset that covers the entirety of England, Scotland, and Wales (approximately

29m records) by combining datasets which cover all five core smart energy capabilities. We call this our 'smart energy capabilities dataset' and we have been able to use this dataset in a number of projects, demonstrating the usefulness of the capabilities lens and flagging additional data requirements. We have produced a set of 18 domestic energy consumer archetypes for National Grid Electricity System Operator (NGESO). These archetypes have been primarily designed to integrate into NGESO's Future Energy Scenario (FES) modelling. However, they can also be used more widely to understand current demand patterns of different types of energy consumers and potential future technology uptake. We have also produced a set of 24 domestic archetypes for Ofgem to use in their distributional impacts model. These archetypes are intended to be used to understand how different policies may impact on a selection of different types of households and energy consumers. Through our evaluation of Household Engagement with the Demand Flexibility Service we have created an anonymised dataset of 18,530 households' smart energy capabilities and their experiences of demand shifting. This data will be archived and accessible to the wider research community. We are currently working with ESO to integrate the data into their consumer archetypes.

Recommendations

However more remains to be done to overcome challenges with availability and access to high quality datasets.

- H. All DNOs to publish data on the number of Low Carbon Technologies (LCTs) connected to their network at a secondary substation level (some already do this). Differentiating between domestic and non-domestic connections would also be very useful.
- I. All DNOs to publish data on the number of smart meters installations at the lowest level of geography possible (currently, one publishes this data at a primary substation level).
- J. UK Research and Innovation (UKRI) and Ofgem create requirements for data from innovation trials to be anonymised and shared with the research and consumer advocacy community

Next steps and priorities

Through our research and stakeholder collaborations in the Smart & Fair programme, we have been able to progress our understanding of smart energy capabilities and champion a more just low carbon transition. We recognise the growing interest in this work and the evolution of the idea that 'no one should be left behind' into a more active commitment to make the transition deliver real benefits to those most in need during a period of substantial hardship. We will be pushing forward this agenda with our collaborators and colleagues in the coming year and highlight the following priorities:

Develop a shared terminology that can be used by smart energy innovators to clarify the way offers are described and increase the information provided publicly. This information needs to include transparent and comparable cost information, covering upfront and running costs, in addition to expected savings or rewards. There is an urgent need for a cost impacts methodology that allows

for consumer advocates and advice organisations to make comparisons within and across offer types.

Scale up the delivery of in-depth smart energy advice built on reliable market wide information and tailored for those who are least able to cope with any negative impacts. This will require investment in training advice organisations.

Pilot more fair flexibility offers and produce more evidence on how household capabilities relate to effective participation in the market. This will allow better understanding of new forms of vulnerability and ways to mitigate or avoid these becoming systemic. It will also improve our ability to model the energy system impacts of domestic demand side response based on actual household experiences and data.

1. Introduction

Vulnerability is changing as the energy market changes and action is needed now. The transition to a smarter, more flexible energy system is impacting households differently. Winter 2022-23 demonstrated some of these inequalities. 1.6 million households and businesses took part in the UK's first national Demand Flexibility Service (DFS) earning incentives by flexing their energy use, while others went to warm spaces, unable to keep their homes habitable and not receiving a payment for the little stress they place on the energy system. These different experiences evidence the emergence of a two-tiered energy system that we warned about in our report in 2020.

CSE's first phase of Smart & Fair research included tools to help understand emerging inequalities and made recommendations for Government, Ofgem and industry to create effective oversight of the emerging smart energy market, and support wider participation without stifling innovation. We have seen some good progress in some areas. For example, the development and launch of the HOMEflex code of conduct sets out a capabilities-based approach as best practice for flexibility service providers to engage with domestic consumers. The concept of 'no one left behind' has been fully embedded into DNO business plans, and we have seen the launch of different DNO advice and support services that aim to widen access to the smart energy transition.

These initiatives show willingness on the part of industry to start evidencing and mitigating the uneven impacts of the smart energy transition. However, we still lack a co-ordinated approach and mandatory standards. Not enough is known about the factors that shape a household's ability to engage with today's energy market and cover their basic energy needs at costs they can manage. We still lack oversight of whose needs are being well served by the emerging market for smart energy products and services, and whose needs are being ignored. There is no requirement on innovators to improve information in the public domain about their smart energy offers and make it easy for consumers to make comparison about which would be the most easy and effective for them. We still lack funding for support and advice that helps households to engage and benefit from participating in the energy system. These issues are central to CSE's Smart & Fair research programme.

In this latest phase of Smart & Fair research, we have been monitoring smart energy offers appearing in the market to understand which consumer segments are well served, and which are getting left behind; we have been developing and piloting smart energy advice tools, and we have been improving our data and analysis of the factors which affect households' ability to access and benefit from flexibility markets.

Background to Smart & Fair

CSE's Smart & Fair programme was developed in 2019 with funding from Scottish & Southern Energy Networks and National Grid Electricity Distribution as a research programme that could work with industry to embed social justice into the energy transition, and achieve 'no one left

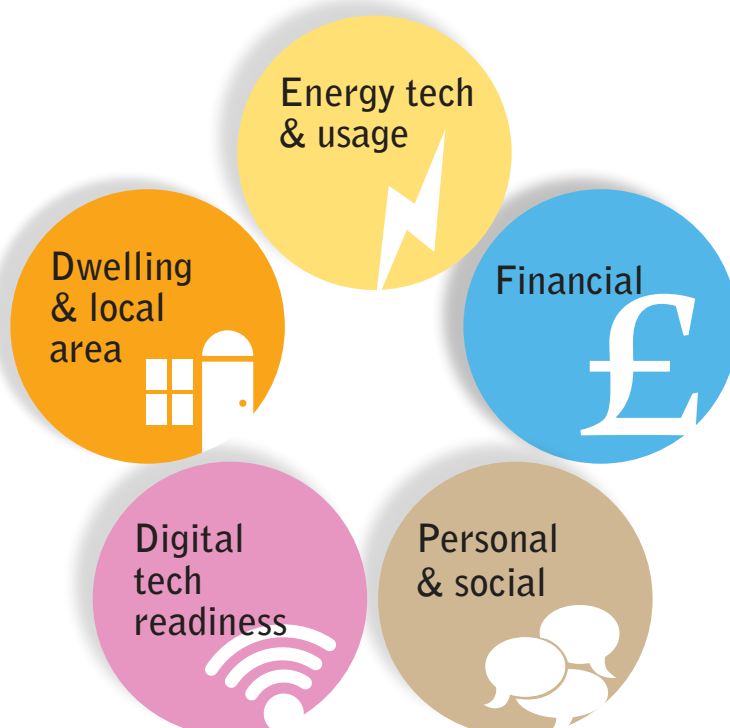
behind'. CSE's first focus in 'Smart & Fair' Phase 1 was to develop the Capability Lens (see Figure 1). The Capability Lens is a theoretical framework that describes the factors that affect a household's ability to access different smart energy offers and effectively participate in emerging energy markets.

The Capability Lens comprises five clusters of capabilities:

- Energy & tech usage – The appropriateness of a household's energy usage profile and existing energy technology and appliances to enable them to participate in and benefit from an offer.
- Financial – The financial status, money-managing, and decision-making skills required to engage in an opportunity.
- Personal & social – The personal factors, mindset, values, social connections, and living circumstances that enable a consumer to hear about, trust, and engage in an opportunity and be able to make appropriate behaviour changes.
- Digital tech readiness – The digital technology hardware and connectivity, skills readiness, and level of digital engagement of a household to enable them to participate in, and benefit from, opportunities.
- Dwelling & local area – The suitability or readiness of a dwelling in its location for the occupant to participate in an opportunity which offers electricity system benefits.

The next phase of work has focused on applying the smart energy capabilities in practice, improving the tools and building understanding across industry of how a capabilities approach can deliver on the principle of 'no one left behind'.

Figure 1 CSE's Smart Energy capabilities lens 2023



The current context

The last two years have been an exceptional period to be working on smart energy. The UK's energy market has changed considerably. 2021 saw the UK's energy retail market in crisis, with 28 suppliers going bust that year (Citizens Advice, 2021). In 2022, the war in Ukraine and associated cost of living crisis saw the government introduce the Energy Bills Support Scheme, the Energy Price Guarantee and other measures. Consumers could not change their supplier, and it is only now, at the start of 2024, that we are seeing an increase in the number of tariffs available, and options for consumers to shop around.

Against this backdrop of turmoil, innovation in smart energy is growing and progress towards a lower carbon, digital energy system continues. Through RIIO-ED2 Ofgem has created a new requirement that DNOs deliver vulnerability strategies that include 'targeted support to overcome barriers related to low carbon technologies' (Ofgem, 2022, p. 13). The Department for Energy Security and Net Zero's £65m Flexibility Innovation Programme includes an 'Inclusive Smart Solutions' programme designed to increase accessible technologies in the market. UKRI and Ofgem's Strategic Innovation Fund requires industry innovators to partner with consumer advocacy organisation and the Electricity System Operator (ESO) has worked with energy suppliers and flexibility service providers to launch a national Demand Flexibility Service.

We have seen rapid innovations and advancements, but also divergence in terminology and purpose. This presents a unique challenge, particularly as these innovation areas do not have standardized government or regulatory oversight. Take, for instance, concepts like a 'flexibility service' or a 'smart energy offer'—their precise meaning can vary widely depending on the context and the stakeholders involved. Understanding vulnerability in this dynamic landscape becomes equally complex.

Consumers are not well placed to be able to grapple with this increasingly complex market. The cost-of-living crisis and energy crisis has seen a dramatic increase in the number of households in fuel poverty. Government statistics showed the number of households in fuel poverty increased by 0.3% in 2022 and were projected to increase by 1% in 2023 to include 3.53 million households (DESNZ, 2023). Trust is low, future retail prices are uncertain, new market mechanisms are unclear, regulatory and market reform continue. In this context it is hard for even the most digitally confident and energy literate households to take decisions about which technologies to invest in or gauge the level of reward they may earn by signing up to a new flexibility service. Advice organisations are stretched to breaking point with the rise in demand for their services (Citizens Advice, 2023b; CSE, 2023b; Money Advice Trust, 2023). They are tackling emergency situations, and have seen the scope of their advice grow significantly already, leaving little space to train up staff on how new smart energy offers may reduce or exacerbate a household's financial precarity. Increasing numbers of households do not have the financial security or the mental capacity to engage in smart energy offers, as they seek stability over risk. The need for households to understand and manage energy costs is becoming ever more urgent, but increasingly hard.

This context sets the groundwork for the next phase of Smart & Fair research.

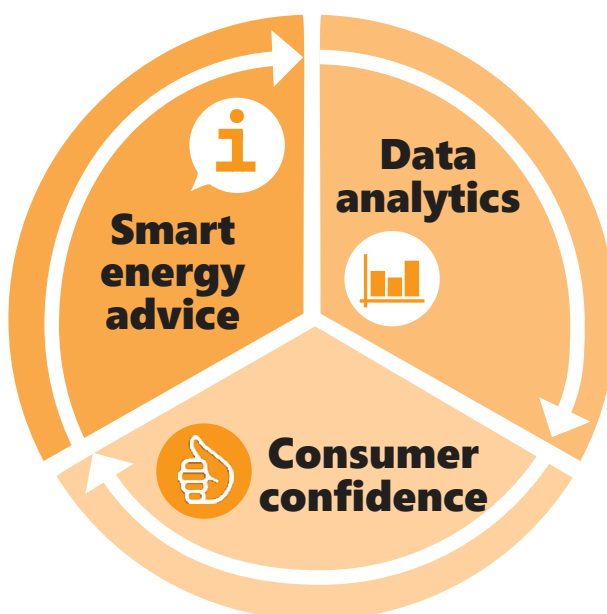
Smart & Fair phase 2 priorities

After publishing the capabilities lens and phase 1 report in 2020, CSE had two key priorities for the Smart & Fair programme:

- 1** Improve, test and apply our tools.
- 2** Embed the capabilities lens as a way of thinking about the smart energy transition and social justice.

This programme of work was kicked off with support from NGED and SSEN, who provided funds to develop a GB-wide household level dataset that captured domestic smart energy capabilities. In parallel, CSE won an innovation grant from the Energy Redress Fund to develop an online tool that could help advisors to navigate the market of smart energy offers and identify options tailored to an advice client's smart energy capabilities. As we progressed this work, we were able to build out a programme of activities and widen the number of partners we collaborated with.

Figure 2: The three interlinked elements of the Smart & Fair programme



The research we have carried out has focused on three interlinked areas (Figure 2). One core element of the programme is the data analytics which helps us to understand the distribution of access to and benefits from the smart energy transition across the GB population. A second element is building consumer confidence by improving evidence and comparable information about what works for whom. The third element is smart energy advice which provides consumers with reliable, trusted information that they can use to improve their ability to engage with the energy market.

In this report

In this report we give an overview of the work we have been doing in the Smart & Fair programme over the past two years (see figure 3). We focus on the main activities funded through SSEN and NGED and the Redress funded Energy Choices Tool. We also reference and provide high level summaries of the concurrent set of projects and activities that have enabled us to test and apply our Smart & Fair tools, like the Smart Energy capabilities lens and household dataset. As outlined in Figure 2, our work has focused on three main areas:

Consumer confidence and market monitoring

We have been working to monitor and describe the range of smart energy products and services available to domestic consumers. We have used the Smart Energy capabilities lens to classify and profile offers according to the capabilities they require of consumers, allowing us to analyse how well different segments of the population are being served. We have also worked with Flex Assure and SSEN as they have developed the HOMEflex code of conduct. A key principle outlined in the code of conduct, is the requirement that Flexibility Service Providers will identify the most appropriate service for a domestic consumer, and assess the benefits that households can expect to see from the service being offered (Flex Assure and SSEN, 2023). We had the opportunity to use the capabilities lens in our evaluation of ESO's Demand Flexibility Service to contribute evidence on what worked for whom. The household engagement evaluation showed the DFS achieved low barriers to participation, but also that households struggling financially and with long-term health impacts has slightly worse experiences and outcomes (CSE, 2023a).

Smart Energy Advice

We have been developing the 'Energy Choices Tool', an online tool that supports energy advisors to provide advice to clients about the increasingly complex array of products and services and identify options that work with the client's existing capabilities. In this chapter we describe the design process and functionality of the tool, highlighting some of the decisions and compromises required to create a workable beta version. We also reference the Smart Energy Action Plans pilot we are running with NGED.

Capabilities Analytics

We have been improving our data analytics and working to better represent the factors that shape a household's engagement with the energy system. This work has underpinned the domestic archetypes we produced for NG ESO and Ofgem and helped us to think through the distributional impacts that will be experienced as the energy market changes.



2. Market monitoring to build confidence

One of the main risks flagged in the first phase of Smart & Fair was the potential for a two tier energy market to emerge, in which some consumers find it increasingly easy to access cheap, renewable energy, while others find it increasingly hard and face penalties for their limited engagement. In phase two, our focus has been to understand how the market is developing and to improve the tools we have to describe and analyse the smart energy market. We see this as a key step in mitigating emerging inequalities.

In this section we discuss three key activities:

- 1** Our market monitoring work stream that aimed to categorise and profile smart energy offers by the capabilities they require of households.
- 2** HOMEflex Code of Conduct, a SSEN-led Network Innovation Allowance (NIA) project which has established best practice principles for flexibility service providers.
- 3** CSE's evaluation of ESO's Demand Flexibility Service Winter 22-23 which used a capabilities approach to understand household experiences of participating.

A smart energy capabilities approach to market monitoring

The primary aim of our market monitoring work package was to create a systematic overview of the smart energy market from the consumer's perspective. While commercial actors produce overviews that characterise the commercial opportunities opening up, Smart & Fair's interest in market monitoring is to articulate who is being well served by the developing smart energy market and why they are finding it easier to engage. Through better representing the range of smart offers on the market, this work could be a valuable resource for stakeholders in the smart energy space. For example, reflecting the capabilities that different offers require may help providers consider the abilities and requirements of consumers, so they can promote their offers more effectively and accurately. Similarly, consumers can use this information to make informed decisions about which offers are best suited for their needs. This insight can be used by advice organisations and consumer support groups who help households to navigate the market, and select options that work, as well as to hold industry to account, requiring them to develop more accessible or inclusive smart energy offers.

We started by assessing the current scope of monitoring work happening across the UK smart energy market. Using internet searches, a range of information sources were mapped including

energy (e.g. Energy Systems Catapult), advice (e.g. Citizens Advice) and consumer interest (e.g. Money Saving Expert) organisations. These sources were then compared using a set of identified common features:

- **Breadth:** do the sources cover most or all of the smart energy offers on the market?
- **Depth:** how much detailed information is provided for individual offers?
- **Capability:** is consideration given to which clients specific offers are suitable for?
- **Impartial:** does the source have an interest in providing information?
- **Accessible:** can information be accessed quickly and easily?
- **Outlook:** is there information on both how the market looks now and might look in future?

Table 1: Summary of UK smart energy market monitoring sources

Source	Breadth	Depth	Capability	Impartial	Accessible	Outlook
Smart Tariff Smart Comparison		X	X	X	X	
Consumer interest websites (e.g. MSE)		X	X			
Offer provider websites (e.g. Octopus)		X			X	
Generic tariff comparison websites		X		X	X	
Financial monitoring	X			X	X	X
ESC – Our Energy Landscapes	X			X	X	X
IRENA – innovation landscape briefs		X		X		X
LCP Delta – various market reviews		X	X	X		
Energy advice websites (e.g. Energy Saving Trust)	X	X	X	X		
Love my EV		X	X	X	X	

As Table 1 shows, monitoring of the UK smart energy market varies by actor. Some focus on the commercial opportunities that new markets present (for example, LCP Delta) others are designed to support consumer taking decisions about tariffs and technologies (for example, Love My EV).

In addition, some offer providers have websites that help a potential customers assess their capabilities to take up a product (see Tepeo's compatibility checker for example¹), but these do not allow for easy comparison between offer types.

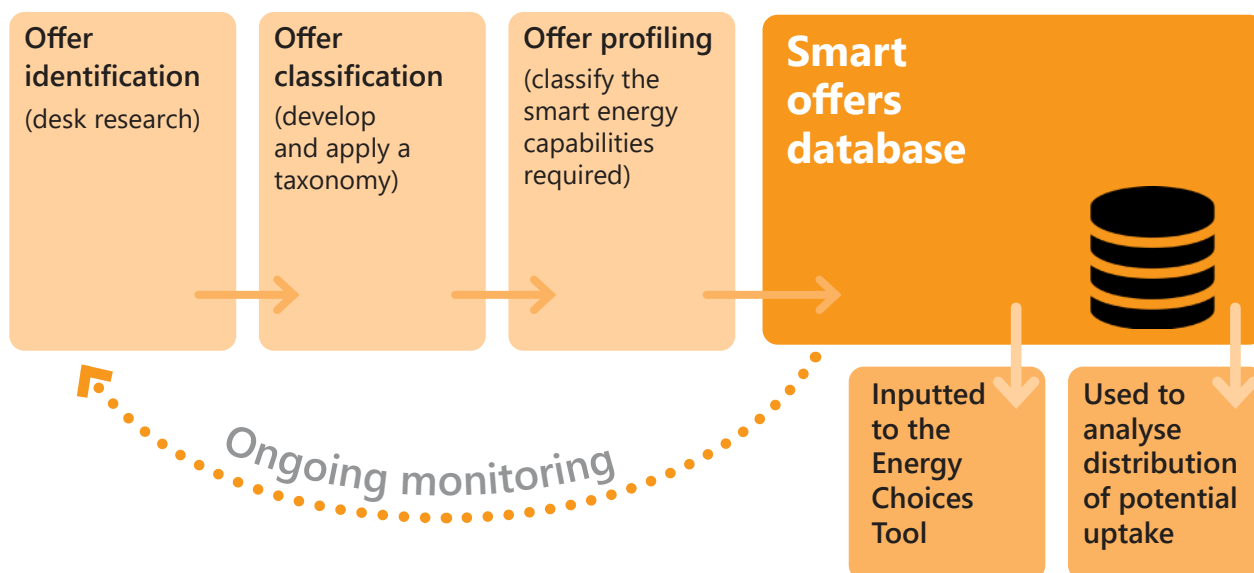
¹ <https://tepeo.typeform.com/get-a-zeb>

While all sources offer multiple useful features, none provide a comprehensive range of market monitoring information. The objectives for our market monitoring work were to:

- 1 Test and develop our Offer Profiling Tool. This theoretical tool was developed in Smart & Fair Phase One as a method to describe smart energy offers by the capabilities they require of households.
- 2 Create a database of offers that can be used to analyse emerging gaps, and can be imported to our Energy Choices Tool (see Chapter 3) to help advisors navigate the market.

Our approach to monitoring aimed to cover both depth and breadth, while including analysis of the capabilities that offers required of households. Market monitoring activity proceeded in the phases shown in Figure 4.

Figure 4: Market monitoring methodology phases and outputs



Offer identification

Given the range of overlapping terms in use across the smart energy market, a key first step in offer identification was identifying a useable definition of ‘smart energy offer’. Not all smart home technologies produce optimal energy outcomes. Academic research has questioned whether they drive up energy consumption (Strengers, 2013) and increase waste (Sovacool and Furszyfer Del Rio, 2020). In addition, user testing for our Energy Choices Tool, demonstrated that the selection of offers would be key to enabling a wide demographic to participate. We also know that demand management and flexible energy use has a long history (Blue et al., 2021), and we wanted to include offers that households may already use, rather than limit only to new products. We were sensitive to cheaper, non-digital alternatives, if they achieved the same energy function, a mechanical timer plug, as well as a smart plug, for example.

Following some phases of research and iteration, researchers agreed upon: ‘any product or service that enables users to save money or earn incentives through managing when they use energy’. This definition thus excluded some smart home technologies and energy efficiency measures, while including non-digital products or services that enable energy flexibility. In our smart energy advice work (see Chapter 3) we describe these smart energy offers as helping households ‘to be smart with energy’.

Internet searching was the principal method used for identifying smart energy offers. Searches were conducted using Google. Search terms included individual names of known smart offers (e.g. “dynamic time-of-use tariff”, “smart plug”) and more generic phrases (e.g. “smart energy products”). Researchers also identified offers through signing up to relevant smart energy newsletters and cross-checking with other market monitoring.

The main focus of the offer identification was offers that could be accessed by UK households, including trials and expired offers. Once identified, all offers were classified in a spreadsheet.

Offer classification: developing a taxonomy of offers

Clear, consistent and accessible information about offers is recognised as a key requirement in growing domestic demand flexibility (ofgem, 2023). However, at the offer identification stage, researchers noticed a number of complexities and potential confusions with the terminology used. Many smart energy offers were described by providers using terms like ‘flexibility services’ or ‘aggregation products’. These terms are vague and technical and could be off-putting for domestic customers. In addition, technical terms are used to describe physically very different propositions, for example, an electric battery and a time of use tariff. Conversely, very similar smart energy offers were described by offer providers using different terminology. For example, the terms solar battery and battery storage are often used to describe an electric battery. The process of identifying offers made it clear that a more workable taxonomy was required.

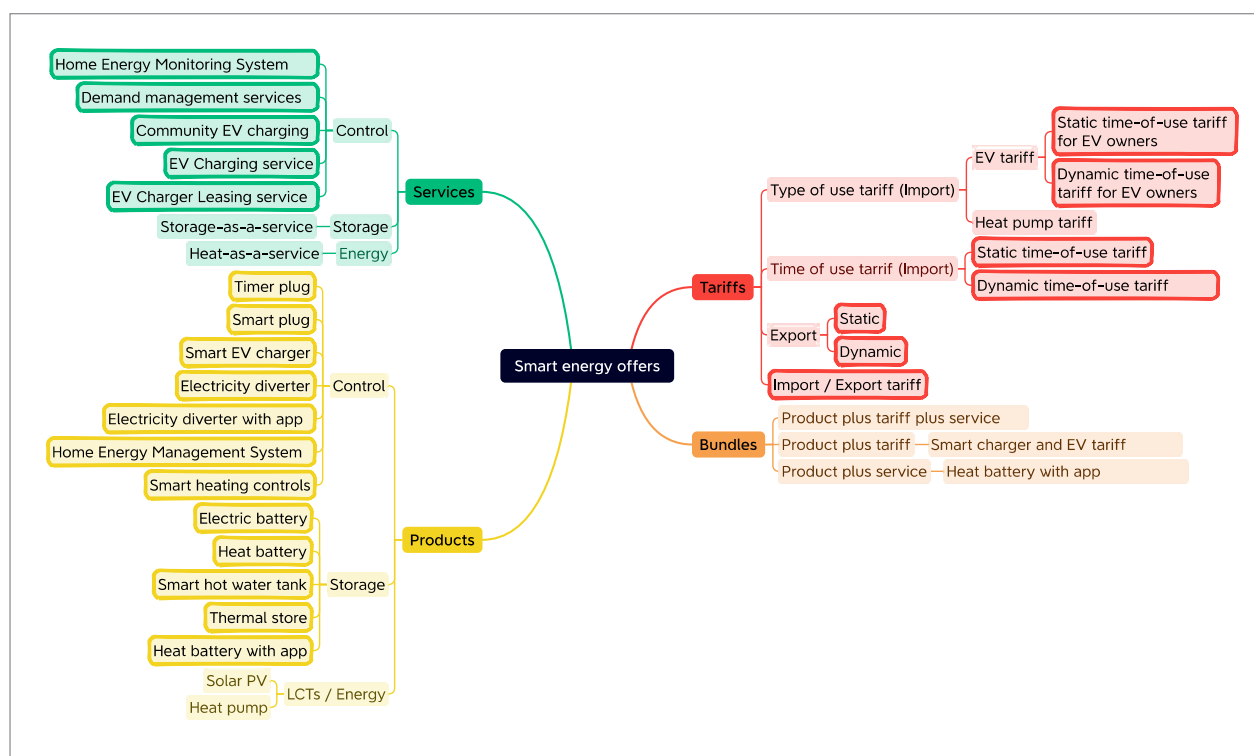
Developing a taxonomy required the researchers to think through which differences and commonalities were significant. This process was informed by using the capabilities lens. One of the key differences we discussed was whether an offer required a direct material intervention in your home, and created a set of concerns around ownership, space, accessibility, and interoperability with existing kit and routines. We also discussed the benefits and concerns opened up if an offer was a service that can be signed up to without requiring a physical intervention in your home. For example an app that does not affect the unit costs of your energy, but may allow you to earn credits or demand response incentives.

We used a mind-map to visualise the range of offers identified in the previous phase, and categorised offers into four simple and distinct categories:

- 1** Product: an offer that involves a user owning something physical in or around their home.
- 2** Tariff: any type of smart tariff.

- 3 Service: offers that provide a service to a user – for example, an app that provides shifting notifications, or from equipment leased in or around their home.
- 4 Bundle: Any offer with a combination of more than one element from any of the above categories.

Figure 5 Smart Energy Offer taxonomy (with profiled offers in bold)



The mind-map was also used to sort offers into 'sub-categories' according to the functions they performed. This would help to provide further detail on what a user might be able to expect from an offer. The sub-categories for products and services are:

- Storage: any smart product or service that involves the storing of energy for long periods.
- Control: any smart product or service that enables or incentivises shifting the time at which energy is used.
- LCTs / Energy: any smart product or service used to generate energy or provide an energy service (heat, transport for example).

There are four different sub-categories for smart tariffs:

- 1 Time of Use tariffs: a tariff that has different unit rates for different times of the day. These unit rates can be fixed or variable.
- 2 Type of Use tariffs: a tariff is only accessible to households with particular technologies
- 3 Export tariffs: any tariff that involves selling electricity from a household back to the grid

4 Import and export tariffs: combination tariffs that cover import and export rates

The resulting taxonomy means individual offers are classified as an ‘offer type’ in the mind-map and spreadsheet. This allows the monitoring to be brand-agnostic and speeds up the monitoring process. Researchers can classify types of offer rather than every individual example of that offer. For example, there are many different types of smart plug, but the differences between them were not considered significant enough to warrant a further subcategory. Instead, potential differences between examples (such as inter-operability with existing home technology) are flagged in the notes and guidance of the spreadsheet.

Offer profiling: analysing offer types by smart energy capability

Offer profiling involved a more detailed analysis of smart energy offers according to the capabilities that they require of consumers. The profiling process was created in the first phase of Smart & Fair and involves assigning capability variables to an offer, and the relative importance of that variable for a household to achieve an optimal result. From the phase 1 work, we had a list of smart energy capabilities variables that could be used to profile the offers (see the Phase 1 report). The process and tool needed to be verified and improved. We evolved the profiling process in response to three needs: First, profiling needed to be consistent across offer types and across the researchers doing the profiling; Second, it needed to allow energy advisors to select optimal matches for their clients (see Chapter 3); Third, it needed to allow analysts to model the potential uptake of smart energy offers across the GB population using the smart energy capabilities household level dataset (see Chapter 4).

The profiling process involved researchers investigating different offer types and assigning a full set of smart energy capability variables to each offer type. Each capability variable was ranked by its importance, either Essential, Desirable or N/A. We needed to distinguish between essential and desirable categories to accommodate the difference between an offer variable that will not work for a household and should be excluded, in contrast to an offer variable which will affect the performance or benefits of an offer for different households, but should not be ruled out. Two examples for a smart plug are given in Table 2.

Table 2: Example of two profiled capabilities (smart plug)

Category	Capability	Importance	Variable	Explanation
Digital	Computer device	Essential	Smartphone or tablet	Users will need a smartphone or tablet to control the smart plug.
Energy	Level of electricity usage	Desirable	High usage	Users will benefit more from the smart plug if they have more electricity usage to shift, although users with low usage can also take up the offer and are not excluded.

We added five preference ‘filters’ to each offer type based on testing of the Energy Choices Tool at prototype stage (see Chapter 3). Energy advice experts consulted during this testing suggested that these filters would be useful to help users understand more about smart energy offers. The filters included in the final full profiling are summarised in Table 3 below and are fully detailed in Table 10 in the appendices.

Table 3: User needs as offer profiling filters

Filter	Explanation
Cost	1-5 score based on the upfront cost of offer, including any necessary installation or maintenance costs.
Running cost risk	1-5 score based on how much the offer could increase energy running costs if used incorrectly.
Disruption	1-5 score based on how much disruption taking up the offer would cause, e.g. through installation.
Carbon reduction impact	1-5 score based on how much carbon the offer could save if used effectively.
Potential financial savings	1-5 score based on how much the offer could save on energy running costs if used effectively.

We developed the profiling guidelines iteratively. Three different researchers profiled the offers initially, results were then pooled and any disagreements discussed and resolved with further research if required. The importance or conditions of a capability in relation to a particular smart offer could be interpreted in different ways by different researchers. The guidelines were designed to set profiling rules in cases of ambiguity and simplify the profiling process.

Profiling guidelines were also developed for the filters. For some of the filter information, like upfront cost, it was simple to match information with a 1-5 filter ‘score’. For filters like disruption and carbon reduction, researchers developed specific profiling guidelines based around the individual components of an offer, either based on information available online or existing knowledge about the carbon impacts of certain interventions.

For the potential financial savings or risks filters, researchers found very little information online from offers providers or developers. To counter this issue, some financial analysis was produced for a small selection of core offer types to model their performance against current energy costs. This modelling was used as the basis for the financial savings and risks filter scores, and their associated guidelines.

Once a set of draft profiling guidelines was completed for all filters and capabilities, a set of 24 offer types were profiled by three different researchers, with each making any notes on how the guidelines could be improved. Following this round of profiling, there was a 60% agreement level amongst the three researchers across all the filters and capabilities for the offers. The profiling process was then repeated, with the guidelines becoming increasingly refined each time, until agreement level was close to 100%.

This process allowed us to create a dataset of 24 offer type profiles for use with the Energy Choices Tool and to help analyse the consumer groups with the smart energy capabilities required to access current smart energy offers.

Outputs and use cases

Through the Market Monitoring work package we have been able to develop the following outputs:

- 134 classified offers in the Offer Classification spreadsheet.
- Mind-map showing offer types.
- Offers Database with 24 profiled offer types added to Energy Choices Tool.
- An updated Offer Profiling Tool – containing the guidelines for profiling offers.

We have also been able to use the Offers Database to run some analysis of smart energy capabilities and uptake of smart energy offers across the UK. In this section we provide an overview of our Market Monitoring outputs and uses cases.

Overview of live UK offers

In total we classified 134 offers, spread across 24 offer types. We used a saturation criteria to determine the limit to offer identification. When each newly identified individual offer could be allocated to an existing offer type we stopped actively searching for new offers, and moved to a more passive monitoring process. Through the monitoring, we saw a decline in smart tariffs being offered, reflecting the crisis in the retail market. We also noticed Bundles were not prevalent as live offers. Nonetheless, they are a key focus for trials, with trial leaders often testing how different offer types might work together in practice. This suggests that more bundles may be available on the market in future.

We found that type of use tariffs add complexity. Many suppliers offer time of use tariffs that are designed to suit specific use profiles based on technologies, calling these an 'EV tariff' or 'heat pump tariff' for example, however the unit rates apply to total electricity supply to the household not just the technology. These types of tariffs indicate how the market is beginning to create unequal opportunities. For example, we saw some suppliers offering static time of use tariffs with low rates that could only be accessed by households with EVs, while their other static time of use tariffs that could be accessed by those with electric storage heaters, for example had more expensive rates (Table 4).

Table 4: Example of different tariffs currently on offer by a supplier

	Static ToU for EV owners only	Static ToU non-EV owners
Day rate	30.25p/kWh (05:30-23:30)	34.48p/kWh (07:00-00:00)
Night rate	7.50p/kWh (23:30-05:30)	14.45p/kWh (00:00-07:00)
Standing charge	36.54p/day	36.62p/day

Offer profiling guidelines and online searchable database

The main focus of our work has been to develop a workable taxonomy of offers and a set of guidelines that allow any user to produce similar profiling results. The guidelines can be used with our online database, developed in conjunction with the Energy Choices Tool.

In future, offer providers or developers could use the guidelines to profile their own offers and then add them into the database of offers. This would enable them to compare how their offers stack up against others on the market and visualise any clients that may be excluded from the offer or its associated benefits.

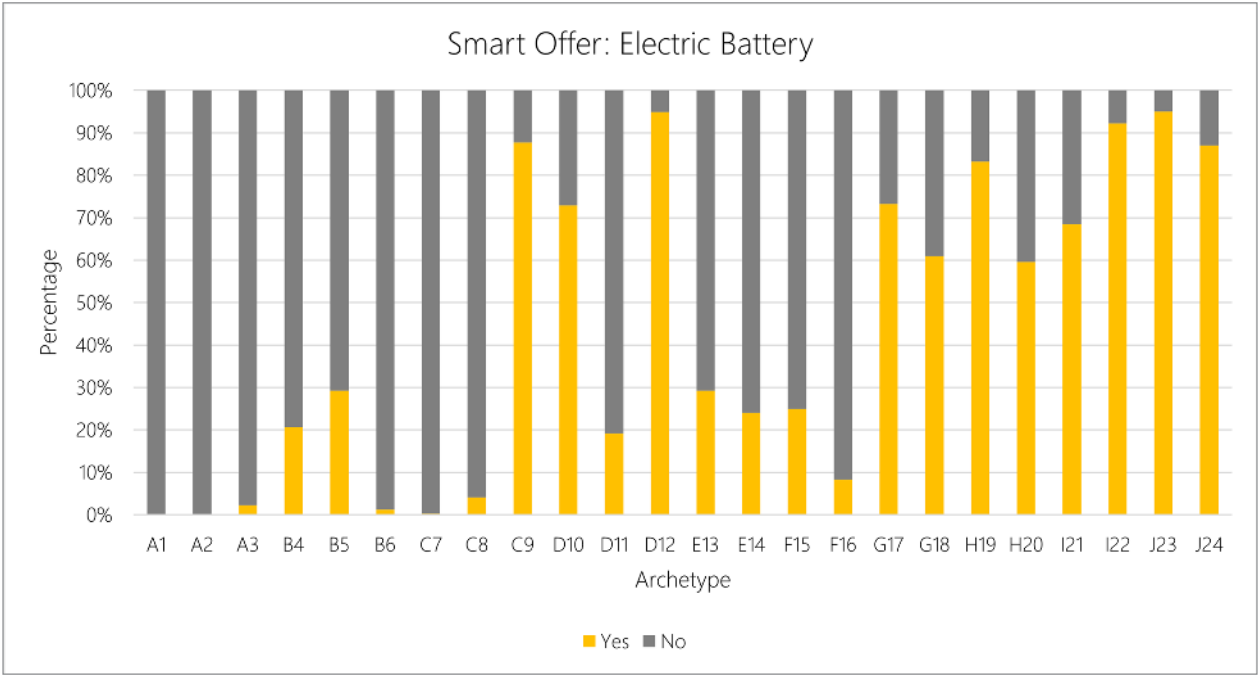
Analysis of potential uptake

The profiling of 24 smart offers enables analysis of the distribution and proportion of GB households that have the capabilities to take up offers. This analysis can be determined by combining CSE's smart energy capabilities dataset with the Ofgem energy consumer archetypes (developed by CSE) – both of which provide detailed information on dwelling and occupant characteristics (see Chapter 5).

The Ofgem archetypes were designed to assist with identification and understanding of different types of energy consumers, including those in vulnerable situations. There are 24 consumer archetypes which cover households from the lowest end of the economic spectrum to the highest, and includes information on disabilities, energy payment method, energy consumption and income. By profiling the smart offers to each of the archetypes, we can see the differential capabilities to uptake of smart offers by different groups of consumers.

For example, Figure 6 shows that few households in archetypes at the lower end of the income spectrum (A1-C8) meet the essential criteria for taking up an electric battery offer, while many households in the archetypes at the higher end of the income spectrum (G17-J24) meet these criteria. We can also see that this relationship is not determined by income alone. Almost all households in D12 meet the essential criteria because 100% of them are owner occupied dwellings, and they are very large households – which are the defining criteria for the electric battery offer.

Figure 6: Proportion of households in each archetype that meet (Yes) or do not meet (No) the essential criteria for taking up the electric battery smart offer



We can also begin to analyse gaps in the market in terms of the range and number of offer types that are accessible to the different archetypes. In Table 5 we can see the proportion of households in each archetype that meet the essential and desirable criteria for the 24 offer types CSE has profiled. All archetypes have 75% of households meeting the essential criteria for at least one offer, but we can see the differences.

Table 5: Number of offers in which over 25%, 50% and 75% of the households in each archetype meet the essential criteria, and the essential + desirable criteria

Archetype	Essential criteria			Essential + desirable criteria		
	> 25%	> 50%	> 75%	> 25%	> 50%	> 75%
A1	4	4	1	1	0	0
A2	4	2	2	0	0	0
A3	5	2	2	2	0	0
B4	4	2	1	2	0	0
B5	6	2	2	2	2	0
B6	4	2	2	1	0	0
C7	4	2	2	2	0	0
C8	2	2	2	2	2	0
C9	11	11	7	3	0	0
D10	11	11	5	3	0	0
D11	3	3	2	0	0	0
D12	11	6	6	5	2	0
E13	11	4	2	2	2	0
E14	7	2	2	2	1	0
F15	6	2	2	2	2	2
F16	2	2	2	2	2	0
G17	6	6	5	2	2	0
G18	6	6	2	2	2	0
H19	6	6	6	3	2	0
H20	11	7	2	3	0	0
I21	11	9	2	3	0	0
I22	11	6	6	5	3	0
J23	11	7	6	4	3	0
J24	6	6	6	3	2	2

This analysis demonstrates one route to achieving a market oversight and analysing distributional impacts. However, to achieve this form of analysis more robustly there needs to be a mandatory requirement on offer providers to publish appropriate data that allows offers to be profiled and compared. There will also need to be improvements in the data used to create consumer archetypes. As shown in Table 9 in the Appendices, it is not possible to perfectly profile each smart offer to the Ofgem archetypes as some information describing essential or desirable capabilities are not present in the dataset. To supplement this, CSE's smart energy capabilities dataset (see Chapter 5) can be used to provide more information on the distribution of smart offer capabilities.

This dataset has the advantage of a high geographic granularity, and so the ability of households to uptake the offers can be mapped at Lower Layer Super Output Area (LSOA)-level across Great Britain. In comparison, the maximum granularity offered by the Ofgem archetypes is at regional or devolved nation level.

In summary, determining the level of eligibility of the smart offers in the Ofgem archetypes can provide a detailed understanding of how different energy consumers may take up the smart offers, revealing the ways in which energy offers could be improved to better target vulnerable or disadvantaged households. Whereas determining eligibility in CSE's GB household level dataset allows the identification of geographic differences in the ability to take up smart offers, and potentially the reasons for these differences.

HOMEflex Code of Conduct

HOMEflex is an NIA project led by Scottish and Southern Electricity Networks (SSEN) Distribution with Flex Assure to develop a Code of Conduct for Flexibility Service Providers. There is currently a lack of standards and assurance mechanisms in the flexibility market (Energy UK et al., 2022). The HOMEflex project addressed this by developing a voluntary Code of Conduct. CSE ran qualitative research with groups of households to discuss their concerns and expectations about flexibility service providers. These insights were used by the HOMEflex team in drafting the Code. The Code was published in 2023 after a process of market analysis and stakeholder engagement led by Flex Assure (Flex Assure and SSEN, 2023).

The Code of Conduct has a chapter on ethical and fair conduct requirements. This chapter specifies the need for flexibility service providers to assess a customer's ability to take up and benefit from the service being sold, and in the event the customer is deemed unlikely to be able to benefit, the service provider should consider what other services may suit the customer more, or how the customer could be supported to be able to benefit (see Clause 5.2.3 in Box 1). This creates a need for a smart energy capabilities approach to describing and assessing flexibility services. It also creates a need to understand the journey that customers will need to go on to increase their smart energy capabilities.

Box 1: excerpt from the HOMEflex Code of Conduct

Clause 5.2.3 If the Service Provider does not reasonably consider the Customer able to participate in or benefit from the Energy Flexibility Service, they must:

- a) communicate the reasons for this decision to the Customer in plain language in a reasonable timeframe; and
- b) take reasonable steps, within their particular capacity:
 - 1. to offer alternative Energy Flexibility Services; and
 - 2. to offer guidance on what changes would need to be made in order for the Customer to participate in the Energy Flexibility Service.

The HOMEflex Code of Conduct demonstrates an important step on the path to taking a capabilities approach to provide oversight of the market. The Code could encourage providers to assess their own offers in terms of household capabilities, which in turn could provide a useful basis for identifying gaps and exclusions. Furthermore the Energy System Operator (ESO) recommends that Flexibility Service Providers registering for the DFS align with HOMEflex Code of Conduct (ESO, 2023, p. 1). This demonstrates how system actors procuring flexibility can support and incentivise Flexibility Service Providers to take this capabilities approach.

However more remains to be done to develop the standardised terminology and the evidence base that will help Flexibility Service Providers to assess the extent to which they are meeting the best practice approaches outlined in the Code.

“You don’t want to feel like you are being duped by these claims and I’m sometimes concerned they are too good to be true. I want to know with my home and my situation, am I actually going to save that?”

Participant in a HOMEflex focus group

Household Engagement with the Demand Flexibility Service

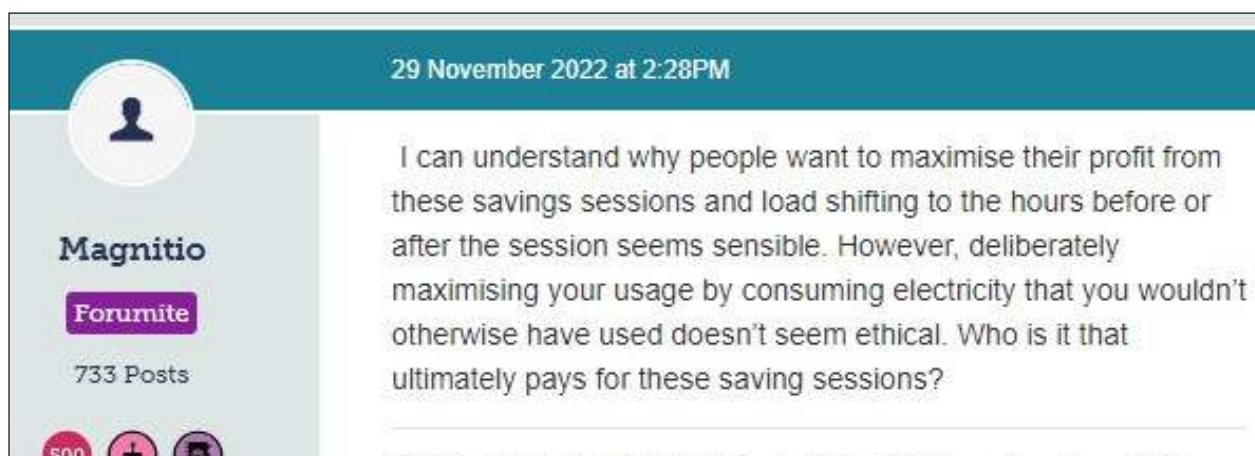
Another route to achieving confidence in the market is through the evaluation of different households’ experiences of using a smart offer. This provides a much-needed evidence base of the factors that affect participation. CSE was commissioned by the Electricity Systems Operator (ESO) to evaluate household engagement with the Demand Flexibility Service 2022-2023. We used a capabilities approach in the evaluation and designed a survey to collect data about households’ smart energy capabilities. We received responses from 23,717 households who had taken part (CSE, 2023a). The full results are available on ESO’s website (www.nationalgrideso.com/document/282981/download).

The evaluation survey indicated that the DFS achieved low barriers to participation. A wide range of households took part in the evaluation survey, including those who have been flagged in research as potentially facing participation barriers; 30% of respondents had a health condition or long-term illness, 18% of respondents were tenants and 30% lived in households with 3 or more people. However, some demographic groups were underrepresented, including younger age groups, lower income households, renters and city residents.

In addition, household experiences differed. Households with health conditions, renters and those struggling financially reported slightly worse experiences and outcomes. The capabilities framework gives further insight into the nuances of these differences. Contrasting experiences for two respondents who both have health vulnerabilities demonstrate two very different sets of smart energy capabilities. One person indicated in their survey response that they were potentially putting themselves at risk of harm through their approach to reducing their demand. They explained “I’m disabled and I found turning off the lights was potentially dangerous”.

In contrast one of the participants we interviewed, who also had health issues found it very easy to shift their electricity use and had an app they used to monitor and control appliances at home. The interviewee explained “I can just go onto my phone and switch something off, especially if it’s a downstairs one and I’m not sure if it’s been left on or not”. This person understands their energy demand, they know how to monitor and control it, they are confident in using digital technologies, and they know what electricity use they can safely shift to earn rewards. The other person lacks these capabilities. If lighting is the only shift-able load they have, the DFS is probably not the right the flexibility service for them. It is therefore imperative that different household experiences are monitored to understand any emerging inequalities, in terms of differential access to offers and outcomes achieved through participation.

Figure 7 screen grab from a Money Saving Expert forum with a quote on the ethics of demand shifting



A third key insight from the Demand Flexibility Service is the discussion of fairness that it produced amongst participants. Tips and tricks for maximizing incentives circulated in online forums, including the advice to increase demand in the four hours immediately before a demand reduction event. However, this discussion also included people suggesting this was counter to what the service aimed to achieve. A commenter on Money Saving Expert’s forum wrote: “Deliberately maximising your usage by consuming electricity that you wouldn’t otherwise have used doesn’t seem ethical” (Figure 7). Some evaluation survey respondents and interviewees also flagged that this behaviour did not seem right. An interviewee described this behaviour as “a bit cheeky”, while a diary respondent argued that inflating demand for rewards “wasn’t in the spirit of the service, although not against the rules”. Other survey respondents pointed out that low electricity users do not receive much reward despite making effort to shift, and questioned the fairness of the incentive mechanism.

Fairness is at the heart of the Smart & Fair programme because we see it as fundamental to building the trust and confidence needed for a fast and effective transition to a smarter, more flexible energy system. Perceived unfairness and confusion about what is required of households to benefit will be detrimental to this goal. Our evaluation of the DFS showed that overall perceptions of demand shifting were positive. 62% of respondents were satisfied with their experience and 83% would participate again. There was also evidence that some households had increased their

understanding of energy use at home and how to shift their demand as respondents described changes they could make to be more effective in future iterations of the DFS. This indicates a real opportunity to build wider understanding and promote public debate about the fairness of different forms of flexibility and how the benefits are accrued across the system and between different types of households. Improving public understanding of this will increase transparency, build trust and support engagement in the market.

“Have always tried to respond to a challenge and in my old age am still up for it. Does give me satisfaction looking after our wonderful world.”

Demand Flexibility Service Survey respondent

The evaluation also showed the merit of using a capabilities approach to understanding participation. Adopting this lens allowed us to investigate different experiences across households and flag how participation in a flexibility service might increase a household’s capabilities. Crucially it also showed that some households were taking part when they lacked the right capabilities to participate safely and effectively. The HOMEflex code of conduct should prompt flexibility service providers to better consider the suitability of their services for households. However much more evidence is needed to support this approach, built through monitoring and evaluating which products are helping which households to generate value.

We should note that not all DFS providers participated in the DFS evaluation meaning their customers were not surveyed. Providers may recognise a commercial interest in protecting insights about the benefits and barriers their customers experienced. However effective oversight of the market requires an overview of which consumer segments are being well served by the market, and which are being left behind. When commercial actors refuse to participate in independent evaluations, they should be required to provide capabilities-based assessments about customers’ experiences. Providers should be required to give an overview of the consumer segments that are benefitting from the products and services they have on the market. This would be one route to demonstrate compliance with HOMEflex Code of Conduct. It would also support the advice sector in providing guidance to households about the types of offers that would work for them.

Key Insights

When we assess smart offers by the capabilities they require of households, we can begin to understand the changing nature of vulnerability in relation to the energy market. We’ve seen that taking this lens to evaluate household engagement with flexibility services helps provide insight into what works for different households. This then provides an evidence base from which to build confidence to participate. It can help us understand the scope for improving capabilities and support participation as a way to increase a household’s capabilities. However there are some significant challenges currently in the way of being able to provide a robust, independent overview of the market for smart energy offers.

A lack of standardised terminology

Findings from the market monitoring activity highlight some of the challenges consumers face when finding information in the smart energy market. There is currently a lack of descriptive information categorising different smart energy offers. There is also only limited detail regarding the capabilities an offer may require or its financial impacts. Without action from relevant stakeholders, this situation risks excluding certain groups from taking up or benefitting from smart offers. It also creates a risk of negative consequences by groups taking up offers that do not work which could lead to increased vulnerability, loss of confidence and failure to deliver the needed flexibility to the energy system.

Through the market monitoring work carried out in phase 2, it is clear that there is still work to be done by industry to standardise terminology used to describe smart offers, create more transparency around the expected financial impacts and be more explicit on the consumer requirements that underpin the expected benefits. Those designing and marketing smart energy offers should consider how best to categorise and describe their offers. Clearer descriptions of smart energy offers and their functions will help consumers to recognise and compare similar offers. More information is needed from commercial actors, but they are unlikely to share this information without action from government and the regulator.

Tracking an evolving market

To track and build confidence in the evolving smart energy market we need more evidence about which households are successfully engaging with the market and which are not, and the range of reasons for these differences. This requires oversight by experts who are across smart energy innovation as well as experts who understand household capabilities and the changing nature of vulnerabilities created through the energy system. The first set of experts bring a future-oriented perspective which can help gauge where new distinctions and offer types are appearing as markets evolve. The second set of experts understand the realities of household lived experiences with technologies and bring these to bear on how we understand the requirements the smart offers demand of households.

Oversight is needed to determine how well different consumer groups are being served and the extent that access to and benefits from a smarter more flexible energy system are fairly distributed. We suggest that a smart energy capabilities approach is also used to understand and mitigate emerging inequalities. This requires additional metrics to the ones currently used by Ofgem to characterise the retail market. Six monthly reviews (during summer and winter) could review the breadth of offers falling into each type to understand market unbalances. Alongside this, however, there should be a mechanism to gauge the value streams that are accessible to different consumer groups and how these stack. This will be an important factor in determining emerging inequalities. Networks (DNOs and ESO) can contribute to this oversight through their work in innovating flexibility services and rolling out the Low Carbon Transition Support services required by the ED2 incentive.

Keeping information up to date

Currently the team at CSE are continuing to monitor for new smart energy offers and update information on new and existing offers manually. To automate this process and import relevant

data into a publicly available offers database we would need cross sector standardisation of offer metadata. There are a number of initiatives that are laying the groundwork for this. The HOMEflex code of conduct is one, the Energy Smart Appliance Standards and Flexibility Provider regulations are others. However, it will require concerted effort by regulators, government and consumer advocacy organisations and networks to articulate the need and benefit of this approach and for industry to comply.

Recommendations

Through this work it is evident that the main priority is to establish a common framework for describing and evidencing the value of smart energy offers and how consumers with different smart energy capabilities can access offers. This framework needs to be designed for the customer and used by industry, regulators and advice providers.

To this end, we recommend that:

- A.** Organisations that procure flexibility (Networks) can ask flexibility service providers to complete a template layperson summary of their offer covering the capabilities required to take it up and transparent examples of expected benefits. This can be published by the procuring organisation. This is the approach used by ESO for the DFS providers. It offers a way to standardise information about offers, and help consumers and advice organisations to make comparisons and take decisions about offers.
- B.** Government and industry to work with consumer advocacy groups to improve terminology and metadata required for comparing smart energy offers. The smart offer taxonomy and profiling guidelines provide a template for this. The Department for Energy, Security and Net Zero's work on regulations for smart energy appliances and licensing for Flexibility Service Providers will be important here.
- C.** All energy system actors to widen access to smart energy capabilities data and track change over time by:
 - Creating a public evidence base of diverse household experiences of smart energy offers.
 - Establishing an annual review of smart energy offers available for domestic consumer groups and progress in offer comparison for industry, advice providers and government or regulator.



3. Smart Energy Advice

Smart Energy Advice can mitigate the risk of households getting left behind by an energy transition that requires active engagement by consumers. However, the range of smart energy offers and the ways that products, services and tariffs interact with each other can be bewildering for energy advisors as well as consumers.

Information is not clear or accessible, as outlined in Chapter 2. Smart home technologies get conflated with smart energy technologies even if they do not deliver optimal energy outcomes. Smart home technologies may increase comfort, but may do so alongside driving up energy use as well as requiring embodied carbon to be manufactured (Pohl et al., 2021). CSE's evaluation of household experiences of the Demand Flexibility Service has flagged another risk; the circulation of demand shifting tips and tricks that circulate in online forums accessed by those in the know, while others are excluded (CSE, 2023b, 2023c).

The smart energy landscape is also complex for Energy Advisors. Being able to estimate the impacts of taking up an offer for a specific household is getting increasingly complex, because the outcome will depend on the household's smart energy capabilities. The advice may also change as regulations and market interventions, like the energy price cap, change. Local flexibility markets mean some households are eligible for some offers, but others in their area are not. This creates uncertainty about how to provide advice about smart energy offers. Added to this is the reality that energy advice services are under increasing pressure since 2021 with the aftermath of the pandemic and the cost of living crisis and casework has increased in complexity and scope (CSE, 2023b), thus reducing the capacity of both advisors and consumers to engage with smart energy offers.

Other issues come from the bundled nature of offers and the variety of offer combinations which make it hard for consumers and advisors to know what step to take first. This point is made by Carmichael et al. (2021) who suggest that online comparison tools are needed that help households to start their smart energy journey via any route. Households could start from tariff switching to get best deals, and find themselves routed to towards time of use tariffs, and ultimately considering low carbon technologies. Or they might start with getting a solar PV unit and later consider demand management and smart tariffs.

A key part of CSE's Smart & Fair research programme has been to think through some of these complexities and seek innovation funding to develop possible solutions. In this report we outline the work done to create our online 'Smart Energy Choices Tool', and the 'Smart Energy Action Plans' we have been piloting with NGED.

Energy Choices Tool

The Energy Choices Tool (ECT) is an online advice tool that has been developed by CSE. It is

intended to offer a simple route into smart energy advice for customer segments that were at risk of being left behind. CSE saw a need for a tool that:

- Supports energy advisors to assess smart energy offers based on clients’ circumstances.
- Enables energy advisors to give tailored advice about smart offers to vulnerable energy customers including the anticipated benefits of smart offers, any risks and how a client can avoid them, and what is needed to take up a smart offer.
- Assists clients to make appropriate choices about smart offers, so they can better manage or reduce their energy use and avoid offers which could be detrimental to them due to financial, health or other reasons.

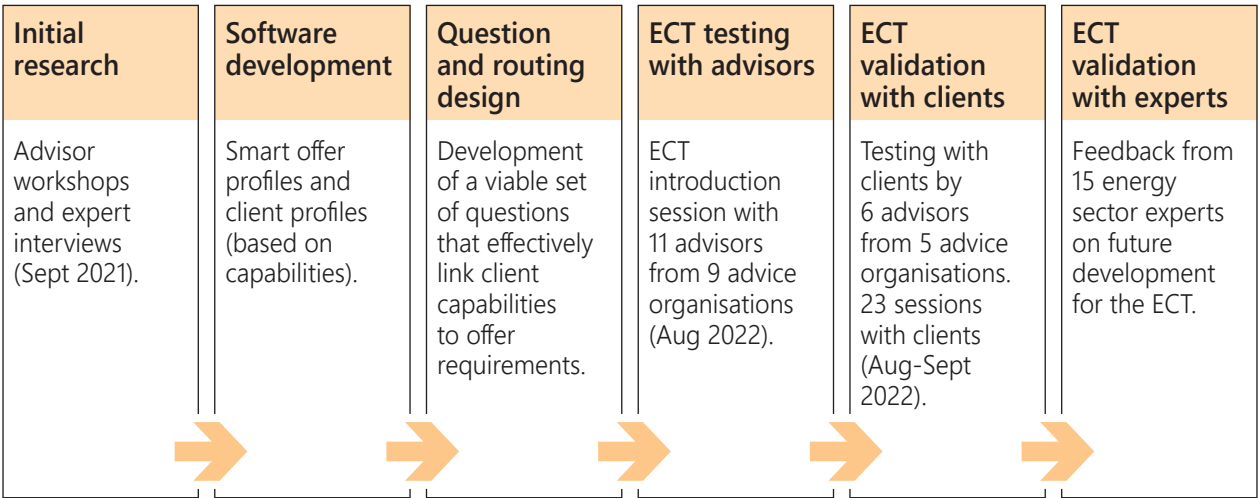
Overall, encouraging the take up of appropriate smart offers by energy customers – especially those on the Priority Service Register (PSR) or at risk of fuel poverty – could positively impact their health and wellbeing and include them in efforts to reduce carbon emissions in the sector-wide drive for decarbonisation of electricity, heat and transport.

In 2021 CSE successfully applied to the Energy Redress Fund to develop a prototype Energy Choices Tool. The next sections describe the approach taken to develop the tool, where it’s at now, and intended next steps.

Co-design process

The tool was created via a co-design process involving energy advisors, their clients and sector experts. Initial discussions about the remit of the tool and user testing occurred over 18 months in 2021-2023 (Figure 8).

Figure 8: Energy Choices Tool co-design process



The prototype tool was developed following interviews with three experts and 10 energy advisors from England and Scotland. Following desk research on market offers, a sample of six smart offer types were included in the tool, selected as being the most common, but representing the widest

set of propositions across tariffs, services and products. The prototype was tested by nine advice organisations. Five organisations went on to test it with 23 of their clients. An advisor workshop in November 2022 shared trial result and obtained further feedback.

The user engagement led to specific recommendations and learnings for the tool and its application:

- Tailor the tool for more vulnerable clients.
- Include a broad range of smart offers, but not every branded product within a smart offer type.
- Include non-smart alternative technologies e.g. mechanical timer plugs.
- Further guidance for advisors on how to discuss results with clients.

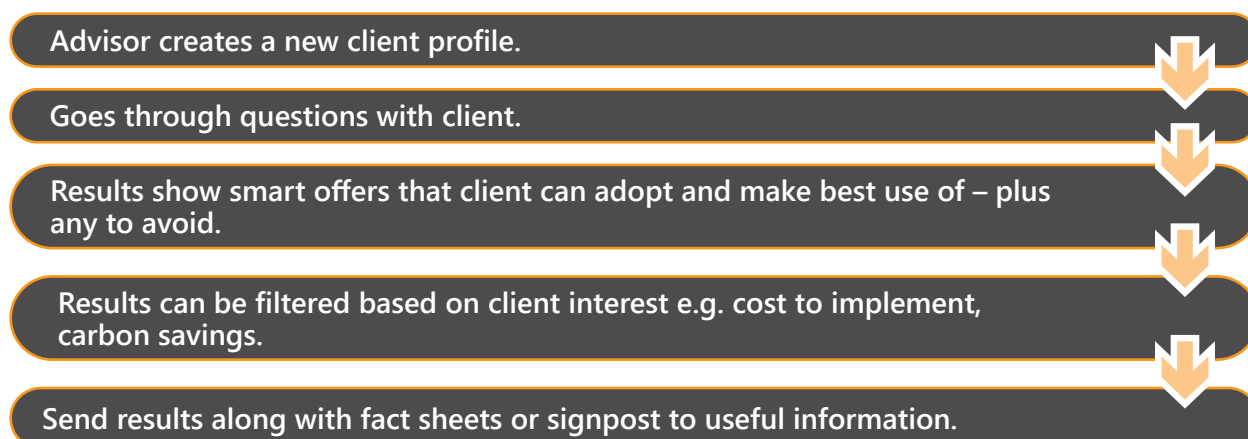
And learning points more broadly about the challenges for the advice sector to give smart energy advice:

- Smart metering is still an issue for some clients and for advisors to recommend. Some households continue to experience technical issues with installation, while others remain highly sceptical towards smart meters.
- The advice sector will require upskilling and training on the types of offers and variety of financial impacts they may hold domestic consumers.

Proof of concept: Energy Choices Tool

The Energy Choices Tool is designed to help people 'be smart with' energy. This covers reducing the amount of energy they use, being flexible about when they use energy and by increasing the amount of renewables they use. The Energy Choices Tool was developed for advisors to use in conversation with clients during an advice call. The advisor runs through a series of questions with the client which are based on the capability lens. The tool matches a client's profile to a set of offers which can then be discussed by the advisor with the client (Figure 9).

Figure 9: Energy Choices Tool process

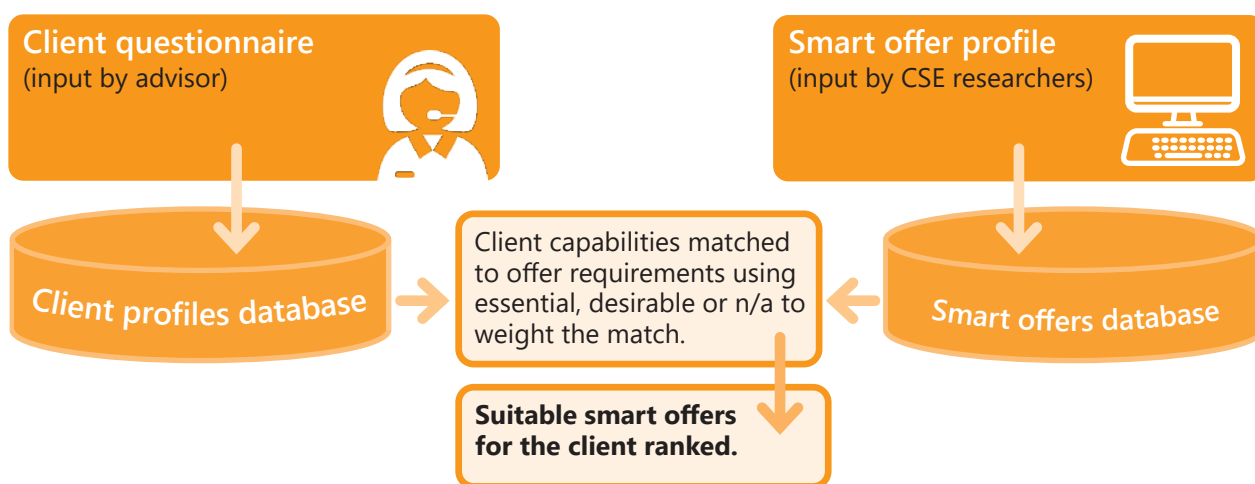


Creating tailored suggestions

The tool makes tailored recommendations by linking together two data sets (shown in Figure 11):

- 1 Client profiles produced through assessing energy customer capabilities which affect their need or ability to take up a smart offer.
- 2 The database of smart energy offers profiled according to the requirements they place on households (see Chapter 2).

Figure 10 Linking a client profile to smart offer profiles



For the tool to generate personalised suggestions for appropriate smart offers, client capabilities are matched to offer requirements. As described in the previous chapter, during the offer profiling process, every offer requirement was assigned either as Essential or Desirable. Essential means that the offer would not be effective or could not be used if the client does not meet this requirement. Desirable means the offer can be taken up but there are some additional improvements to be made to make the offer work more efficiently or effectively. For instance, someone that (1) is confident using an app or online programme and (2) has wifi at home would be able to use a smart plug. These are 'Essential' for someone to be able to adopt this technology and Essential for the smart offer to function. For battery storage it would be Essential to make structural changes to a dwelling. If a client rents their home, we've assumed that it is unlikely that they will be able to make structural changes, so they do not fulfil this essential need to take up the offer. Any offers with this essential requirement will be ranked below other more suitable offers.

“I think it is doing something really unique and filling the gap. That there just isn't this advice on this smart tech and the smart services.”

Expert interviewed for the Energy Choices Tool

How well an offer matches with a client's capability is visualised in the Energy Choices tool. Bars and percentages are used to illustrate the degree of match between capabilities and requirements. Figure 11 shows the results for a static time of use tariff where a fictional client has fulfilled all the Essential requirements and most of the Desirable requirements.

Figure 11: Screenshot from the Energy Choices Tool showing match bars



The tool uses these results to rank offers for the client. Offers are ranked, rather than excluded because this means the advisor can see which properties are missing and can prompt further discussion. The advisor and client can consider whether the client could make changes in order to adopt a smart offer. For instance, installing a smart meter or tariff switching could enable someone to take up smart offers.

Advisors wanted the tool to indicate the financial costs associated with a smart offer. We addressed this by categorising smart offers (Figure 12), each having a ranking scale (see Table 10 in the Appendices)

Figure 12: Categorisation of smart offers

CATEGORY	CATEGORY	CATEGORY	CATEGORY	CATEGORY
Cost to implement	Effort to implement	Operating cost risk	Carbon reduction potential	Running cost savings

Figure 13 shows the results for a hypothetical client with disabilities, who has low energy use and can be flexible when they use electricity. The tool shows that the Demand Flexibility Service is a 100% Essential match and 50% Desirable match for this client, the lower Desirable match is due to the client having low energy use when high electricity use tends to work more effectively with demand flexibility offers.

Figure 13: Screen grab showing results for hypothetical client with disability, low electricity use, some flexibility.

Name	Match detail	Product type	Cost to implement	Effort to implement	Operating cost risk	Carbon savings potential	Running cost savings potential
Smart thermostat		Product	£200-£2000	Small	Medium	Small	£50-£150
Dynamic time-of-use tariff		Tariff	Free	Minimal	Medium	Medium	£0-£50
Static time-of-use-tariff		Tariff	Free	Minimal	Medium	Medium	£0-£50
Demand Flexibility Service		Tariff	Free	Minimal	Minimal	Small	£50-£150
Monitoring service		Tariff	Under £20	Minimal	Minimal	Minimal	£0
Electric Battery		Product	Over £2000	Medium	Medium	Small	£0-£50
Electricity diverter (with app)		Product	£200-£2000	Medium	Medium	Small	£50-£150
Smart plug		Product	£20-£200	Minimal	Small	Small	£0-£50
Heat battery		Product	Over £2000	Large	Medium	Small	£0-£50
Thermal store		Product	Over £2000	Large	Medium	Small	£0-£50

Showing 1 - 10 of 23 results

Additional materials and resources for advisors

It is an online tool with a simple user interface. The home page explains what 'smart' is, what the tool does, the process involved, how to start using it, and a case study. The menu includes a User Guide, FAQs, additional useful information (like how financial savings were calculated) and fact sheets on the offer types used within the tool.

The ECT currently includes 24 smart offer types that have currently been profiled (as of September 2023), including time of use tariffs (static, dynamic), type of use tariffs (e.g. EV tariff), smart heating controls, smart hot water tank, and EV charging services.

Next steps

The prototype tool was shared with 15 energy sector professionals with expertise in smart offers, customer vulnerability, advice provision or energy research. The aim of expert engagement was to address key challenges raised in user testing and to identify options for ways forwards with wider tool roll out.

The need for an Energy Choices Tool was identified across all stakeholders engaged, in the expectation that it could simplify information about smart offers at a time when people are more conscious of their energy use due to high fuel (and other) costs. They recognised that the Energy Choices Tool filled a current gap in terms of providing simplified, impartial information. Having offer types instead of 'all brands' was seen as advantageous as it avoided putting users off with too much choice. It also reduced the risk of making incorrect recommendations, leaving the consumer with some information to take with them on their next step of researching a specific offer that might work for them.

However, experts flagged that more work is needed to think through how bundled offers can be represented and how different smart energy offers combine and work together. They also stressed the need for the tool to be kept up to date, impartial and accurate in the sense of presenting the entire market of smart offers.

CSE will be drawing on these insights from advisors and experts as we develop the next, Self-Serve version. In user testing some well-informed clients used the tool to check and validate their decision-making on smart offers. Some used it to explore different home scenarios (e.g. with or without a heat pump) to assess changes in results. This suggested that some energy customers would find it useful to access a self-serve Energy Choices Tool. Wider access to the tool, can support greater take up of low carbon technologies and smart offers, whilst reducing demand on advisors.

Working in partnership with National Grid Electricity Distribution and Northern Powergrid and drawing on input from experts and advisors, CSE is developing an Energy Choices Tool that can meet the needs of independent users and energy advisors so that appropriate personalised advice on smart offers is freely available to as many people as possible.

In doing so, CSE is seeking to:

- Mimic the advisor-client engagement process in the tool, to generate tailored advice with a suggested user journey. This involves explaining how to get the most from a smart offer and practical implications such as financial options (grants, leasing or repayment plans) and installation requirements.
- Address customer motivations like comfort and control of smart devices once installed.
- Signpost to advice organisations for self-serve users who want further support and to further resources to facilitate further action.
- Ensure the tool is up to date via ongoing marketing monitoring and updates checked by an oversight board

CSE will also seek to answer wider questions that remain within the provision of smart energy advice, such as

- What further support is needed to build advisors' confidence in offering smart energy advice?
- What would optimise the tool's usefulness in terms of enabling users to take further action? How can that impact be measured?
- How can the bundled nature of smart offers be conveyed and communicated in a simple way?
- How can ostracized energy customers be engaged in honest conversations about the risks around smart technologies?

Smart Energy Action Plans

In parallel to developing the online tool, CSE has been working with NGED to develop Smart Energy Action Plans (SmEAPs) for customers in vulnerable situations including those who are on NGED's Priority Services Register (PSR). The main focus of this project has been to identify how smart energy advice can become a core service offered as one of NGED's Low Carbon Transition services. This project has built on the processes and tools developed for the Energy Choices Tool, and has

tested how to bring this type of advice into business as usual advice provision.

There have been five key strands of work:

- 1** Testing different ways of offering smart energy advice tailored to the customer's needs.
- 2** Training and upskilling energy advisors.
- 3** Developing new tools and resources for customers and advisors.
- 4** Identifying and widening referral routes and engagement hooks.
- 5** Evaluating SmEAP tools and approach.

Different types of plans

Through testing, the team have identified the need for different types of plans to reflect different customer circumstances and needs, resulting in two types of plans being trialled; introductory plans and detailed plans. Both types of plans involve providing the customer with an overview of the smart energy transition, building a picture of the customer's current smart energy capabilities and explaining how this can impact their participation in a smart energy system. Advisors use this insight to identify smart energy offers that might benefit the customer based on their current capabilities, but also to explore how clients can plug any capability gaps to access more smart energy offers in the future (e.g. getting a smart meter installed to be able to benefit financially from time of use tariffs).

Introductory plans

These are for clients who are not ready for an in-depth and comprehensive conversation on participating in the smart energy transition, but are open to:

- Improving their understanding of the smart energy transition.
- Receiving tailored advice on one or two specific offers or options, for example about smart meters or renewables.

The introductory plan includes a light-touch overview of the changing energy system, a review of the client's core 'smart energy capabilities', advice on how to improve any gaps in these capabilities, and brief advice on one or two smart energy offers. Typically, advice topics include:

- Smart meters.
- Access to digital technology.
- Digital skills.
- Understanding energy usage.
- Experimenting with flexing their usage.
- Thinking about renewables.

Detailed plans

Detailed plans are for clients who are already engaged in the smart energy transition to some extent and are interested in an in-depth review of how they can best participate in and benefit in this new energy system. The detailed SmEAP advice call entails:

- Assessment of the customer's personal situation, priorities and objectives – via a questionnaire developed from the ECT client questionnaire.
- Exploration of how this impacts their participation in the smart energy transition – what are the key barriers or opportunities both now and in the future?
- Discussion of all the smart energy products or services that might be appropriate.

Following the detailed SmEAP advice call, which can last between 1-2 hours, the customer is sent their personalised detailed SmEAP. This includes a copy of the questionnaire and their responses, a summary of the offers and products relevant to them, and supporting information such as CSE's factsheets.

“It's been very positive and I think it's certainly built on and given us the impetus to do what we've done in terms of getting to the next stage with the batteries.”

Feedback from a Smart Energy Action Plan recipient.

Training and upskilling energy advisors

Advice on smart energy offers is complex and wide-ranging; it straddles the skillset and knowledge base of both energy advisors (e.g. tariffs) and retrofit professionals (e.g. low carbon technologies), with some offers sitting outside the scope of both of these groups (e.g. optimisation platforms). Advice organisations will require significant investment to upskill their teams to give in-depth advice on the full range of smart energy offers. There are limited options for training courses on the market currently that cover smart energy offers in the context of fuel poor or vulnerable customers. CSE explored three training courses delivered by external providers: NEA's Introduction to Domestic Renewable Low Carbon Technologies (Level 2), NEA's Decarbonising Homes: Technologies, Impacts and Solutions (Level 4), and the Retrofit Academy's Level 3 Award in Domestic Retrofit Advice. None of these would, on their own, give energy advisors with the knowledge and understanding required to support fuel poor or vulnerable customers participate in the smart energy transition.

CSE opted to develop their own in-house training by drawing upon the experience from their fuel poverty advice team, the retrofit team and the Smart & Fair team. There have been two tiers of training courses developed – an introductory course for all fuel poverty advisors, and an in-depth course for the SmEAP advisors. The project has also identified the challenge of engaging fuel poverty advisors on smart energy advice, given the wide range of advice topics they already have to be skilled in, and the limited perceived benefit of smart energy offers for fuel poor or vulnerable customers.

Developing new tools and resources

Significant new resources had to be developed for advisors as well as for customers, including:

- Different templates for the different levels of SmEAPs.
- New customer-facing factsheets, such as our “Getting smarter with energy” factsheet that provides an overview of the changing energy system and how best to participate in it.
- In-depth advisor guidance materials to help them respond to a wide range of client needs and queries.
- Simple information sheets on each offer type to provide a short description, explain key benefits, provide at-a-glance information on costs, savings, risk and disruption, outline the capabilities required to take up the offer and outline the capabilities that would help maximise the benefits from the offer.

The key challenge was achieving a balance between technical information and ease of understanding, particularly when considering that the plans would be relied upon by vulnerable customers who are considering these offers for the very first time. Moreover, there is a need to regularly review and update the resources through the market monitoring exercise, to minimise the risk of incorrect advice being given to vulnerable customers.

Referral routes and engagement hooks

NGED customers access the Smart Energy Advice through a number of referral routes, including Contact Centres; Fuel poverty services – e.g. CSE Power Up! Team, casework teams, NGED Affordable Warmth delivery partners and Energy Affordability Fund grantees; and Retrofit services – e.g. through CSE’s work on the Home Upgrade Grant Scheme in Bristol. The engagement hooks vary depending on the referral routes. There is a strong focus on saving money for fuel poverty routes, while making most of newly installed technology is key for retrofit routes. For fuel poverty advice organisations, a key challenge was their capacity to train up their staff on such a wide range of complex topics, and the difficulties engaging vulnerable, fuel poor customers in smart energy advice when there are limited offers in the market suitable for this client group. Although engaging fuel poor clients through the retrofit route (through grant-funded schemes) was found to be easier, it is important to consider at what point to offer SmEAP advice. In some cases, due to the complexities of the retrofit process (e.g. ventilation requirements and correct heat pump sizing) and the involvement of several actors (local authority, retrofit assessor, retrofit co-ordinator and installer all communicating with the customer), it was found that the best approach was to offer SmEAP advice once the retrofit process was near completion, i.e. once new measures had been installed.

Insights from developing Smart Energy Advice tools and services

Overall, these two pilots have shown the need for Smart Energy Advice that is designed specifically for consumers segments that are at risk of being left behind. In user testing advisors, clients and energy experts stated that an Energy Choices Tool which supported advisors or the public to make wise, informed decisions about smart offers was timely and necessary. Developing a self-serve tool – as CSE is now doing with support from National Grid Electricity Distribution and Northern Powergrid – can widen access to tailored advice, while reducing demand on advisors. The two pilots have also shown the opportunity that exists currently to work with DNOs as they develop and scale their provision of ED2 Low Carbon Transition services. In this section we highlight some of the main insights and ongoing questions these pilots have raised.

How to deal with costs?

As flagged in Chapter 2, it is complex to estimate the cost implications of different offers when profiling them. Cost impacts are even more complex when providing advice about offers, as the advice needs to take into account existing household energy costs and how the uptake of an offer or combination of offers may affect these. The advice needs to differentiate between upfront investment costs, energy bill impacts and potential incentives as well as help people consider factors such as return on investment and future income through flexibility markets.

Detailed cost assessments can only be carried out with appropriate research into a specific offer for an individual household. As discussed in Chapter 2, some providers already provide tools that let a potential customer input detailed information about their housing situation, including tariff details to generate cost estimates and assess the suitability of the product for the household. But these provider tools do not allow for easy comparison across provider offers, nor do they make it easy to consider the interaction between products, tariffs and services. The Smarter Tariffs Smarter Comparison tool (<https://smartertariffsmartercomparison.org/>) will be an excellent option for households to identify the best smart tariff given their actual consumption. But this is only for households who already have a smart meter. Through the Smart Energy Action Plan pilot we know that a key entry point for households to seek out smart energy advice is because they have questions and uncertainties about whether or not to get a smart meter.

Smart energy advice does need to provide indicative costs and help households identify which options to explore in more detail. Currently, the Energy Choices Tool uses banding to give indicative figures on cost to implement, financial savings and running cost risk. In testing, advisors used these indicative figures to discuss cost implications further, such as financial risk. Although expert reviewers pointed out the limitations of this approach and more generally flagged the difficulty in determining costs and payback periods given current market uncertainty and the ongoing regulatory and market reforms.

A different route to cost assessments could be to provide generic worked out cost examples for complex or bundled offers that people can use to benchmark their own situation against. These

should clearly state the assumptions used in cost calculations and be regularly updated. Costed examples could be created using Ofgem or ESO consumer archetypes (see chapter 5) or using dwelling archetypes. Identifying a solution for providing useful and accurate cost information is a priority for the next phase in the Energy Choices Tool development.

Customer journeys

The Smart Energy Advice pilots described in this chapter are designed for consumer segments who are at risk of being left behind. Through the Smart Energy Action Plans pilot, we have seen two main routes to this advice. The first route stems from interest in (or scepticism towards) smart meters. This opens an opportunity for advice that links smart meters to the changing energy system and helps people to think through what these changes might mean for the way they use energy at home, and how much it will cost them. The second route stems from specific low carbon technologies and households interested in knowing they are making most the technology and are on the right tariff. These households may or may not be the decision makers behind the technology installed. Social housing retrofit schemes mean that some tenants may have Solar PV, Heat pumps, or smart high heat retention storage heaters. Others may be owner occupiers who are accessing grants to carry out retrofits. Smart energy advice designed to mitigate the risk of being left behind needs to be able accommodate these different entry points.

We need to relate the smart energy advice customer journey to a more holistic picture of energy actions open to a customer and allow smart offers to be placed within the wider context of retrofit and energy efficiency. The most accessible smart energy advice should help people think through how smart energy products, services and tariffs work together. But this does not need to be associated with any requirement to purchase expensive digital technologies, and it should not downplay the need for energy efficiency and demand reduction. The focus of CSE's Smart Energy Advice is to help people 'be smart with' energy.

We also need to reflect upon how far along the smart energy advice journey our tools and processes take people. The Energy Choices Tool allows people to relate types of products and services to their current smart energy capabilities, rather than make recommendations for specific products or build switching options into the tool. This approach was valued by advisors and experts because it keeps advice impartial and simple. It also allows for users to take a forward looking perspective to think about what capabilities they could change to improve their engagement with the energy system. People can look at what options open up if they have a smart meter for example, or a heat pump. They can reflect on whether or not they can safely flex their demand to access a cheaper tariff or earn an incentive. When they have considered a range of options and identified a plan, they can then begin researching the specific technology, service or tariff that will work best for them. This can be done independently via provider sites, or with support from trained, independent advisors and retrofit assessors.

We also need to recognise that smart metering remains a key challenge, with clients either unable or unhappy to have a smart meter installed. Advisors frame smart metering in terms of a changing energy system and the access it creates to better deals, given that many of the customers

supported are in fuel poverty and saving money is a key priority for this group. Although this opens up the possibility of a more in-depth discussion with some customers, the technical challenges with the roll out continue to hinder engagement and will be a significant factor in trying to implement the 'no one left behind' principle.

Training for advisors and referral organisations

The pilots also show the need for training on smart energy advice. This includes the teams giving advice to household who need to be upskilled in their knowledge about smart energy products, services and tariffs, as well as the referral teams who need to consider when smart energy advice might be the appropriate next step for households. CSE is continuing to develop training materials and resources and will work to share these. However, advice organisations will find it hard to prioritise training their teams in a new advice area, given the pressure for advisor services currently, and the increasingly complex nature of this advice for households coping with an intersection of cost of living and energy crises. Improving publicly available metadata for smart offers and market monitoring insights will help to simplify training and help advisor keep on top of the changing market, but more funding for advice organisations is also required.

Standardising and rolling out Smart Energy Advice

The three points noted above will help to improve and progress the provision of CSE's smart energy advice which specifically aims to mitigate the risks of being left behind. However, there is a wider issue of how this form of Smart Energy Advice can be funded and delivered long term. A key element will be improving the approach to market monitoring, through better tools, standardised requirements on businesses bringing smart energy offers to market, and clarity on the body that will provide oversight. But support for the advice sector will be required. Using ED2 incentives to require DNOs to provide LCT services creates the opportunity to reflect on how best to ensure this type of 'no one left behind' advice is routinely and widely available to the customers that need it.

Recommendations

Through this work we recognise and recommend the following actions for developing and scaling the provision of smart energy advice:

- D. DNOs to support training and knowledge sharing on smart energy advice for advice organisations and referral partners across and between DNO license areas.
- E. DNOs to convene a 'what is working' forum to share insights from piloting of LCT services and tools under the ED2 incentive mechanism. This forum should feed relevant insights and recommendations to stakeholders that can support and influence the provision of smart energy advice, including consumer advocacy groups, government and industry bodies such as HOMEflex and Smart Energy GB.
- F. Government to develop a strategy for the long term funding and provision of smart

energy advice across the UK.

- G. Government to improve public information about the smart energy transition including the role that smart meters play in decarbonisation.

These recommendations are in line with other initiatives and recommendations, such as Citizens Advice's call for the government to invest in a national independent information campaign on how people can contribute to net zero, backed up by impartial advice (Citizens Advice, 2023a). And work led by the Centre for Net Zero on a smart buildings rating to improve consumer understanding of the flexibility and its value (Centre for Net Zero and Energy System Catapult, 2023).



DISABLED

4. Smart energy capabilities data analysis

This section focuses on the progress made with our dataset on households and buildings. We start by giving an overview of our GB-wide household level dataset, which we call our ‘Smart Energy Capabilities dataset’, including its current limitations and drawbacks. We then describe some of our recent outputs that have utilised the dataset and discuss why these are useful in the context of Smart & Fair. Next, we list datasets that have the potential to provide us with information we are currently missing and therefore enhance our modelling capabilities. We finish by outlining our next steps and offering our recommendations to interested parties.

Smart energy capabilities dataset

We have constructed a household level dataset that covers the entirety of England, Scotland, and Wales (approximately 29m records) by combining these datasets:

- Ordnance Survey AddressBase.
- Energy Performance of Buildings Register.²
- Experian ConsumerView (Household Directory).

The datasets have been joined by using the household address or the Unique Property Reference Number (UPRN).

Table 6 shows the data variables within CSE’s Smart Energy Capabilities dataset. These variables represent a range of factors that affect consumers’ ability to participate and benefit from the low carbon transition and the second column in Table 6 shows the most relevant Capability Lens cluster associated with each.

² Department for Levelling Up, Housing and Communities).

Table 6: Data variables within CSE’s smart energy capabilities (GB-wide household level) dataset and the most relevant capability lens cluster associated with the variable

Variable	Capability lens cluster
Property type	Dwelling & local area
Property age	Dwelling & local area
Number of bedrooms	Dwelling & local area
Recommended insulation	Dwelling & local area
EPC rating	Dwelling & local area; Energy tech & usage
Heating fuel/system	Energy tech & usage
Solar PV installed	Energy tech & usage
Mains gas connection	Energy tech & usage
Number of children in the household	Personal & social
Child age bands (0-4, 5-11, and 12-17)	Personal & social
Number of adults in the household	Personal & social
Head of household age	Personal & social; Digital tech readiness
Experian Mosaic UK7 type	Personal & social; Digital tech readiness
Household income	Financial
Tenure	Financial
Residency length	Financial

To estimate whether a household had solar PV installed, we used the DLUHC Energy Performance of Buildings Register dataset as well as an open dataset of solar PV installations (Stowell et al., 2020b), which was created by Stowell et al. (2020a) using Open Street Maps as a platform for a major crowd-sourcing mapping campaign.

Missing EPC data was imputed based on average (or modal for non-numeric) values for addresses in the same postcode with non-missing EPC data with the same built form, number of bedrooms, and building age. If this was not possible, then one (or more) of those variables were dropped until there was a non-missing EPC value found in the same postcode to impute from.

There are 66 possible values for the variable ‘Experian Mosaic UK7 type’. These are the 66 household archetypes created by Experian by performing a cluster analysis on hundreds of variables (28% from Census data; 72% from Experian proprietary data, statistical models, and privacy-compliant public data).

Use cases

The Smart Energy Capabilities dataset described above allows us to:

- Identify and give the geographic distribution of different types of consumers based on their capabilities to take up, engage with, or access a particular smart energy offer.
- Reveal which types of consumers are most likely to be 'left behind' by the transition to a smart energy system because they do not have the capabilities to participate in any (or very few) smart energy offers.
- Understand the impact of reducing the capability requirements of particular smart energy offers to enable additional consumers to participate, which can help to inform policy decisions.
- Create consumer archetypes for future energy systems modelling or distributional impacts analysis based on similar household characteristics, energy use, technology uptake, and capabilities.
- Create dwelling archetypes for domestic building stock decarbonisation pathways based on similar dwelling attributes (e.g. property type, age, and size) and location specific attributes (e.g. suitability for district heat network connection).

We have experimented with the first three use cases by selecting a subset of smart energy offers gathered from the Smart & Fair Market Monitoring work package. However, the use case is still in an experimental phase due to the issues outlined in the section below.

Data validation and 'ground truthing'

One of the main aims of Smart & Fair Phase 2 was to validate some of the smart energy uptake predictions with data showing actual uptake (e.g. trial data from community energy organisations). We approached SSEN for Solent Achieving Values from Efficiency (SAVE) trial data and Octopus Energy for CrowdFlex trial data. However, both datasets contained anonymised household IDs with location data at a level not granular enough for meaningful validation purposes.

Another approach we can take with validation is to aggregate uptake predictions to a higher level of geography (e.g. LSOA) and compare this with actual uptake. This method is unlikely to be viable for trial data on smart energy offers due to there not being enough participants or enough coverage across Britain. However, it is an option we want to pursue for low carbon technology (LCT) uptake because there are datasets that capture a significant portion of the actual uptake across Britain at a geographically granular level (these are described in more detail in Table 7).

Limitations and drawbacks

The Smart Energy Capabilities dataset already contains a lot of information about people and buildings that relate to the Capability Lens. However, it is still lacking in certain key areas which limits our ability to make predictions. At a household level, we currently do not have data on:

- Smart meter installations.
- Electric vehicle (EV) ownership.
- Off-street parking.
- Household disposable income.
- Household savings.
- Household debt.

This clearly limits our ability to make predictions of uptake of various smart energy offers and LCTs. Using EV time-of-use tariffs as an example, a prediction of uptake without knowledge of smart meter installations, EV ownership, or off-street parking will be lacking because all three are important conditions that need to be fulfilled for most EV time-of-use tariffs and there is not a satisfactory proxy variable for any of them.

Household disposable income, savings, and debt are three variables that will affect a household's likelihood to purchase LCTs and/or smart technology, but the best proxy we have for them is household income.

Currently, our only household level knowledge of heat pump installations comes from the DLUHC Energy Performance of Buildings Register. The dataset contains a lot of missing data and EPCs are not updated regularly enough to provide an accurate up to date picture of heat pump uptake, which has been on the rise in recent years.

Data at a higher level of geography (e.g. LSOA)

To complement our GB-wide household level data, we have also combined a number of lower-layer super output area (LSOA) datasets from multiple sources. Data from the 2021 Census in England and Wales provides us with a lot more socio-economic and demographic data (e.g., level of qualifications, deprivation levels, digital literacy). Data from the 2022 Census in Scotland is due to be published in Summer 2024.

The Department for Transport (DfT) and Driver and Vehicle Licensing Agency (DVLA) publish quarterly statistics (starting from 2011) at an LSOA level on the number of licensed ultra-low emission vehicles by fuel type (e.g., battery electric, plug-in hybrid) and keepership (e.g., company, private).

3 <https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8666>

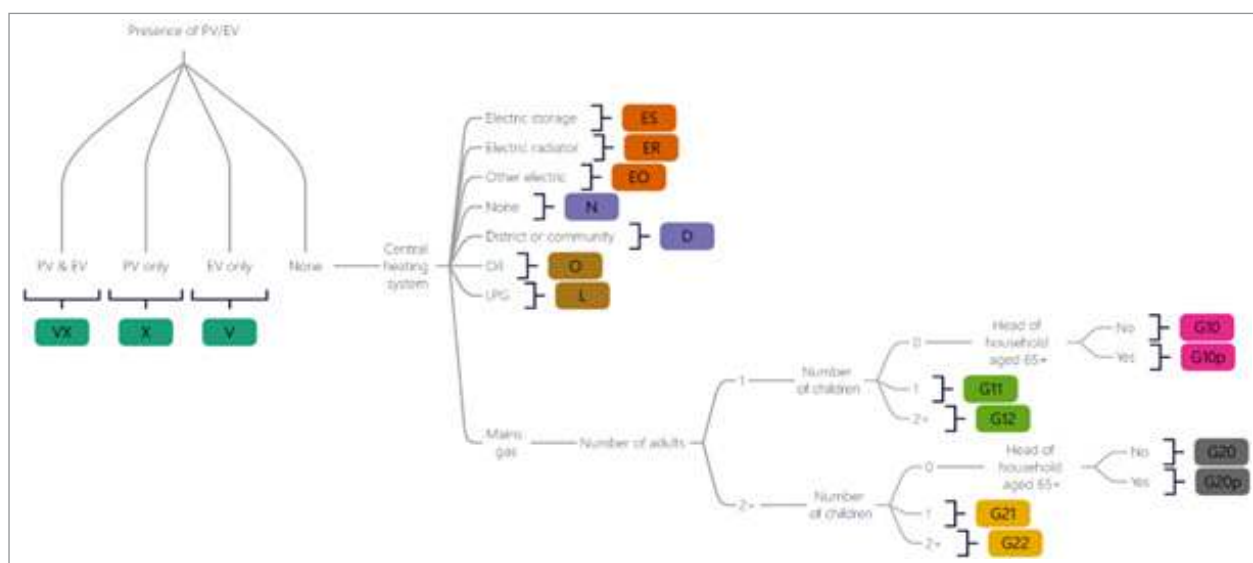
Outputs

In this section, we discuss some specific outputs of work we've conducted using the Smart Energy Capabilities dataset alongside other data at a higher level of geography.

National Grid ESO domestic energy consumer archetypes

CSE have created a set of 18 domestic energy consumer archetypes for National Grid ESO (NGESO). These archetypes were created using the Smart Energy Research Laboratory (SERL) dataset³. The SERL data contains the following information for over 10,000 GB households: half-hourly electricity import, electricity export, and gas consumption data from smart meters running from Jan 2019 to late 2022 and self-reported survey data on dwelling and household characteristics. Figure 14 shows how the 18 archetypes were created by splitting the SERL data via a decision tree (using the self-reported survey data). Half-hourly electricity and gas profiles as well as monthly consumption summaries were extracted for each archetype.

Figure 14 Tree diagram of the 18 domestic energy consumer archetypes created for National Grid ESO



Due to similarities with the archetype definitions and variables in our Smart Energy Capabilities dataset, we were able to classify each household in GB into one of the 18 archetypes (note, two archetypes could not be used in the classification process due to an absence of household level data on EV ownership). After classification, we were able to add more information to each archetype per LSOA using the other variables in the Smart Energy Capabilities dataset (e.g. average household income for archetype G21 in LSOA E01023041).

4 <https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8803>

5 www.gov.uk/government/collections/english-housing-survey

6 www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

These archetypes have been primarily designed to integrate into NGESO's Future Energy Scenario (FES) modelling. However, they can also be used more widely to understand current demand patterns of different types of energy consumers and potential future technology uptake.

Ofgem domestic energy consumer archetypes

CSE were recently commissioned by Ofgem to segment the population of Great Britain into a set of distinct groups of energy consumers, or archetypes. The archetypes were produced by segmenting an energy consumer dataset that was derived from the Living Costs and Food (LCF) Survey 2019-2020.⁴ This core dataset was supplemented by multiple additional datasets to incorporate critical information that is missing from the LCF. Additional datasets included: the Ofgem Consumer Engagement Survey 2020 (Williams and Waring, 2018), from which we incorporated various energy market engagement metrics; the English Housing Survey (EHS)⁵, from which we incorporated EPC ratings, different disability types, and communal heating data; and Digest of UK Energy Statistics (DUKES) tables.⁶ The resulting energy consumer dataset was segmented using a cluster analysis which resulted in a final set of 24 archetypes. The distribution of these archetypes was reported for each region across GB.

Through their integration into Ofgem's distributional impacts model, the archetypes are intended to be used to understand how different policies may impact on a selection of different types of households and energy consumers. They may be used to investigate existing or proposed policy designs or to help rebalance any policies which have been identified as unintentionally overlooking or disadvantaging certain households, particularly those classed as vulnerable or in fuel poverty.

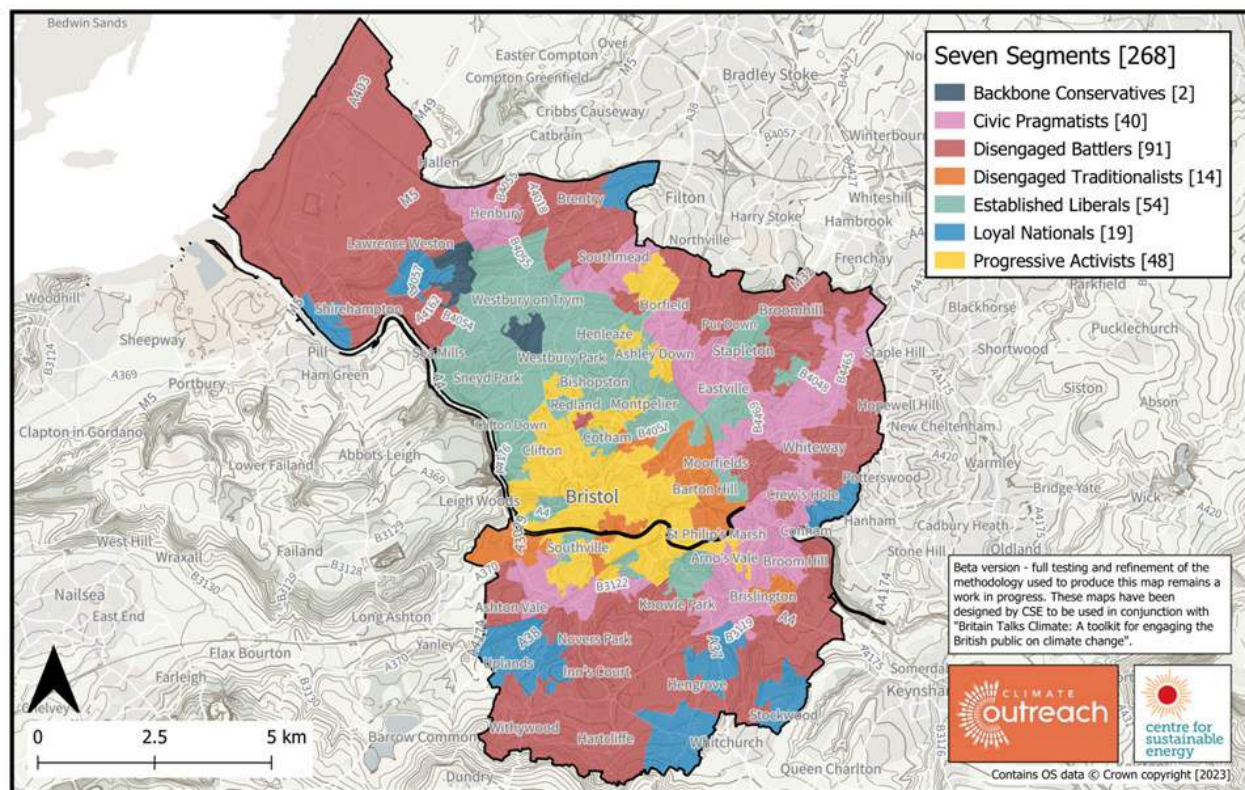
Collaboration with Climate Outreach: mapping Britain's Seven Segments

A collaboration between Climate Outreach, the European Climate Foundation, More in Common, and YouGov identified distinctive segments within the British population based on More in Common's core belief model through a combination of quantitative and qualitative research methods deployed through surveys, focus groups, and one-on-one interviews. Britain's Seven Segments differ based on a range of psychological and ideological factors to go beyond grouping by simple dichotomies (leave/remain EU). Using this research, Climate Outreach have built a toolkit to support any organisation that wants to engage the British public on climate change.⁷

We have classified each Experian Mosaic UK7 type into one of the Seven Segments, which allows us to estimate their geographic distribution. Figure 15 shows the Seven Segment with the highest household count in each LSOA in Bristol. This allows energy/climate change communicators (e.g., energy community groups) to understand the areas with high levels of disengagement, which often corresponds to areas of higher levels of deprivation.

⁷ <https://climateoutreach.org/britain-talks-climate/>

Figure 15: The geographic distribution of Britain's Seven Segments in Bristol, showing the most populous segment in each LSOA.



Targeted recruitment for Bath & West Community (BWCE)

BWCE identified three household 'profiles' to target for recruitment to their ReDREAM project.⁸ The three profiles were defined by their attitude towards technology, head of household age, income bracket, attitude towards environmental issues, and building EPC rating, which could all be matched to variables within our Smart Energy Capabilities dataset (Experian Mosaic UK7 type was used for the attitudes towards environmental issues and technology). We provided BWCE with data showing the number of households per census output area (in the Bath and surrounding areas region) that fall into each profile. From this, they could identify the areas to target to achieve a higher recruitment rate.

Potential additional data sources

In this section, we present potential additional data sources that could address information deficiencies in our Smart Energy Capabilities dataset. Some of these datasets are readily available and only require processing, but others have strict access requirements.

⁸ <https://redream-energy-network.eu/demo-site/united-kingdom/>

Data published by Distribution Network Operators

Across Great Britain there are 14 licensed Distribution Network Operators (DNOs) that cover specific areas and are owned by six different groups. The six DNO groups are Scottish and Southern Electricity Networks (SSEN), Scottish Power Energy Networks (SPEN), UK Power Networks (UKPN), Electricity North West (ENWL), National Grid Electricity Distribution (NGED), and Northern Powergrid (NPG).

All of the DNOs have developed online data portals where users can access a selection of datasets related to the network. The usefulness of these data portals for 'Smart & Fair' related research varies considerably between DNOs. NGED⁹ and UKPN¹⁰ publish datasets on LCTs (including solar PV, EV chargers, heat pumps, and energy storage) connections at a secondary substation level, which gets updated in near real-time. On average, there are 41 and 114 customers connected per secondary substation in the NGED and UKPN licence area, respectively. Therefore, these datasets are very geographically granular and could be combined with small area socio-economic and demographic statistics to answer 'Smart & Fair' related research questions. The one downside with these datasets is that they do not distinguish between non-domestic and domestic customers.

Unfortunately, similar data on LCTs at the secondary substation level is lacking in other DNO data portals. Most DNOs publish similar data at a primary substation level (roughly on the order of 1000s of customers), but this is less useful due to the significant loss of geographic granularity.

NGED are the only DNO to publish data on the number of smart meter installations.¹¹ They publish the data monthly at a primary substation level.

Demand Flexibility Service household engagement evaluation

The Demand Flexibility Service was introduced in winter 2022/23 to access the potential electricity demand flexibility available over periods of time when national demand is at its highest. The service allowed domestic consumers, as well as industrial and commercial users, to be incentivised for voluntarily flexing the time when they use their electricity.

CSE was commissioned by National Grid ESO to conduct a social evaluation of the DFS in the summer of 2023. Our survey of DFS participants was designed using the framework of the Smart & Fair capability lens: we gathered information about household composition and attitudes, dwelling characteristics (including LCT ownership), and variables related to demand flexibility (motivations, shifting strategies used, challenges experienced, and likelihood to participate in future DFS type offers).

18,530 households have consented to their anonymised DFS evaluation data being made available for future research. We believe it is in the best interests of consumers for this data to be made

⁹ <https://connecteddata.nationalgrid.co.uk/dataset/distribution-substations>

¹⁰ <https://ukpowernetworks.opendatasoft.com/explore/dataset/ukpn-low-carbon-technologies-secondary/information/>

¹¹ <https://connecteddata.nationalgrid.co.uk/dataset/smart-meter-volumes>

available to academics and consumer advocate organisations, so CSE is aiming to import the data into the UK Data Service (a nationally funded research infrastructure for curating and providing access to social science data). However not all suppliers participated in the evaluation. One of CSE's recommendations from the evaluation was to mandate a common evaluation to increase the availability of data on diverse households' experiences of demand shifting.

Smart meter data

The Data Communications Company (DCC), in collaboration with CSE and other consumer advocates, successfully requested consent from Ofgem to permit DCC to share a sub-set of anonymised smart meter 'system data' to a select group of organisations for specific projects (CSE's Smart & Fair programme being one of them). The aim of the data sharing is to enable the development of methods to identify and support households at risk of fuel poverty. Ofgem granted approval in August 2023¹² and a working group including DCC, CSE, and other organisations is now developing the data sharing process.

Addressing information deficiencies

As we mentioned previously, we currently do not have geographically granular data for smart meter installations, EV ownership, off-street parking, household disposable income, savings, and debt. We also have concerns about our household level data on solar PV and heat pump installations due to the age of the data and gaps in coverage. Table 7 shows potential data sources for these variables (and more) and a comment on data access requirements.

12 www.ofgem.gov.uk/publications/consent-granted-dcc-under-conditions-9-and-10-smart-meter-communication-licence-and-section-m43-smart-energy-code-august-2023

Table 7: Potential data sources for variables that either do not currently exist in our Smart Energy Capabilities dataset or for which we lack comprehensive data.

Variable	Potential data sources	Comments
Solar PV, heat pump, battery storage installations	Microgeneration Certification Scheme (MCS) installation data ¹³ .	The data is updated monthly. However, open data is only at local authority level. We have requested data at a more granular level of geography e.g. LSOA (in progress).
	Ofgem Feed-in Tariff (FiT) installation report ¹⁴	Data at an LSOA level. No information on heat pumps or battery storage. Data only represents installations that have completed the FIT accreditation process and are on the Central FIT Register.
	DNOs (online data portals)	Only NGED and UKPN publish this data at a secondary substation level.
Smart meter installations	Data Communications Company	Geographic granularity of the data that can be shared with CSE is yet to be determined.
	DNOs (online data portals)	Only NGED publish this data and only at a primary substation level
EV ownership	DfT and DVLA number of licensed ultra low emission vehicles by fuel type and keepership (df_VEH0135) ¹⁵	Data at an LSOA level and updated every quarter.
Off-street parking	No dataset found	Could potentially build a model that predicts whether a household has off-street parking using the English Housing Survey but accuracy not guaranteed.
Household disposable income	ONS income estimates for small areas, England and Wales: financial year ending 2018 ¹⁶	Data is five years old and at an MSOA level (approximately 3,000 households). Not very geographically granular.
Household savings	No dataset found	
Household debt	UK Finance mortgage lending ¹⁷ and personal loans ¹⁸ . Consumer Data Research Centre (CDRC) County Court Judgements (CCJs). ¹⁹	Mortgage lending and personal loan data published by UK Finance at a postcode sector level (approximately 3,000 households). CCJ data published by CDRC at an MSOA level. Both not very geographically granular.
Attitudes towards LCTs and smart tech/tariffs	DESNZ Public Attitudes Tracker (PAT) ²⁰	Survey size approximately 5,000 adults. Geographic unit: Government Office Region.

Demand flexibility	Demand Flexibility Service (DFS) – survey data and smart meter data	Could potentially build a model that predicts a household's demand flexibility potential using the survey and smart meter data but with the caveat that this would be based on data from a trial that was not representative of the GB population and may not be reflective of long-term demand flexibility habits.
Digital skills	Digital Propensity Index for England and Wales at an LSOA level using the Census 2021 online response rates, combined with modelled predictions. ²¹	Does not capture the fact that some people have the skills to complete an online survey but do not have the skills to interact with other forms of technology (e.g. mobile app).

Next steps and recommendations

We currently have a GB-wide household level dataset with variables that cover a number of consumer capabilities in the Capability Lens, which we call our Smart Energy Capabilities dataset. However, we are still missing up to date, geographically granular information in a number of key areas: smart meter/heat pump/battery storage installations, EV ownership, off-street parking, household disposable income, savings, and debt. We have attempted to validate the data at a household level, but this has proved challenging.

We have utilised the Smart Energy Capabilities, often alongside survey data or data at a higher level of geography, to produce outputs such as the National Grid ESO domestic energy consumer archetypes, Ofgem consumer archetypes, mapping Britain's Seven Segments, and recruitment targeting assistance.

Next steps

We described in Table 7 the potential data sources for variables that either do not currently exist in our Smart Energy Capabilities dataset or for which we lack comprehensive data. We want to pursue

13 <https://mcscertified.com/about-the-mcs-data-dashboard/>

14 www.ofgem.gov.uk/publications/feed-tariff-installation-report-31-march-2023

15 www.gov.uk/government/statistical-data-sets/vehicle-licensing-statistics-data-files

16 www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/bulletins/smallareamodelbasedincomeestimates/latest

17 www.ukfinance.org.uk/data-and-research/data/mortgage-lending-within-uk-postcodes

18 www.ukfinance.org.uk/data-and-research/data/personal-loans-within-uk-postcodes

19 <https://data.cdrc.ac.uk/dataset/county-court-judgements-ccjs>

20 www.gov.uk/government/collections/public-attitudes-tracking-survey

21 www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/digitalpropensityindexforenglandandwaleslsos/census2021

this data and where successful, add it to our dataset to improve our representation of energy consumers. Three of the potential data sources (MCS, FiT, and DNO data) contain regularly updated information on LCT installations. We want to use this data to understand the key determinants of LCT uptake.

CSE are in the process of conducting an analysis of the DFS survey and smart meter data. This data gives insights into a household's motivation, willingness, and capacity to participate in demand flexibility. There is an opportunity for us to combine the insights from this analysis with the National Grid ESO domestic energy consumer archetypes and to potentially add demand flexibility variables into our Smart Energy Capabilities dataset. Both opportunities are possible due to the multiple common variables between the DFS survey, archetypes, and our Smart Energy Capabilities dataset.

Recommendations

- H.** All DNOs to publish data on the number of LCTs connected to their network at a secondary substation level (some already do this). Differentiating between domestic and non-domestic connections would also be very useful.
- I.** All DNOs to publish data on the number of smart meters installations at the lowest level of geography possible (currently only one publishes this data at a primary substation level).
- J.** UKRI and Ofgem create requirements for data from innovation trials to be anonymised and shared with the research and consumer advocacy community.

5. Conclusions & next steps

The work carried out under the Smart & Fair programme has progressed three interlinked areas of analysis: monitoring and characterising smart energy offers, creating the Energy Choices Tool to help consumers and advisors navigate the market, improving our representation of smart energy capabilities with our people and buildings dataset. Significant progress has been made. We have worked to develop the Smart Energy Capabilities tools and methods and have collaborated with a range of partners and stakeholders to embed smart energy capabilities as way of understanding and route to acting on emerging inequalities.

We will continue to work with partners and stakeholders to progress a smart and fair energy transition. We see the following priorities for the near term:

Develop a shared terminology that can be used by smart energy innovators to clarify the way offers are described and increase the information provided publicly. Making simple, standard information available will help consumers navigate the market. It will allow for automated data collection and more effective comparison of offers, and help identify which offers work well together. It will simplify training needs for energy advisors and help them keep on top of an evolving market. It will also support better oversight of how well the market is serving different consumer groups. This information needs to include transparent and comparable cost information, covering upfront and running costs, in addition to expected savings or rewards. There is an urgent need for a cost impacts methodology that allows for consumer advocates and advice organisations to make comparisons within and across offer types.

Scale up the delivery of in-depth smart energy advice built on reliable market wide information and tailored for those who are least able to cope with any negative impacts. This will require investment in training advice organisations on smart energy offers including renewable technologies. This could be done through training developed in-house by those organisations, or through a combination of external training courses. Training courses currently available in the industry are either too high-level or too focused on technical aspects, and lacking in a focus on how vulnerable or fuel poor customers could engage with smart offers or low carbon technology. Advice organisations would also need to regularly refresh their training as this is a rapidly evolving market.

Produce more evidence on how household capabilities relate to effective participation in the market. This will allow better understanding of new forms of vulnerability and ways to mitigate or avoid these becoming systemic. It will also improve our ability to model the energy system impacts of domestic demand side response. A Smart Energy Capabilities approach can be used to evaluate pilots and trials of new smart energy services, but it can also be used to inform the design. CSE's use of the smart energy capabilities lens in recent evaluations and pilots has indicated a need to think more innovatively about what works for people. For example, demand turn down flexibility is less likely to deliver benefits to fuel poor households struggling to meet their basic energy needs, but turn up services may be more appropriate and impactful for consumers and the energy system.

Community scale solutions developed in partnership with trusted local partners may help overcome some confidence issues and widen access to smart energy products and services (CSE, 2023d). Improving evidence of what works for whom is a key priority, as well as innovating to widen the kinds of offers on the market and the forms of value they deliver to households and the energy system.

2024 presents a lot of opportunities to progress the Smart & Fair programme. DNOs will be evaluating and scaling their low carbon transition support services, opening the possibility that smart energy advice becomes routinely and widely available to the customers that need it. Trials of more inclusive flexibility services will be taking place through network innovation programme like the Ofgem's Strategic Innovation Fund and the Inclusive Smart Solutions programme. Flexibility Service Providers will be able to adopt and demonstrate their compliance with the HOMEflex code of conduct. New permissions for the Smart DCC will widen access to smart meter system data and improve our understanding of domestic energy use and low carbon technology uptake.

The Smart & Fair programme will continue to innovate with stakeholders and champion wider access to the low carbon transition and its benefits.

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Appendices

Table 8: Capability lens and client question examples

Capability lens	Examples of client questions	Response options
Financial	Do you have a regular reliable income?	Yes / No
Dwelling	What type of changes are you able to make to your home?	Structural and fixtures / Fixtures only / None of the above
Energy	Are you on a time-of-use tariff (includes Economy 7/10)?	Yes / No
Digital tech readiness	Which of the following skills do you have?	Ability to use an online account / Ability to use an app / None of the above
Personal and social	If they were involved as a 3rd party in an offer, would you be happy to share your energy data with these groups?	An industry body (e.g. National Grid) / Another private company/organisation (e.g. Amazon) / Neither

Table 9: Essential and desirable capabilities of four smart energy offers, and whether the capability can be mapped (denoted by X) in the Ofgem archetypes and in CSE's GB-household dataset

Smart Offer	Capability	Essential	Desirable	In Ofgem archetypes?	In GB-household dataset?
Smart plug	Electricity usage		X	X	X
	Computer device	X		X	X
	Digital confidence	X			X
	Internet connection	X		X	X
	Okay with sharing data	X		X	X
Smart heating controls	Space heating system	X		X	X
	Heating usage		X	X	X
	Ability to make changes to dwelling	X		X	X
	Computer device		X	X	X
	Digital confidence		X		X
	Internet connection	X		X	X
	Okay with sharing data	X		X	X
	Okay with machine learning		X		X

Flat EV tariff	Existing EV	X			X
	Existing EV charger	X			
	Willing to switch to a specific kind of tariff	X		X	
	Reliable income	X		X	X
	Okay with sharing energy data	X		X	X
Demand Flexibility Service	Electricity usage		X	X	X
	Ability to flex		X	X	X
	Meter	X			X
	Computer device	X		X	X
	Digital confidence	X			X
	Internet connection	X		X	X
	Okay with machine learning	X		X	X

Table 10 Ranking scales for smart offer preference filters

Category	What it refers to	Range
Cost to implement	How much does the offer cost to take up (including installation)?	• Free • Under £20 • £20-£200 • £200-£2,000 • Over £2,000
Effort to implement	How much effort is needed to take up the offer? E.g. buying technology, booking contractor, preparing property, installation	• Minimal effort: can take up immediately (e.g. signing up online) or, if physical, can be installed by customer with no tools (e.g. a plug) • Small effort: single measure that requires physical installation that can be done by customer themselves. • Medium effort: single measure that requires professional physical installation (not related to heating) • Large effort: single measure that requires professional physical installation (related to heating) • Very large effort: multiple measures that require professional physical installation

Carbon reduction potential	How much carbon could the offer save if used effectively?	• No direct carbon reduction: any offer that doesn't itself involve reduction in household usage of gas/electricity/ petrol. • Small direct carbon reduction: any offer that aims to itself reduce total household usage of gas/electricity/ petrol. • Medium indirect carbon reduction: any offer that involves an import tariff with more than one unit cost. • Large direct carbon reduction: any offer that involves a new EV. • Very large direct carbon reduction: any offer that involves installation of any new renewables.
Operating cost risk	How much could the offer increase energy running costs if used incorrectly?	• Minimal risk: no financial penalty specified in offer text, any export tariff (including import/export). • Small risk: any plug, any EV charging services, any flat-rate import tariff. • Medium risk: any energy storage, any renewable electricity generation, any import tariff with more than one unit cost, anything that can automate heating (space or water) or electricity usage. • Large risk: any heat pump, any import tariff with more than one unit cost + anything that can automate heating (space or water) or electricity usage. • Very large risk: any import tariff with more than one unit cost + any heat pump/storage.
Running cost savings	Reduction in running cost from adoption of smart offer	• £0: monitoring platforms • £0-£50: any plug, any import tariff with more than one unit cost, any flat-rate EV tariffs, any storage or smart hot water tank, any optimisation • £50-£150: any smart heating controls, any export tariff (including import/export), any TOU EV tariffs, any electricity diverter, EV charging service, any flexibility incentive scheme (e.g. DFS) • £150-£500: any heat pump + any battery/any import tariff with more than one unit cost/any optimisation, any battery + any import tariff with more than one unit cost/any optimisation, Tesla Energy Plan, EV community charging service • £500 or more: any EV charger, any renewable generation + storage/electricity diverter/optimisation/ export tariff, EV charger leasing service
Product type	Type of product	• Product • Service • Tariff • Bundle of 2 or more of the above e.g. product and tariff



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SMART & FAIR

Working with the smart energy
capabilities lens