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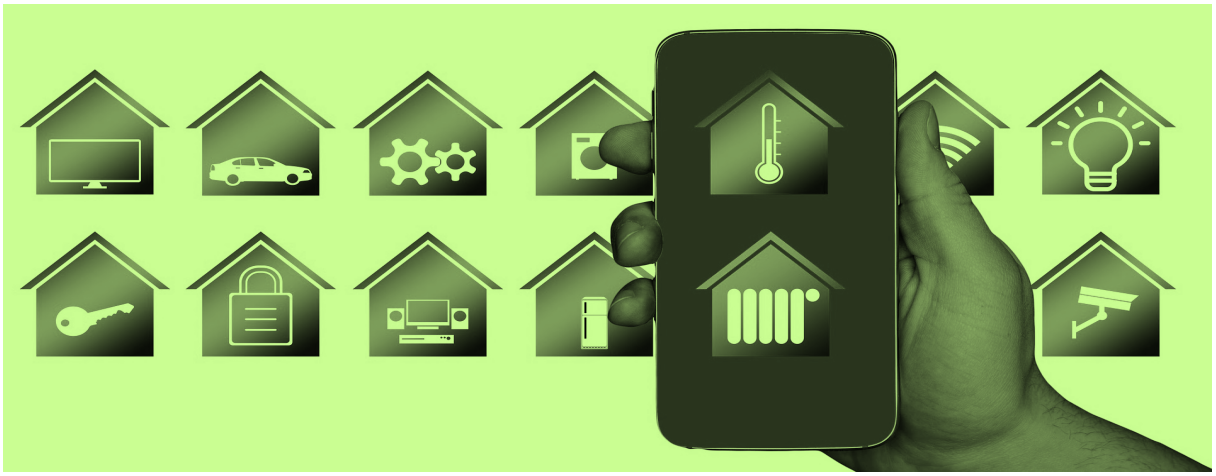


Barriers to changing energy usage behaviour in order to participate in domestic energy flexibility

Findings from a quick scoping review and qualitative/deliberative consumer research

A Collaborate Research report for Citizens Advice,

June 2023

Contents

1. Executive summary

1.1 Introduction

Smart flexible energy has the potential to provide a range of benefits to consumers and society. However, for domestic consumers to be able to take advantage of such services they will need not only to engage with the requisite technology but also to change their energy usage behaviours.

The primary aim of this research was to explore further the barriers that may be experienced by some households to changing their energy usage behaviours, both generally and specifically in the ways required by smart time of-use (ToU) tariffs, as well as what might help to mitigate these barriers.

A two-stage approach was taken to conducting this research:

1. Stage 1 was a Quick Scoping Review (QSR) of available evidence on people with higher barriers to changing their energy usage behaviour, as well as people who are and are not using smart meters (as ownership of a smart meter will be another requirement to participate in future domestic energy flexibility).
2. Stage 2 was a programme of primary research focused on three groups who are expected to face particularly significant barriers to changing their energy usage:
    - those with someone who is pregnant or children 0-5 in their household;
    - those who are renting privately in shared households; and
    - those with someone in their household who relies on the energy supply to manage a health condition.

We conducted a series of qualitative/deliberative workshops and in-depth interviews in three regions across England and Wales. In total, 48 consumers took part in this research in March and April 2023.

1.2 Key findings

1.2.1 Learning from the Quick Scoping Review

A number of existing studies predict that the audiences represented in our primary research sample would experience higher barriers to participation in domestic energy flexibility due to being less able to change their energy use (referred to in some reports as low 'flexibility capital'[1]). In addition, one of our three main cohorts - private renters - were found to be less likely to have smart meters, which represents another barrier to participation.

The literature further indicates that some of the barriers experienced would be difficult to overcome as the degree to which people are able or not able to be flexible is shaped by living conditions,

[1] Powells G and Fell M (2019) Flexibility capital and flexibility justice in smart energy systems, Energy Research & Social Science, Volume 54

everyday life and social norms. As such, a number of reports predict that a proliferation of energy flexibility services may result in inequitable financial and/or social impacts, especially for those with lower flexibility capital or lower financial resources without adequate mitigation policies in place.

The existing evidence validates the need for this research to explore further amongst these groups the barriers to changing their energy usage behaviours, both generally and specifically in the ways required by smart ToU tariffs, as well as what might help to address these barriers.

1.2.2 Consumers' current energy usage behaviour

In the initial exploratory qualitative part of our primary research, participants reported that they are more conscious of their home energy usage and make efforts to save energy, primarily prompted by the energy price crisis. However, a significant proportion of the energy usage of all three target groups remains at peak times, particularly in the early evening, which is when most people are at home and fits with their personal and household routines.

Beyond these common influences, each of the target groups had different specific drivers of how and when energy is used in their homes:

- **Someone pregnant or children 0-5 in the household:** They may have an increased need for heating and do laundry more frequently. They are also likely to have fixed mealtimes due to work hours and childcare timings, and to have fixed pre-bedtime routines. For working parents most chores are likely to be done after work.
- **Private renters living in shared households**: There may be different work patterns, habits and preferences within the household, and housemates may need to fit in with the availability of appliances in busy shared households. Landlords may also determine some timings and noise abatement considerations may prevent appliance use later at night.
- **Someone in household with a health-related need for energy:** They may need to use electrical medical equipment and/or have an increased need for heating or hot water to manage pain. The timing of energy use may also be influenced by their health condition (e.g. needing carers to be present to support tasks, taking medication with food, maintaining a consistent routine and avoiding fatigue later in the evening).

The circumstances of all three target groups lead to particularly significant opportunity-related barriers to, and potentially negative impacts associated with, flexible energy use. This is particularly for:

- those with a health-related need for energy, as changing their energy use could potentially affect their health outcomes; and
- the use of energy for medical equipment, heating and cooking, as participants did not feel they had much if any scope to change the timing of these.

In the context of high energy prices, a lack of ability to change energy usage behaviour in order to reduce bills was a cause of significant stress and anxiety for many participants in this research.

1.2.3 Consumers' views of future energy flexibility

In the deliberative element of the research, we explained the general concept of and rationale for energy flexibility, as well as how smart ToU tariffs and smart energy technology may support people to use energy flexibly by automatically time-shifting some practices and activities subject to householders' preferences. Prior to these explanations, there was low understanding about the future electrification of energy, or how this will create supply challenges that may require more flexible domestic energy use to manage.

Once informed, the reaction to the concept of flexible energy use was polarised with some people receptive, others ambivalent and still others strongly opposed. These differences reflected the extent to which people expected to benefit from this, their views on the environment and climate change, and whether or not they distrusted the motivations of suppliers and the government to introduce such a change.

Notwithstanding these differences, there was a commonly held sentiment that dynamic pricing lacks fairness as it is not inclusive of people who are less able to be flexible in their energy usage behaviour, as well as those with a range of other circumstances (e.g. not having a smart meter, having low financial resources, having less control of their energy use at home due to their housing tenure) that could prevent them from participating. This engendered strong feelings, particularly from some of those with a health-related need for energy who felt least able to change the way they use energy.

In addition, participants expected it to be very challenging for domestic consumers to compare a new range of smart ToU tariffs and select the most suitable one for their household's specific usage patterns. They perceived increased risks resulting from suboptimal tariff choice as well as billing errors.

Participants' views on smart energy technology to support energy flexibility varied depending on their current usage of, and attitudes to, technology. However, even technophiles did not expect smart technology to fully overcome the barriers and they also perceived some additional risks of exclusion.

Overall, negative sentiments about the prospect of energy flexibility outweighed positives and many questions remained about how it would work and affect householders.

1.2.4 Barriers to participation in domestic energy flexibility

All three target groups in this research have more significant opportunity barriers to changing how much energy they use and/or when they use it, as has been described in Section 1.2.2. However, these are not the only barriers they face to participating in energy flexibility. The COM-B model[2] provides a framework for understanding the full range of barriers including:

[2] See, for example, Social Change (2019): A guide on The COM-B Model of Behaviour

- Other opportunity barriers, such as not having the financial resources to access smart technology or to risk adopting dynamic ToU tariffs (given the uncertain impacts on bills). Some could also be excluded from participation as they are not energy decision-makers or don't have a smart meter at home.
- Capability barriers, due to the greater mental load that participants anticipated would be required for people to understand and choose suitable ToU tariffs and change usage behaviours. It was expected that some people would find this particularly difficult, such as those experiencing brain fog due to a health condition or people with lower digital skills (who would find using smart technology to support flexible use more challenging).
- Motivational barriers, with a number of participants expressing concern that flexibility models place an unfair burden on households to solve the problem rather than suppliers, government and big business. Some were also not convinced that there would be sufficient rewards to compensate them for the detrimental impacts associated with changing their behaviour in this way, and there was additionally some scepticism about whether such models would be implemented successfully and achieve the wider aims.

Given this range of potential barriers, it was not felt to be possible for everyone to change their behaviour in order to participate in domestic energy flexibility. Consequently, there was consensus that alternatives, such as social tariffs, would need to be developed for these groups.

Participants also made a number of other suggestions to support those able to be more flexible, which included:

- Awareness-raising campaigns, both nationally and locally.
- Enabling consumers to choose the most suitable ToU tariff, by simplifying the available choices, providing tariff comparison tools and protecting them from contract lock-ins.
- Providing sufficient financial reward to encourage behaviour change, as well as financial support (e.g. to acquire smart technology) to help those who need it to participate.

In addition, there were some people who were against domestic energy flexibility in principle and felt that the problem should be tackled in other ways and by other parties such as government, suppliers and large non-domestic consumers.

1.3 Conclusions and implications

This research clearly demonstrates that certain groups have reduced opportunity compared with the general population to change their energy use and particularly to alter the times at which they use energy. This lack of flexibility capital could prevent some people - especially those with a health-related need for energy - from participating in future domestic flexibility. Some people may also have other opportunity-related barriers to participating in domestic energy flexibility, such as living on a low income, not having a smart meter or not being an energy decision-maker at home. These barriers may contribute to a general public perception that such models lack fairness and inclusivity.

Barriers to changing energy usage behaviour

In addition, some people lack capability and motivation as well as opportunity to participate in energy flexibility. Energy flexibility models are considered to be very complex and difficult to engage with. It is felt by many to place too much burden of responsibility on households rather than government, suppliers and large commercial energy users. The expectation of detrimental impacts to home routines and household members prompts some negative feelings towards the whole concept of domestic energy flexibility. Negativity about this concept is also influenced by low understanding of why this will be important and beneficial in supporting a transition to net zero as well as scepticism about the level of financial benefits consumers will derive.

The range of barriers identified to participation in domestic energy flexibility suggests that interventions will be required in multiple areas, as well as protections for those with extremely significant opportunity barriers such as those with medical need for energy.

Some ideas on how to mitigate these barriers, drawing on this research, are provided below:

Ideas for mitigating the barriers to participation in domestic energy flexibility	
Opportunity	• For people with insurmountable barriers, alternatives could be considered such as flat rate social tariffs[3]. • Consumers prioritise predictability of bills so those able to load shift are likely to prefer static ToU tariffs or occasional off-peak rebates over other types. • People living on low incomes would benefit from financial assistance to acquire the smart technology that can support flexible energy use. • In addition, expediting the mass market development of smart home batteries, and providing financial assistance to help people acquire these, could reduce the impact of load shifting on people's household routines. • Increasing smart meter ownership amongst those living in private rental accommodation could mitigate a fundamental barrier for those living in this type of housing tenure who may otherwise be motivated and capable of participating in energy flexibility.
Capability	• Given the low public awareness and understanding of energy flexibility models and ToU tariffs[4], significant awareness raising will be needed to prepare people for such a major behavioural change. • Ideally, smart ToU tariff design should be as simple as possible to help enable people to make choices that are right for them.

[3]This aligns with the recent major programme of work on social tariffs in the energy sector conducted by Citizens Advice in collaboration with the Social Market Foundation and Public First. The final report, Fairer, warmer, cheaper, recommends a new social tariff based on household income and energy consumption, and which is provided without the requirement for active participation or application from households.

[4] A recent BEIS survey found that 25% had never heard of ToU tariffs and 50% said they know a little or hardly anything.

	• An easy, accurate, independent and multi-channel way of comparing tariffs and evaluating their suitability for individual households will also be important, perhaps linked to smart meter data and delivered through smart tariff price comparison websites. • In addition, it will obviously be important to allow consumers to easily change tariffs and to ensure they are protected from being locked into unsuitable tariffs.
Motivation	• ToU tariffs will need to be provide sufficient value for people to feel that they warrant the required behaviour change. A previous Citizens Advice study found that while consumers are interested in these tariffs, without electric heating and EVs the value is modest and between 25-40% faced higher bills in recent trials.[5] Similarly, Ofgem research determined that satisfaction with ToU tariffs is higher among EV owners but non-EV owners feel less able to capitalise on off-peak periods and there is uncertainty if/how they could save using these tariffs.[6] • Emphasising the environmental benefits (e.g. increased use of renewables, reduced reliance on fossil fuels) and not just costs may be more successful in encouraging public buy-in. • In addition, explaining what others (government, suppliers, big business) are doing to contribute could help to convey that 'we are all in this together'.

[5] Citizens Advice [accessed 3 March 2023] The value of time of use tariffs
[6] Ofgem (2020) Energy consumers' experiences and perceptions of smart 'Time of Use' tariffs

2. Introduction

2.1 Background and aims

Increased uptake of domestic energy flexibility, enabled by smart metering, has the potential to provide a range of benefits such as lowering household energy bills, reducing pressure on the electricity networks, and supporting the use of renewable energy sources and transition to net zero.

However, for domestic consumers to be able to take advantage of such services they will need not only to engage with the requisite technology but also to change their energy usage behaviours. As statutory consumer advocate for energy, Citizens Advice is concerned is that some people risk being left behind in the transition to a smart, flexible energy future.

Earlier this year, Citizens Advice set out its evidence-based views on the fundamental principles of what people need from future regulation to feel more confident about smart home technology and energy flexibility[7]. These included being confident about any contracts they sign up to, knowing where to go for help and having transparency and control over their data. In addition, Citizens Advice commissioned a separate research project to hear from people with barriers to using the technology needed to enable their participation in smart energy services.

Being able to be flexible in the times at which energy is used at home will be another important requirement for participation in future energy services, given the expected proliferation of smart time-of-use tariffs which offer cheaper rates at times when there is lower demand for energy. While such tariffs could work well for some consumers, Citizens Advice has predicted that barriers to accessing time-of-use (ToU) energy models are likely to be higher and affect more people compared to other future energy supply models[8].

The primary aim of this latest research was to explore further the barriers to households changing their energy usage behaviours, both generally and specifically in the ways required by smart ToU tariffs, as well as what might help to mitigate these barriers.

This research was focused on three groups who are expected to face higher barriers to changing their energy usage:

- those with someone who is pregnant or children 0-5 in their household;
- those who are renting privately in shared households; and
- those with someone in their household who relies on the energy supply to manage a health condition.

These groups can each be described as having lower 'flexibility capital'[9], a term that has been developed to describe differences in people's ability to change their energy use. This is due to them

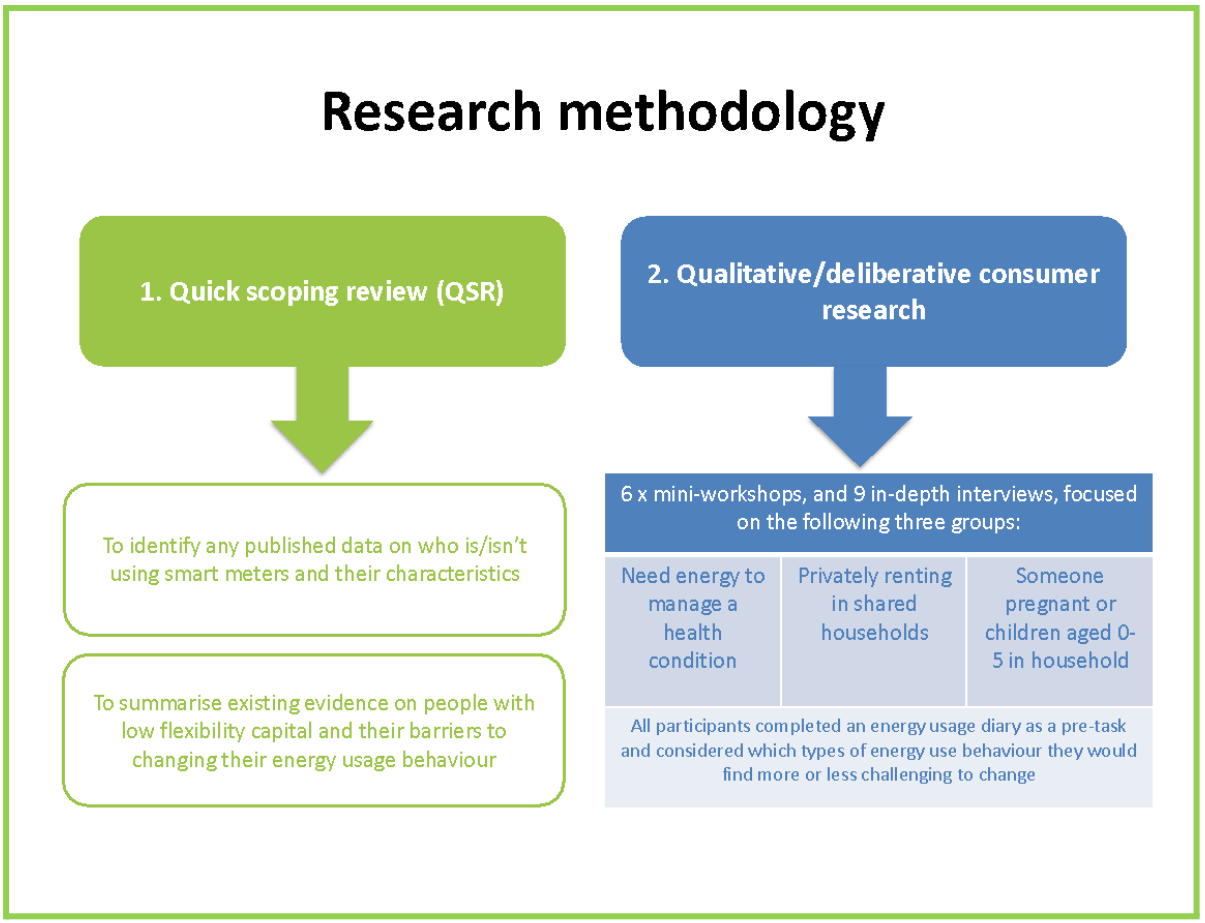
[7] Citizens Advice (2021) Smartening Up: How to improve people's confidence in smart home technology
[8] Citizens Advice (2019) Future for All - Making a future retail energy market work for everyone
[9] Powells G and Fell M (2019) Flexibility capital and flexibility justice in smart energy systems, Energy Research & Social Science, Volume 54

having a higher need for energy in the home and/or less opportunity to change the times in which it is used.

In addition, Citizens Advice wished to identify existing data on who is and is not currently using smart meters and their characteristics, as smart meter ownership will be required for consumers to access energy flexibility services.

2.2 Methodology and sample

A two-stage approach was taken to conducting this research, as has been summarised below:



More detail on the qualitative/deliberative consumer research is provided in the table to follow:

	Qualitative/deliberative consumer research in more detail
Data collection approach	• **Workshops involved 6-8 participants, were 2 hours in duration and held in accessible centrally located venues.**

	Qualitative/deliberative consumer research in more detail
	• In-depth interviews were c.75 minutes in duration and conducted face-to-face in participants' homes or via video call, depending on their preferences.
Recruitment approach	• The sample was free found by specialist research recruiters using a variety of methods including databases, central location interception and snowballing. • All participants were fully screened to ensure they fitted the required specification.

Sample composition	• 20 participants had someone in their household with a health-related need for energy, including:
	  ○ users of electrical medical equipment users at home such as an oxygen concentrator ventilator, dialysis machine, CPAP machine, nebuliser and mobility-related devices (e.g. electric wheelchair, stairlift, hoist); and
	  ○ people requiring heating and hot water to manage pain.
	• 16 participants had someone pregnant or children 0-5 in their household:
	  ○ this cohort included households where someone is disabled or has additional needs.
	• 15 participants were privately renting in shared households:
	  ○ all were living in multi-occupancy (>2 people) households; and
	  ○ this cohort included households where someone does shift work.
	• In total, 48 consumers took part (some fitted into more than one of the target groups).
	• The sample also included:
	  ○ a mix of gender, ages (from 19 to 80), energy meter types and income levels; and
	  ○ representation of people from minoritised backgrounds (n=11).

Research locations and timing	• The research was conducted in Stockport and Cheshire, London and Surrey, and Swansea. • The fieldwork took place in March and April 2023.

2.3 How we made the consumer research accessible and inclusive for participants

As some of the target consumer audiences in this research were 'harder to reach', we employed a number of approaches to overcome any barriers to participation and ensure the research was inclusive. These included:

- Working with a specialist recruitment agency, with past experience of engaging the target audiences, which drew on multiple recruitment methods to identify eligible participants.
- Opting for smaller workshops (6-8 participants) to provide a more intimate setting for the discussions, ensuring that all workshop venues were accessible and minimising the length of the workshops (to 2 hours) in order to minimise the burden of participation.
- Offering in-depth depth interviews as an alternative to the workshops for people who would find it difficult to participate in a group setting e.g. due to their health or caring responsibilities.
- Providing whatever adaptations and support individual participants required, as identified through the recruitment process.
- Ensuring that the moderator read out any written information during the sessions, as well as providing alternative ways to enable participants to express their views (e.g. an image bank and emojis).

Given the expected low base of awareness amongst the target consumer audience of flexible energy systems, we used deliberative methods in the consumer workshops to develop participants' understanding, following an initial exploration of their current energy usage behaviour and barriers to changing this. We drew on a toolkit of techniques to build knowledge, including simple fact sheets and group exercises designed to enable participants to develop solutions to any challenges they had identified.

2.4 This report

This report covers the main findings from both stages of this research. The detailed findings that follow are arranged into the following sections (listed according to their numbering in the report):

3. Learning from the Quick Scoping Review

Followed by three sections drawing on insight from the primary qualitative/deliberative research:

4. Consumers' current energy usage behaviour
5. Consumers' views of future energy flexibility
6. Barriers to consumers' participation in domestic energy flexibility

We used a grounded thematic approach for analysing the primary research findings, which is a systematic process that identifies all the themes emerging from the research responses and measures their prevalence. In addition, to add further insight we applied the behavioural science-based COM-B Model[10] to help interpret the behavioural barriers to changing energy usage behaviour experienced by the participants in this research.

There is also a standalone Executive Summary (Section 1) that precedes this Introduction, and a final section (Section 7) that sets out what Collaborate Research regards to be the key Conclusions and Implications from this research.

[10] See, for example, Social Change (2019): A guide on The COM-B Model of Behaviour

3. Learning from the Quick Scoping Review

3.1 Existing evidence on barriers to changing energy usage behaviour

The following groups have been identified in the current literature as having higher than average barriers to shifting their energy use (lower flexibility capital), and each have been represented in our primary research sample:

- **Households with someone who is disabled, has a medical need for energy or other vulnerabilities**: A research report which considered differential impacts of demand-side response (DSR) measures across socio-demographic groups[11] determined that ToU rates *"may disproportionately impact the energy bills and health of vulnerable households, defined as those who face greater energy needs combined with greater social and financial pressures".* The research predicts that this type of energy tariff *"disproportionately increases bills for households with elderly and disabled occupants, and predicts worse health outcomes for households with disabled and ethnic minority occupants than those for non-vulnerable counterparts".* Another recent report[12] does not specifically consider energy flexibility but found that disabled people may be using several types of medical equipment at home and their conditions will also often demand higher levels of cooling or heating. This report states that a large majority of households operating life-supporting medical equipment are not currently receiving any support and those who do may not receive sufficient amounts to offset the increased costs. The authors conclude that changes are required to ensure that disabled people *"feel confident that the support mechanism will meet the costs of their medical equipment's electricity usage and should not feel any need to ration the time it is operated".*
- **Households with children and women within households:** A study from Australia[13] found that *"time of use tariffs are unlikely to effectively reduce peak period electricity consumption in households with children and may have inequitable financial and/or social impacts for these households".* Another report[14] concluded that flexible energy may have gender risks if women find themselves having to become more flexible in undertaking household chores or otherwise be *"excluded from accessing the cheaper, greener electricity of the future".*
- **Households with particular working patterns or people living in shared households**: Citizens Advice's Future for All report[15] identified some specific groups that are expected to be less able to change their energy use, such as households whose working patterns prevent them from doing so and people living in shared households who can't control overall energy use. An

[11] White, L.V., Sintov, N.D. (2020) Health and financial impacts of demand-side response measures differ across sociodemographic groups. Nature Energy, Volume 5
[12] recco (2023) Support for medical equipment users: A new approach to meeting electricity costs
[13] Larissa Nicholls, Yolande Strengers (2015) Peak demand and the 'family peak' period in Australia: Understanding practice (in)flexibility in households with children, Energy Research & Social Science, Volume 9
[14] Charlotte Johnson (2020) Is Demand Side Response a woman's work? Domestic labour and electricity shifting in low income homes in the United Kingdom
[15] Ibid

academic study[16] similarly determined that flexibility would be hard to achieve for students and others living in shared households.

- **Individuals and households with low flexibility capital and/or low financial resources:** A report from Sweden[17] argues *that "low affordability combined with low flexibility capital increases the risk for financial effects of energy poverty, whereas low affordability combined with high flexibility capital increases the risk for energy poverty affecting comfort, convenience and wellbeing*". Another study[18] similarly concludes that *"freedom of choice over whether and how to economise flexibility capital can be limited by factors such as financial resources"* as the trade-offs between comfort/convenience and cost may not feel fully voluntary.

The existing evidence also indicates that some of the barriers experienced will be difficult to shift as the degree to which people are able or not able to be flexible is shaped by living conditions, everyday life and social norms. One report[19] argues that due to these systemic influences on behaviour *"rather than seeing flexibility as related to the characteristics of individuals and their behaviour, as is common in the industry and policy... it is the social practices which shape electricity demand curves that need to be at the centre of analysis".*

A number of reports consequently expect that DSR energy markets may result in inequitable financial and/or social impacts for those with lower flexibility capital. One author [20] refers to *"multiple risks of injustice"*[21] that may unintentionally create and reinforce *"flexibility poverty"* if there are not sufficient policies in place to mitigate regressive outcomes. Another[22] warns that *"organising the operation of energy systems around end user flexibility renders the users a commodity instead of giving them agency".*

3.2 Evidence on who is and is not using smart meters

According to the latest Smart Meter Statistics Quarterly Report[23], 52% of all domestic meters in Great Britain at the end of Q2 2022 were smart meters (including those in smart or traditional mode) and 45% of all domestic meters were smart meters operating in smart mode. However, Smart Meter Statistics do not include any data on variations in smart meter take-up regionally or socio-demographically.

[16] Ingvild Firman Fjellså, Marianne Ryghaug & Tomas Moe Skjølsvold (2021) Flexibility poverty: 'locked-in' flexibility practices and electricity use among students, Energy Sources, Part B: Economics, Planning, and Policy
[17] Jenny von Platten (2022) Energy poverty in Sweden: Using flexibility capital to describe household vulnerability to rising energy prices, Energy Research & Social Science, Volume 91
[18] Powells G and Fell M (2019) Flexibility capital and flexibility justice in smart energy systems, Energy Research & Social Science, Volume 54
[19] Gareth Powells, Harriet Bulkeley, Sandra Bell, Ellis Judson (2014) Peak electricity demand and the flexibility of everyday life, Geoforum, Volume 55
[20] Ingvild Firman Fjellså, Marianne Ryghaug & Tomas Moe Skjølsvold (2021) Flexibility poverty: 'locked-in' flexibility practices and electricity use among students, Energy Sources, Part B: Economics, Planning, and Policy
[21] Philippa Calver, Neil Simcock (2021) Demand response and energy justice: A critical overview of ethical risks and opportunities within digital, decentralised, and decarbonised futures, Energy Policy, Volume 151
[22] Frans Libertso (2022) (No) room for time-shifting energy use: Reviewing and reconceptualizing flexibility capital, Energy Research & Social Science, Volume 94
[23] Official Statistics (25 August 22): Smart Meter Statistics in Great Britain: Quarterly Report to end June 2022

The latest BEIS Public Attitudes Tracker[24] similarly found that half of households (50%) said that they have a smart meter, with no change from Spring 2022. According to this survey, smart meter ownership was higher for owner-occupied (51%) and social rented households (52%) compared with 41% of privately rented households. Households living in houses or bungalows were also more likely to say they had a smart meter (52% compared with 42% of households living in an apartment). However, no profiling socio-demographic information is available on individuals within these households from this survey.

Ofgem's 2022 surveys on Household Consumer Impacts of Market Conditions[25] also include a question on smart meter ownership. Due to the methodology used[26], the findings should be treated with caution however they do provide some additional data on people living in households with and without smart meters which provide some indicative evidence on their characteristics. Analysis of these data sets suggests that people without a smart meter in their household currently are more likely to be:

- Older
- Digitally excluded
- From electricity only meter households (which may indicate that they live in more rural or remote areas without access to mains gas supply)
- Not on the Priority Services Register (PSR)
- People who have not sought help on their bills
- People who haven't previously switched energy suppliers
- People who have low trust in energy suppliers
- People in the private rental sector

Some of these factors are linked (e.g. older people are more likely to be digitally excluded and non-switchers) while others are suggestive of distinct cohorts (e.g. private renters skew younger and trust in suppliers in these surveys is lower amongst mid-age rather than oldest groups).

Conversely, young people are more likely than average to have smart meters. Smart meter ownership is also higher among people on the PSR indicating that vulnerable consumers known to suppliers are more likely to being offered smart meters. In addition, ownership of smart meters is higher amongst social tenants suggesting that this sector has been proactive in installing smart meters. There is not a strong association of income levels with smart meter ownership or non-ownership, although people who do have smart meters are more likely to be on means tested benefits and report struggling with energy affordability.

In terms of the cohorts of interest to this research:

[24] BEIS (22 September 22): BEIS Public Attitudes Tracker: Energy Bills and Tariffs Summer 2022, UK
[25] Ofgem (30 September 22): Consumer Impacts of Market Conditions survey: Waves 1(March 2022) & 2 (July 2022)
[26] These surveys were conducted in March and July 2022 using a predominantly online methodology with an offline (telephone and F2F) boost specifically designed to reach digitally excluded people. The total sample size each wave was c.3,500, quotas were applied during data collection and the findings were weighted at the analysis stage based on gender, age, SEG and region within Great Britain. The findings of each survey show a higher percentage of households with smart meters compared to Smart Meter Statistics and BEIS PAT (61% in W1 and 62% in W2) so they should be treated with caution.

- Those who have someone pregnant or children aged 0-5 in the household are more likely to have smart meters.
- People with a medical-related need for energy are also more likely to have smart meters (if they are known to suppliers and on the PSR).
- Conversely, private renters are less likely to have smart meters, especially if they live in an apartment.

4. Consumers' current energy usage behaviour

4.1 General home energy usage feelings and behaviour

Unsurprisingly, energy price rises were front-of-mind and a major concern for all participants involved in this research.

> ***"It's not a great time to use lots of energy because of how much things have gone up. It's a source of friction and can cause arguments*" (Privately renting in shared household, London)**

> ***"It's a vortex, sucking money... There is no light at the end of the tunnel"* (Health-related need for energy, Stockport)**

This has prompted householders to be more conscious of their home energy usage and to make efforts to change their behaviour, with mentions from participants of:

- limiting the times heating is on, turning down the thermostat or using alternatives to central heating to keep warm (most participants);
- using air fryers or batch cooking (some participants);
- other ways of reducing energy use at home, such as showering at work or the gym or working from coffee shops rather than from home when possible (a few participants); and
- some attempts to time shift some of their energy usage, either because a few had taken part in the Demand Flexibility Service (DFS) over the winter or they believe (erroneously) that energy use is generally cheaper off-peak (a few participants).

The effects of these behavioural changes ranged from mildly reduced comfort to, in a couple of cases, significantly impacting their health and wellbeing.

> ***"I used to take a bath for my osteoporosis but I don't any more, it's too expensive, it's ridiculous"* (Health-related need for energy, Swansea)**

Nevertheless, a significant proportion of the energy usage of all three target audiences is currently at peak times (weekday evenings 5-8pm) which is when most people are at home and fits with their personal and household routines. This is when:

- almost all are using central heating and cookers/ovens;
- most are using baths/showers (especially those with young children, health conditions and doing manual work); and

- many are also using washing machines as well as dryers and dishwashers if they have these.

High energy prices, coupled with a lack of ability to make further changes to their usage behaviour in order to reduce their bills, is a cause of considerable anxiety, particularly for those with a health-related need for energy.

> ***"It's stressful, just the cost at the moment. So, you feel more conscious of what you're using but also knowing that the medical devices I can't do without"*** **(Health-related need for energy, London)**

> ***"I'm worried to death but I can't sit there freezing. The pain increases and I feel miserable and end up having to go to bed. I don't want to spend life in bed"*** **(Health-related need for energy, Cheshire)**

> ***"I'm in a lot of support groups for disability and people are stressing about how to keep up with prices on their medical equipment charging"*** **(Health-related need for energy, London)**

Some of those with smart meters at home reported no longer engaging with their in-home display as it is a very visual representation of energy use that they feel unable to change which causes them stress and anxiety.

> ***"I turned it [the smart meter] off as I was just watching my money go down, it was depressing"*** **(Privately renting in a shared household, Stockport)**

> ***"The bill is extortionate but we need to use it so there's no point [checking the smart meter], I'd just get more stressed."*** **(Health-related need for energy, Stockport)**

> ***"You don't want to be that person who's like 'we need to turn everything off'. It would affect your life so much - it's a basic need to have a shower and it would become like you can't even have a shower"*** **(Someone pregnant or children 0-5 in the household, Swansea)**

4.2 Drivers of how and when energy is used at home

Similar to much of the general population, all participants' energy use at home is driven by outside factors, such as their working and childcare hours, which determine when they are at home and available to carry out tasks. They also all had well-established home-based routines which governed times at which energy is used for household activities.

Apart from these general influences, each of the target groups have different drivers of how and when energy is used in their homes:

Drivers of times at which energy is used - Someone pregnant or children 0-5

- There may be an increased need for a warm home e.g. during pregnancy or if they have a very young child in the household.
- The household may need to do frequent laundry if there is a very young child or multiple children present.
- They are likely to have fixed meal times due to work hours and childcare timings.
- Bath time tends to be part of a fixed pre-bed routine for children.
- Time shortages for working parents in the mornings mean that most chores tend to be done after work, in the early evening.

> ***"We live in an old house that doesn't retain heat and we need to make sure our daughter is warm as otherwise I worry about it impacting on her sleep. She's too young to communicate if she's hot or cold"*** **(Child 0-5 in the household, Cheshire)**
>
> ***"I can eat after eight, I can wash after eight, but I can't keep my daughter up until eight to then feed her. She'd be falling asleep in her food love her!"*** **(Someone pregnant or children 0-5 in the household, Swansea)**
>
> ***"If one thing is late then everything is late. It throws everything out of sync. There's only a small window because of school and children need structure and to get sufficient sleep"*** **(Someone pregnant or children 0-5 in the household, London)**

Drivers of times at which energy is used - Privately renting in shared household

- There may be different work patterns, habits and preferences that mean the household is 'always on'.
- Fitting in with availability of appliances may govern the times at which they are used.
- It may be challenging to achieve co-operation with flat mates on energy use if they are not friends.
- Landlords may determine some timings e.g. setting heating schedules especially if bills are included in the rent.
- Noise abatement considerations may which limit the possibility of night time use of some appliances.

Drivers of times at which energy is used - Privately renting in shared household

"If you work and share a flat it's not always a possibility [to be flexible] as it's just when you're available" **(privately renting in a shared household, London)**

"We all cook different things so four hobs and the oven are always on in the evening. It's hard to change times" **(Privately renting in a shared household, Stockport)**

"The heating's on but the windows can be left open. Co-operation is difficult as it depends on personalities and how much people feel the cold and the heat" **(Privately renting in a shared household, London)**

Drivers of times at which energy is used - Health-related need for energy

- They may need to use electrical medical equipment constantly or at particular times.
- They may have an increased need for heating and/or hot water to manage pain.
- Their home-based routine may also be influenced by their health condition e.g. they may:
  - have limited time at home during the day if attending medical appointments;
  - need to take medication at certain times and with meals;
  - need to have frequent showers/laundry due to incontinence;
  - need carers to be present to support tasks;
  - need to perform tasks early in the evening to limit fatigue/sundowning; and/or
  - prioritise maintaining a consistent routine to minimises stress (e.g. for people with dementia or neurodiversity).

"With my heart problem, I'm on blood thinners so I'm constantly freezing...I've got to turn the heating on every morning and every evening just to sort of relax a bit" **(Health-related need for energy, Swansea)**

"I have medication that I have to take straight after food and it's got to be a hot meal so my stomach is full and it's got to be at a certain time, so it would be really difficult to change" **(Health-related need for energy, Swansea)**

"With stuff like using the shower, I have to do it when the carers are here. So, it's really difficult for me to then just change to another time " **(Health-related need for energy, London)**

"My dad's got dementia and with that comes a thing called sundowning which means that as it gets later in the day, his brain capacity is even more reduced...So there's no way

Drivers of times at which energy is used - Health-related need for energy

that I could feed him or even use the stairlift safely after eight o'clock at night"
(Health-related need for energy, Stockport)

4.3 Barriers to changing the times at which energy is used

The circumstances of all three target groups mean that there would be more opportunity-related barriers to, and potentially negative impacts associated with, changing their energy use compared to the general population.

However, there are also some variations with feedback from this research indicating that the highest such barriers are expected by those with a health-related need for energy. Changing their energy use could affect their health outcomes and their circumstances are expected either to not change or worsen. Opportunity barriers for households with young children may also be high with changing routines potentially impacting children's sleep, performance at school and general wellbeing. On the other hand, opportunity barriers for private renters in shared households may be lower than for the other groups and some feel they could be more flexible e.g. due to working shifts or working from home for some of the time.

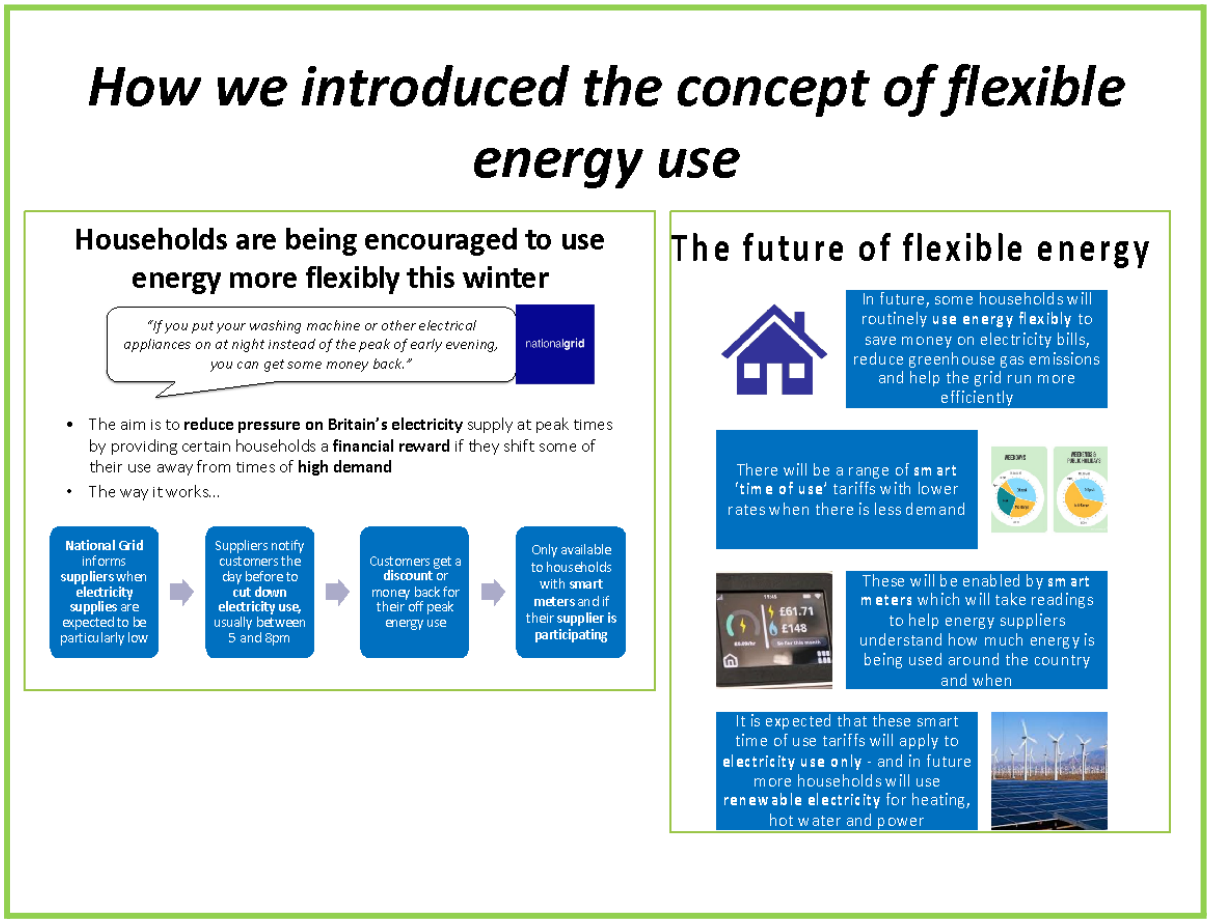
There are also some differences among the groups in terms of which uses of energy would be most difficult to shift:

- Opportunity barriers are highest for some medical equipment which needs to be always or often on.
- Most feel it would be challenging to change the times they cook and heat their home due to their availability and well-established household routines.
- Bathing, showering and laundry timings would also be challenging to change for those with children at home or medical needs but others felt that they could be more flexible on this.
- The energy uses that participants expected to be least difficult to shift were dishwasher use and the charging of some medical equipment which can be done at off-peak times.

5. Consumers' views of future energy flexibility

5.1 Views on the general concept of flexible energy use

We first introduced the concept of flexible energy use in the research by explaining the recent Demand Flexibility Scheme (DFS) that some suppliers and domestic consumers took part in during last winter. We then explained that some households may use flexible energy routinely in the future and why this is expected, as highlighted below:



There was only moderate awareness and low understanding amongst participants of the DFS over the winter and the few who took part in the scheme perceived there to have been not much reward for changing their behaviour.

> ***"My head ends up spinning and you're only saving pennies, it's not worth it. I'd rather be warm and have a cooked meal"*** **(Health-related need for energy, Cheshire)**

Notwithstanding the DFS and media reports of blackout threats over last winter, there was a lack of basic understanding from participants about the future electrification of energy, or how this will create supply challenges that may require more flexible domestic energy use to manage.

> ***"I don't understand how you can produce power without gas...Why don't they just build more power stations then?"*** **(Someone pregnant or children 0-5 in household, Swansea)**

> ***"It's a bit scary. It's obvious talking about this that we have a real problem with electricity use if we're having to go down that route. I worry that we can't provide electricity at the times we need it and we might have blackouts"*** **(Health-related need for energy, Cheshire)**

Overall, reactions to the prospect of future flexible energy use, once informed, ranged from positive to ambivalent through to very opposed. This range of views reflected:

- the extent to which they expect to be able to participate and benefit from this;
- their views on the environment and climate change; and
- their extent of distrust in the motives of suppliers and the government.

> ***"It's a good thing because I think it has environmental benefits by relying less on fossil fuels and using energy, like from solar and wind, when it is being generated"*** **(Privately renting in a shared household, London)**

> ***"I would feel quite positive about the smart flexible route if there was a cost benefit. I would try to be flexible to get this benefit but it's not always possible"*** **(Someone pregnant or children 0-5 in the household, London)**

> ***"It puts the pressure on the consumer but the infrastructure isn't there"*** **(Someone pregnant or children 0-5 in the household, London)**

> ***"They [suppliers] are making billions of pounds in profits when vulnerable people are suffering"*** **(Health-related need for energy, Stockport)**

Overall, there was a commonly held sentiment, even amongst those who perceived some benefits associated with flexible energy use, that dynamic pricing lacks fairness as it is not inclusive of people who are less able to be flexible in their energy usage behaviour who can't be more flexible in their energy usage behaviour. In addition, this system of pricing is also expected to exclude people with a range of other circumstances that could prevent them from participating (such as not having a smart meter, having low financial resources, or having less control of their energy use at home due to their housing tenure).

> ***"Not everyone can be flexible, it doesn't benefit everyone and that makes it unfair really. It would be good if there was an option for people in my situation. It's beneficial but some***

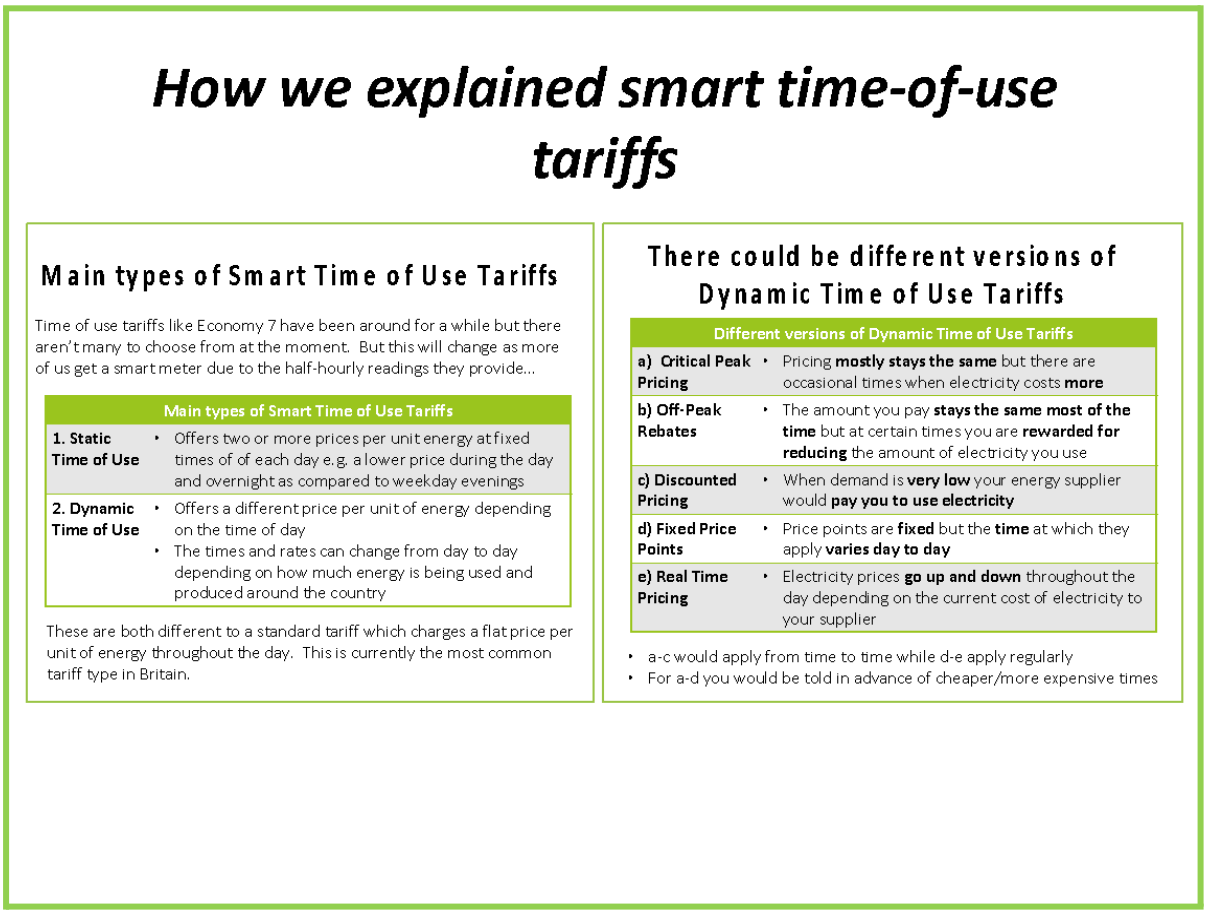
people are left out. I'd be feeling excluded from the benefits of it because I can't be as flexible as everyone else" **(Health-related need for energy, London)**

"It punishes families, I'm quite anti it. This [peak times] is when living happens" **(Someone pregnant or children 0-5 in the household, London)**

"I'd be worried that it would hinder the poorest people. It could cause inequality if it just benefits people in better paid jobs" **(Privately renting in a shared household, London)**

5.2 Views of smart time-of-use tariffs

Once the general concept of flexible energy use had been discussed, we introduced participants to prospect of having a range of smart ToU tariffs rather than flat rate tariffs as is the norm currently. We first informed them of the distinction between static and dynamic ToU tariffs and then took them through five potential different versions of dynamic ToU tariffs, as shown below.



How we explained smart time-of-use tariffs

Main types of Smart Time of Use Tariffs

Time of use tariffs like Economy 7 have been around for a while but there aren't many to choose from at the moment. But this will change as more of us get a smart meter due to the half-hourly readings they provide...

Main types of Smart Time of Use Tariffs	
1. Static Time of Use	• Offers two or more prices per unit energy at fixed times of of each day e.g. a lower price during the day and overnight as compared to weekday evenings
2. Dynamic Time of Use	• Offers a different price per unit of energy depending on the time of day • The times and rates can change from day to day depending on how much energy is being used and produced around the country

These are both different to a standard tariff which charges a flat price per unit of energy throughout the day. This is currently the most common tariff type in Britain.

There could be different versions of Dynamic Time of Use Tariffs

Different versions of Dynamic Time of Use Tariffs	
a) Critical Peak Pricing	• Pricing **mostly stays the same** but there are occasional times when electricity costs **more**
b) Off-Peak Rebates	• The amount you pay **stays the same most of the time** but at certain times you are **rewarded for reducing** the amount of electricity you use
c) Discounted Pricing	• When demand is **very low** your energy supplier would **pay you to use electricity**
d) Fixed Price Points	• Price points are **fixed** but the **time** at which they apply **varies day to day**
e) Real Time Pricing	• Electricity prices **go up and down** throughout the day depending on the current cost of electricity to your supplier

- a-c would apply from time to time while d-e apply regularly
- For a-d you would be told in advance of cheaper/more expensive times

Barriers to changing energy usage behaviour

Potentially having this range of smart ToU tariff options to choose from was felt by participants to be very complicated as they are conceptually very different to current tariffs, which themselves are poorly understood.

> ***"We're not all Martin Lewis. It's not clear and easy to understand"*** **(Someone pregnant or children 0-5 in the household, London)**

> ***"Loads of new tariffs could be confusing. It would be difficult to get it straight in my head on the best time to use things."*** **(Health-related need for energy, Surrey)**

In terms of evaluating the options provided, static ToU tariffs were perceived to be least challenging to understand and respond to such that people may be able to form new routines and habits. However, some still favoured flat tariffs over these due to flat tariffs being seen as less complicated and not to require behavioural change.

> ***"[Static ToU] is about all I can mentally take"*** **(Health-related need for energy, Stockport)**

With the dynamic tariffs, having these apply occasionally rather than regularly was preferred. In particular, participants favoured 'off-peak rebates', which were viewed as a reward for not using energy at certain times, over 'critical peak pricing', which was seen as a penalty for peak time use and to introduce more risk of bill shock. Discounted pricing was also of interest but there was some scepticism about these being 'too good to be true' and an expectation that the times at which these apply would be impractical (e.g. the middle of the night).

> ***"With off-peak rebates I'd be able to budget for each month and it could only go down from there so there might be a bonus for that month"*** **(Privately renting in shared household, Stockport)**

> ***"It depends on the timing [of discounted pricing] and if it's sensible and I'm still awake or whether it would be at stupid o'clock."*** **(Privately renting in shared household, Stockport)**

'Fixed price points' and especially 'real time pricing' were least preferred overall as these options were regarded to be most difficult to understand and respond to, and a lottery in terms of whether consumers would do better or worse in terms of their energy bills. Participants expected to find this type of tariff very stressful as they prioritise predictability when it comes to energy costs, especially given the current energy price crisis.

> ***"We're a society where we've got to pre-plan our lives and know what we're spending. That's just chaos to me"*** **(Someone pregnant or children 0-5 in the household, Swansea)**

> ***"You'd be literally looking at your smart meter going up and then be trying to stop your activities. You can't plan ahead, you'd have to be constantly watching the meter"***
> **(Privately renting in a shared household, Stockport*)***

> ***"How do they expect a family to run that way unless you're super rich and don't care what you pay? It's not a practical solution, it's too variable, you have no control over it"***
> **(Health-related need for energy, Surrey)**

Overall, it was expected to be very challenging to compare smart ToU tariffs and select the most suitable one for their household's specific usage patterns. This was perceived to increase the risk to consumers associated with suboptimal tariff choice. Participants also anticipated these tariffs to make it even more challenging for consumers to check their bills to ensure the correct amount has been levied, and therefore to introduce a greater risk of billing errors.

> ***"It's hard enough [to compare tariffs] now, this makes it 10 times more difficult!"***
> **(Privately renting in a shared household, London)**

> ***"It's hard to understand what they're offering. If someone came on the phone and said 'this, this and this', who knows if you'd choose the correct one."*** **(Health-related need for energy, Cheshire)**

> ***"The more complicated you make things the more chance there is that it will go wrong"***
> **(Health-related need for energy, Swansea)**

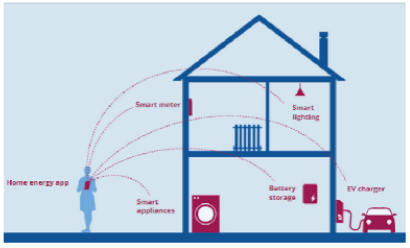
5.3 Views on smart technology to support flexible energy use

In addition, we explained how smart technology may be able to support flexible energy use in the future by enabling consumers to automate the timings of some types of household energy use, as shown in the chart below:

How we explained smart technology to support flexible energy use

Smart home technology could help people use energy more flexibly

- Households decide the level of flexibility that's convenient to them e.g. via a home energy app
- Smart meters will know when there is cheap or green power available



- They tell this to smart appliances which will be able to use this information, alongside household preferences, to decide when to automatically turn on
- Some households with electric vehicles or home batteries will also be use smart technology to charge these at the cheapest times

Attitudes to this prospect were linked to how participants felt about smart technology per se, including how confident they felt using it and the extent to which they derived benefit from it now.

For those who were more favourable about smart technology, its potential application to automating flexible energy use was expected to simplify the process and reduce the mental load that would otherwise be required to remember to manually shift their energy use timings.

> ***"For the average household it seems like the logical way forward. It makes it easier to be flexible"*** **(Someone pregnant or children 0-5 in the household, London)**

However, smart technology was not perceived to fully overcome the barriers to flexible energy use previously identified. This was for several reasons:

- People will continue to have strong preferences that drive their household routines even if it is possible to shift them supported by smart technology.
- It was felt that some manual intervention would still be required even if some processes could be automated (e.g. to prepare food for the oven, unload the washing machine and hang out washing or put it in the dryer etc.) and that this would limit the extent to which timings of these activities can change.

- There were perceived be safety risks (e.g. of fires, floods) associated with use of some appliances without the householder present which could deter people from automating their use.

In addition, using smart technology in this way is perceived to exclude some people, including:

- people who are less technologically savvy (likely to be older);
- people on lower incomes who would find it more difficult to afford smart devices; and
- private renters as landlords may be reluctant to install such devices.

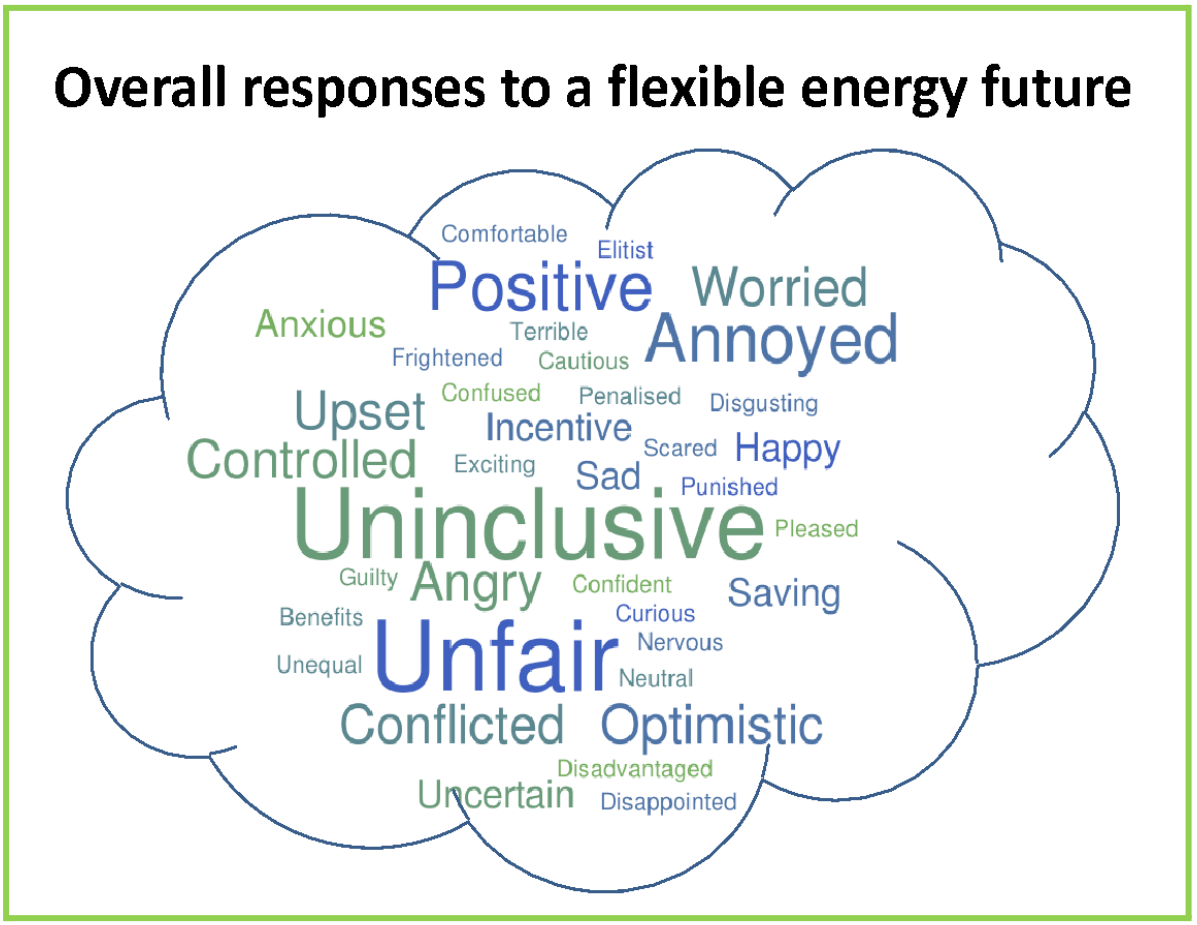
> ***"These things aren't free so you're having to spend money to save"*** **(Health-related need for energy, Cheshire)**

> ***"It's a good idea in theory but it's pie in the sky for my house"*** **(Privately renting in a shared household, London)**

> ***"The vulnerable and elderly, it's going to blow their minds*****" (Health-related need for energy, Cheshire)**

5.4 Overall response to a flexible energy future

Overall, the response to a flexible energy future was polarised, with negative sentiments outweighing positive. This is highlighted in the word cloud to follow which is based on responses to a written task.



Overall, participants' main concern about the prospect of flexible energy use relates to its perceived lack of fairness and inclusion. This engendered strong feelings especially from some of those with a health-related need for energy at home:

> ***"I'd be thinking, 'why am I being punished? If I could be flexible I would, it's not out of choice'. I'd be moaning 'why is there not a good rate for those with medical needs?' I'd be feeling disappointed that I have been left out. Having medical equipment is not pleasurable and then being hit by a penalty on top makes me feel not included"*** **(Health-related need for energy and a child aged 0-5 in the household, London)**

> ***"My main concern is about paying a premium because I've got no choice. I wouldn't want to feel punished if I wasn't able to be flexible. That would feel tough and very unfair. There are lots of disadvantages to being disabled already, this could be the straw that broke the camel's back"*** **(Health-related need for energy, Surrey)**

Many outstanding questions about this prospect also remain for participants, including 'how would it work in practice?', 'how would it fit with individual household's circumstances?', 'how much could households save?' and 'how could it be made fair and inclusive for all?'.

6. Barriers to consumers' participation in domestic flexible energy

6.1 All barriers to participating in flexible energy

As reported in Sections 4.3 and 4.4, the three target groups involved in this research each face higher opportunity-related barriers to changing their energy usage behaviour compared with the general population due to having an increased need for energy and/or less flexibility in when energy is used. However, these are not the only barriers they face to participating in flexible energy.

The COM-B behavioural model provides a systematic framework for understanding all of the different barriers that are relevant to the target audiences, and these spanned:

- **Capability:** Barriers relating to having insufficient skills and abilities to enable participation.
- **Opportunity:** Barriers to changing energy use behaviour as well as other external barriers to participation.
- **Motivation:** Barriers relating to how much people want to engage and see value associated with participation.

All relevant barriers identified through this research have been summarised in the table below:

All barriers to participation for the target groups (using the COM-B framework)	
Opportunity barriers to changing energy usage behaviours *(recap)*	• **All:** Limited availability at home due to outside responsibilities at work, school etc.; well-established home-based routines which themselves are entrenched social practices so difficult to change. • **Someone pregnant or children 0-5 in the household:** They may have an increased need for heating and do laundry more frequently. They are also likely to have fixed mealtimes due to work hours and childcare timings and to have fixed pre-bedtime routines. For working parents most chores are likely to be done after work. • **Private renters living in shared households**: There may be different work patterns, habits and preferences within the household, and housemates may need to fit in with the availability of appliances in busy shared households. Landlords may also determine some timings and noise abatement considerations may prevent appliance use later at night. • **Someone in household with a health-related need for energy:** They may need to use electrical medical equipment and/or have an increased need for heating or hot water to manage pain. The times at which energy needs to be used may also be influenced by their health condition (e.g. needing

	carers to be present to support tasks, to take medication with food, to maintain a consistent routine and to avoid fatigue later in the evening).
Other opportunity barriers	• Some were not able to have smart meters due to where they live, or did not wish to have them due to having had poor past experiences or hearing negative word of mouth about them (this particularly related to inaccurate billing). • Many participants, and especially those living on lower incomes, indicated that they would find dynamic ToU tariffs incompatible with budgeting for their energy costs. • Those on lower incomes also felt that they not be able to afford smart technology to support flexible energy use. • Some private renters were not energy decision-makers regarding their tariffs (if utilities are included in their rent) and smart meters, and some expected to be excluded from accessing smart technology to support flexible energy use if their landlords are reluctant to invest in this.
Capability	• Many felt it would be a greater mental load for them to think about manually time-shifting their energy use, especially if this would need to happen regularly and in a variable way. • The range of ToU tariffs presented to participants was confusing to all and especially to people who suffer from brain-fog due to a health condition. • Those with lower digital skills expect it to be challenging for them to engage with smart technology to support flexible energy.
Motivation	• There was a strong feeling that domestic flexible energy places the burden of responsibility too much on households. ***"It places a lot of responsibility on households, on certain people. It doesn't sit right, I don't think it's fair, it's not people who consume the most"*** **(Someone pregnant or children 0-5 in the household, London)** • As a result, there were many questions asked such as why big business is not being asked to do more, why industry and government isn't investing more in generation infrastructure to support electrification and why suppliers are reportedly making supernormal profits but consumers are not being protected more from price hikes. ***"How are they [suppliers] investing in generating more electricity?"*** **(Health-related need for energy, Stockport)**

	"Big companies should be doing more. Retail parks at night are lit up like during the day" **(Health-related need for energy, Cheshire)** • There was also concern that such behavioural shifts, even if theoretically possible to achieve, would remove agency and control from consumers about their behaviours and routines in the home. Participants anticipated that this could have a detrimental impact on people's home lives e.g. causing inconvenience and reduced comfort, and potentially even affecting their health and wellbeing. ***"What's the point of life if you are in your home at our age and you have to look and see if you can afford a cup of tea. It's just existing"*** **(Health-related need for energy, Swansea)** • In addition, there was scepticism about the level of rewards that will be offered for making these significant changes, which potentially jeopardise the sanctity of the home, and whether it would be financially worth it. ***"If they let you know in advance you could maybe do the washing in the morning but I would only change it up if it was significantly financially beneficial. For a tenner I'm not turning my life upside down"*** **(Someone pregnant or children 0-5 in the household, Swansea)** • Some also questioned whether the system will be implemented successfully and achieve its objective of modulating demand. ***"Will we just create another set of peaks like LTNs [Low Traffic Networks]?*** **(Health-related need for energy, Stockport)** • These motivational barriers appear to be more prevalent among middle aged or older people (especially those with a health-related need for energy). Conversely younger people (more prevalent in the private renters' cohort) appear to be more open to the prospect and more motivated both by potential cost savings and environmental benefits.

6.2 Research participants' suggestions on how to address these barriers

Participants felt it won't be possible for everyone to change their behaviour in order to participate in domestic energy flexibility, so there was consensus that alternatives should be developed. Participants also made a number of other suggestions, each of which have been summarised in the table to follow:

Participants' suggestions for addressing barriers to participating in energy flexibility

Providing alternatives for those who can't be flexible	• Participants felt that it will not be possible to mitigate the barriers to changing energy use experienced by some people, especially those with a health-related need for energy. As such, it was regarded as crucial that this is recognised by government and suppliers, and that alternatives are developed accordingly. ***"They need to bear in mind that some people won't be able to participate. Someone needs to take responsibility so that they are not falling through the cracks"*** **(Health-related need for energy, Cheshire)** ***"There should be a dispensation for the elderly and those reliant on energy medically"*** **(Health-related need for energy, Stockport)** • In particular, many participants suggested the provision of a discounted flat rate (social tariff) for those who can't be flexible due to a medical condition or disability, and some felt that this should be extended to other groups such as older people, households with young families and households living on low incomes. ***"There are a lot of people round here have got COPD, I think it's because of where we're living with the steel works, and I also used to smoke. The help would be we wouldn't have to worry financially. At the end of the day when you're not well and you're worrying about that the last thing you need is to worry about how am I going to live and have heating?"*** **(Health-related need for energy, Swansea)** ***"There should be a special rate [for electrical medical devices] as we need them to live. At the more extreme end they help people stay alive. Mine are more mobility based but I can't use a manual chair. It feels stressful and unfair. I'm not just charging these for fun, they're essential for you to be able to leave your bed"*** **(Health-related need for energy, London)**
General awareness raising	• For those who may be able to participate in flexible energy, significant awareness raising is perceived to be needed. ***"We should be taught more about this"*** **(Privately renting in a shared household, Stockport)** • As well as national publicity campaigns, was suggested that councils, housing associations and other advice agencies should help to explain the changes at a local level by running workshops, demonstrations and one-to-one advice sessions.

	"I would need someone to come in my house and explain it all to me, just like you have" **(Health-related need for energy, Swansea)**
Enabling consumers to choose the most suitable tariffs	• It was felt that the ToU tariffs options discussed in this research are not user friendly and would need rationalisation and simplification. • An easy and accurate way of comparing tariffs and evaluating their suitability for individual households was also called for. ***"We all wait for Martin Lewis"*** **(Health-related need for energy, Stockport)** • In addition, participants felt that it will be important to be easily able to change tariffs and not be locked into potentially unsuitable contracts. ***"Give people a chance to try them [new ToU tariffs] and not be on a fixed contract so you can change back easily. I hate it when they make it really hard"*** **(Health-related need for energy, London)**
Financial incentives and support	• There was a generally held view that smart ToU tariffs would need to provide a good level of reward for off-peak use (much higher than is on offer with the recent DFS) to encourage people to change their usage behaviour in this way. • It was also suggested that government or suppliers should offer grants and loans so that: ○ people on low incomes can buy smart appliances to support flexible energy use; and ○ private landlords are incentivised to install smart technology in their properties. • In addition, financial incentives and support were also felt to be needed in other areas to support the transition to net zero, such as to help people make fabric changes to their homes and adopt low carbon heating systems.
Solving the problem in other ways	• There were also some people who were against domestic flexible energy use on principle, as they regarded it as being too controlling, imposing too much burden on households and not inclusive. • They felt that the problem should be solved in other ways e.g.: ○ by more investment in energy infrastructure and renewable energy generation (perhaps funded through windfall taxes on suppliers benefiting from supernormal profits); and

	○ by making large non-domestic consumers primarily responsible for being more flexible. ***"It's how they [suppliers] conserve it and allocate it at peak times. It's not for the consumer to say we won't use anything for your benefit and they're still forking out on the direct debit every month"*** **(Health-related need for energy, Swansea)** ***"It's not consumers who are causing this, it's the big corporations. What are their obligations?"*** **(Health-related need for energy, Stockport)**

7. Conclusions and implications

7.1 Conclusions

Each of the target groups for this research have reduced opportunity compared with the general population to change their energy use and particularly to alter the times at which they use energy. The reasons for this vary across the three groups as has been detailed in the preceding sections. This lack of flexibility capital could prevent some people from participating in future domestic energy flexibility.

Not surprisingly, these barriers are most significant overall for people with a health-related need for energy. This group is at risk of being 'between a rock and a hard place' if flexible energy use is required to save money on energy bills as:

- they are least able to change their behaviour or most at risk of negative impacts to their health and wellbeing if they do make changes; and
- many are living on a limited income and already have higher costs due to their disability so they would be more financially disadvantaged as a result of not being able to be flexible.

Some people may also have reduced opportunity to participate in domestic energy flexibility due to living on a low income, not having a smart meter or not being an energy decision-maker at home.

All of these opportunity barriers may contribute to a general public perception that domestic energy flexibility models lack fairness and inclusivity.

In addition, people in each of the three target groups may lack capability and motivation as well as opportunity to participate in energy flexibility. Such models are perceived to be complex and to require a greater mental load required to engage with them. In addition, domestic energy flexibility is felt by many to place too much burden of responsibility on households rather than government, suppliers and large commercial energy users. The expectation of detrimental impacts to home routines and household members prompts some strongly negative feelings towards the whole concept of domestic energy flexibility. Negativity about this concept is also influenced by low understanding of why this will be important and beneficial in supporting a transition to net zero as well as scepticism about the level of financial benefits consumers will derive.

7.2 Implications

The range of barriers identified to participation in domestic energy flexibility suggests that interventions will be required in multiple areas, as well as protections for those with the most significant opportunity barriers such as those with medical need for energy.

The following ideas have been developed by the authors of this report, drawing on the research findings:

Ideas for mitigating the barriers to participation in domestic energy flexibility	
Opportunity	• For people with insurmountable barriers, alternatives could be considered such as flat rate social tariffs[27]. • Consumers prioritise predictability of bills so those able to load shift are likely to prefer static ToU tariffs or occasional off-peak rebates over other types. • People living on low incomes would benefit from financial assistance to acquire the smart technology that can support flexible energy use. • In addition, expediting the mass market development of smart home batteries, and providing financial assistance to help people acquire these, could reduce the impact of load shifting on people's household routines. • Increasing smart meter ownership amongst those living in private rental accommodation could mitigate a fundamental barrier for those living in this type of housing tenure who may otherwise be motivated and capable of participating in energy flexibility.
Capability	• Given the low public awareness and understanding of energy flexibility models and ToU tariffs[28], significant awareness raising will be needed to prepare people for such a major behavioural change. • Ideally, smart ToU tariff design should be as simple as possible to help enable people to make choices that are right for them. • An easy, accurate, independent and multi-channel way of comparing tariffs and evaluating their suitability for individual households will also be important, perhaps linked to smart meter data and delivered through smart tariff price comparison websites. • In addition, it will obviously be important to allow consumers to easily change tariffs and to ensure they are protected from being locked into unsuitable tariffs.
Motivation	• ToU tariffs will need to be provide sufficient value for people to feel that they warrant the required behaviour change. A previous Citizens Advice study found that while consumers are interested in these tariffs, without electric heating and EVs the value is modest and between 25-40% faced higher bills in recent

[27]This aligns with the recent major programme of work on social tariffs in the energy sector conducted by Citizens Advice in collaboration with the Social Market Foundation and Public First. The final report, Fairer, warmer, cheaper, recommends a new social tariff based on household income and energy consumption, and which is provided without the requirement for active participation or application from households.

[28] A recent BEIS survey found that 25% had never heard of ToU tariffs and 50% said they know a little or hardly anything.

	trials.[29] Similarly, Ofgem research determined that satisfaction with ToU tariffs is higher among EV owners but non-EV owners feel less able to capitalise on off-peak periods and there is uncertainty if/how they could save using these tariffs.[30] • Emphasising the environmental benefits (e.g. increased use of renewables, reduced reliance on fossil fuels) and not just costs may be more successful in encouraging public buy-in. • In addition, explaining what others (government, suppliers, big business) are doing to contribute could help to convey that 'we are all in this together'.

[29] Citizens Advice [accessed 3 March 2023] The value of time of use tariffs
[30] Ofgem (2020) Energy consumers' experiences and perceptions of smart 'Time of Use' tariffs