

Which?

Household Energy Flexibility: Who Really Benefits?

Expert perspectives

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Executive summary

Flexible energy use offers a way to reduce household energy bills

Flexible energy use involves consumers shifting timing or quantity of power usage to match electricity availability on the network. The UK Government aims to expand this capacity dramatically, targeting 10 to 12 GW of domestic and business demand flexibility by 2030, up from 1.6 GW in 2024.¹ For households, this mainly means reducing the amount of electricity they draw from the grid during peak times in preference for off-peak use.

As the proportion of renewable energy on our energy grid grows, the value of “consumer-led flexibility” increases. With 80% of consumers consistently telling us they are worried about energy prices,² flexible energy use could be an important tool to reduce high energy bills. Many households, particularly those with solar panels, home batteries and electric vehicles, could gain significantly by shifting when they draw electricity from the grid to off-peak times.

However, there is a significant risk that the benefits of flexibility will be very unevenly distributed

Many flexible behaviours require low-carbon technology - and richer households tend to own more of these technologies.³ Moreover, some households will find it difficult to shift the timing of their energy demand. Ofgem’s recently published Flexibility and Net Zero survey lays bare the potential scale of this risk.⁴ Based on this survey, we estimate that the households with the highest potential to shift electricity use can shift around 10% of their consumption on average, whereas a quarter of UK households can only shift an average of 0.1% of their electricity consumption.⁵

Those households who cannot shift much consumption may still benefit from the reduced costs of building and operating the grid, but the disparity is currently stark. Although the Government is aware of this issue, there is a substantive risk that policymakers are failing to pay sufficient attention to ensuring lower-income and vulnerable households are not left behind by the rollout of demand-side flexibility. The Government’s recent update to the Clean Flexibility Roadmap⁶ does not include any metrics that will allow the government to monitor which types of households are engaging and how it is affecting them.

Expert perspectives: benefits, risks and what the Government should focus on

As the issue is complex we commissioned a set of expert perspectives from some of the foremost organisations working in the area to:

- Explain which types of households are likely to benefit the most, and which face the biggest barriers

¹ [Clean Flexibility Roadmap](#), DESNZ, Ofgem and NESO, July 2025

² [Consumer Insight Tracker](#), Which?

³ [Smart energy: Flexible energy and low carbon technology adoption](#), Which?, March 2026

⁴ [Tracking energy consumers’ use of low carbon and flexible products and services: 2025](#), Ofgem, May 2026

⁵ Ofgem find that the top quartile of households by flexibility potential can shift an average of 243kWh annually, versus 3kWh for the bottom quartile of households. We assume that average electricity use for both quartiles are similar to the average household annual electricity consumption of 2,500 kWh, in line with Ofgem’s Typical Domestic Consumption Values updated from 1st July 2026.

⁶ [Clean flexibility roadmap: July 2026 update](#), DESNZ, 2026

- Explore potential interventions that the Government should be making, either now or planning for the near future

A key concept highlighted by Michael Fell, a principal research fellow at the UCL Energy Institute, is the idea of "flexibility capital". This is the idea that a household's ability to engage with flexible energy is determined by both:

- technical factors, such as low-carbon technology ownership and housing type, and,
- social ones like household composition, daily routines, and digital confidence.

Unfortunately the perspectives contained here make clear that the pattern of flexibility capital amongst households is likely to lead to the benefits of energy flexibility being disproportionately enjoyed by higher-income households, potentially leaving lower-income, vulnerable, or non-digitally engaged consumers behind. Substantial government intervention is likely to be needed to avoid this outcome.

Households that merit particular focus include:

- Households who use a lot of electricity and have some ability to shift demand, but struggle to sign up to flexible tariffs or respond to price signals. This may be due to technical barriers (e.g. not having a working smart meter or being on a prepayment meter) or social factors such as low digital confidence or limited energy knowledge,
- Households that have flexible electric heating or other flexible load, but for whom current offers do not work well. Storage heater households are a key example, as there is only one smart tariff available to them at the time of writing,
- Households with very low electricity use, who may have little real opportunity to save through flexibility, and can end up being harmed if they try to cut back even further. Heating often tops the list of things that low-income and vulnerable households ration. For some, this makes health conditions difficult to manage.

Addressing this system-wide challenge will require a range of interventions. Our experts suggest a number of specific areas that merit thorough consideration by the Department for Energy Security and Net Zero. These include:

- A coordinated approach to consumer engagement that combines inclusive design, clear and trusted communication, appropriate standards and multi-channel support, with explicit consideration of low-income and vulnerable consumers,
- Ensuring that the potential savings from consumer-led flexibility are not locked behind ownership of specific high cost appliances or accessible only to those with a high degree of energy knowledge,
- Novel approaches that help people access benefits without owning technology,
- Building trust in data sharing through strong, clear, visible consumer protection and innovators that invest in building consumer confidence that their data is used proportionately to offer ongoing value,
- More widely available independent advice to help a broader set of consumers navigate this new, more complex, energy environment.

Robust and timely monitoring is needed

There are also important emerging issues that need to be the focus of policy thinking, informed by robust and timely evidence collection. For example, those on low incomes or in social housing may receive fully funded low carbon technology through the measures being taken forward through the Warm Homes Plan and hence be able to benefit from energy

flexibility.⁷ However, this could leave a “squeezed middle” of households who are not eligible for grants but cannot afford to install low carbon technology themselves? The policy direction taken by the Government presumes that zero or low interest loans can fill this gap, however many households may not take up these offers.

We agree with the recommendation from the Centre for Sustainable Energy that Ofgem must ensure they are monitoring which households are beginning to take up energy flexibility and the benefits and costs being experienced by different types of households.⁸

⁷ [Warm Homes Plan](#), DESNZ, January 2026

⁸ [Smart & Fair 2024-26 report](#), Centre for Sustainable Energy, 2026

Introduction

Flexible energy use offers a way to reduce energy bills

Energy remains an area of major concern for consumers. Concern about prices has remained consistently high over the last few years. The retail energy price cap was introduced in 2019 with the aim to ensure that households on a default tariff pay a fair price for their energy.⁹ However, the gas crisis of 2022 and higher prices since then have kept prices high. Since 2022 at least 80% of consumers responding to our regular consumer insight tracker have told us they are worried about energy prices.¹⁰ Fixed tariffs offer one way for consumers to save money; during 2025, average fixed tariff prices were more than £100 cheaper than Standard Variable Tariffs. However, 64% of consumers remain on Standard Variable Tariffs.¹¹

At the same time the UK's energy system is changing fast as we move toward:

- cleaner power, such as wind and solar, and,
- greater electric low-carbon technology, such as electric cars, solar panels and home batteries.

As the proportion of renewable power generation increases, matching energy supply with demand is a growing challenge because electricity output changes with the weather. This can be dealt with by the use of stable sources of power as backup, such as gas power stations. However, this can come at a substantial cost.

One way to reduce this cost, and in turn electricity bills, is flexible energy use. This is when consumers shift the amount of electricity they use during a period of time, typically in response to a smart tariff with different prices at different times of day. This helps keep costs down as gas power stations need to be called on less often. Consumers might:

- Shift their consumption out of peak time to reduce demands on the grid, for example charging an Electric Vehicle or running their washing machine overnight
- Provide electricity generated through solar panels to the grid
- Store electricity from the grid in a home battery to be used during times when electricity is more expensive.
- Increase their consumption when there is a surplus of electricity generation.

The Government calls this “consumer-led flexibility”.

Consumer-led flexibility

Nearly one in five households already tell us they are participating in at least one modern form of consumer-led energy flexibility, whether that is through a tariff offering such as an EV tariff or through smart offer discounts from their energy supplier.¹² There are fewer households engaging more deeply, with 2.8% of households on a smart tariff as of July 2025, but this is growing at 70% per year.¹³

⁹ [Future of domestic price protection discussion paper](#), Ofgem, 2024

¹⁰ [Consumer Insight Tracker](#), Which?

¹¹ [State of the market report: Energy retail markets highlights](#), Ofgem, January 2026

¹² [Smart energy: Flexible energy and low carbon technology adoption](#), Which?, March 2026

¹³ [State of the market report: Energy retail markets highlights](#), Ofgem, January 2026

Individual households could gain significantly from these behaviours; off-peak electricity use for many time-of-use tariffs was less than a third the cost of Ofgem's retail price cap in June 2026.¹⁴ However, as the examples illustrate, many flexible behaviours require low-carbon technology - and richer households tend to own more of these technologies.¹⁵ Moreover, some types of households are more able to shift their energy demand than others - families with young children or with night workers may find it harder to shift their consumption than others.

The good news is that even households that cannot shift the time they use electricity could still gain. Consumer-led flexibility is part of the provision of "short duration flexibility", which Government modelling has shown could help reduce system costs by £30-£70bn in total across 2020 to 2050.¹⁶ These savings at a grid level will mean a lower amount needs to be raised from all bills than would be the case in the absence of consumer-led flexibility.

Understanding the consequences for different household types

However, the degree to which these savings will be passed on to household groups with different income and wealth characteristics is not clear and will be influenced by a wide range of factors. To better understand the risks and opportunities for consumers we asked some of the foremost organisations working in the area to help put together a primer on the issues. Many thanks for the contributors for their thought-provoking pieces presented in this report:

- Flexibility capital: a framework - Michael Fell, University College London
- What does consumer-led flexibility look like for different household types? Max Woollard, Nesta
- Flexibility for everyone: turning ambition into reality for all consumers - Danica Caiger-Smith, Energy Systems Catapult
- Smart and Fair: Understanding participation in demand flexibility - Charlotte Johnson, Centre for Sustainable Energy

These short pieces are meant as primers to the wide range of excellent work these groups do in this area.

Government and regulator evidence gathering

The Government and regulators are also aware of the potential for different consumer groups to experience the energy transition in different ways. For example, the Department for Energy Security and Net Zero commissioned the Inclusive Smart Solutions programme from the Energy Systems Catapult.¹⁷ This programme studied the barriers that prevent consumers, especially low income and vulnerable consumers, from participating in a future energy system. We feature a piece here by one of the report's authors, Danica Caiger-Smith.

¹⁴ [Best time-of-use electricity tariffs UK for households — June 2026](#)

¹⁵ [Smart energy: Flexible energy and low carbon technology adoption](#), Which?, March 2026

¹⁶ [Smart Systems and Flexibility Plan Appendix I: Electricity System Flexibility Modelling](#), Department for Business Energy and Industrial Strategy, July 2021

¹⁷ [Inclusive Smart Solutions: Final Report](#), Energy Systems Catapult, 2025

Ofgem has also recently published wave 1 of their Flexibility and Net Zero Survey.¹⁸ Key findings from this first wave are that:

- Over half of all households (57%) say they could shift their electricity use to off-peak times or already do this.
- Laundry provides a large near term opportunity with 54% of all households saying they could shift their laundry to off-peak times. This presents an opportunity for a wide range of households to save, although Ofgem estimate that an average household willing to shift 25% of their usage to off-peak times would only save £10.40 over a year. The survey does find that households are approximately as likely to say they will shift their demand for altruistic reasons to reduce demands on the grid at peak-times as they are for financial reasons. We think that more behavioural evidence is needed here to understand how households actually behave.
- 6% of all households say they have an electric vehicle and could shift the time it charges at present. Notably, 63% of all households with an EV say they already charge their vehicle at off-peak times, suggesting this behaviour is becoming normalised with an opportunity to increase this further.
- 2% say they have a heat pump and could shift when their heat pump runs.
- When households' consumption patterns are taken into account, it emerges that most of the currently untapped flexibility potential is likely to be concentrated in a small group of early adopters of electric vehicles, who are willing to shift consumption to off-peak times more than they currently do

As part of the survey, Ofgem also combined households that consented to their smart meter data being shared to their survey responses. This enabled Ofgem to assess households "energy flexibility potential". The findings from this work show how flexibility potential is strongly concentrated at the moment. The table below shows that half of households have less than a tenth of the potential than the top quartile of households. Based on these results, we estimate that the households with the highest potential to shift electricity use can shift around 10% of their consumption on average, whereas a quarter of UK households can only shift an average of 0.1% of their electricity consumption.¹⁹ Ofgem's modelling also further illustrates the risk that those households who have the biggest flexibility potential, and hence stand to gain the most from flexible energy use, are likely to already be better off.

We now turn to our expert perspectives that help to provide conceptual ways to understand the likely dynamics and initial results from work undertaken in this space.

¹⁸ [Tracking energy consumers' use of low carbon and flexible products and services: 2025](#), Ofgem, May 2026

¹⁹ Ofgem find that the top quartile of households by flexibility potential can shift an average of 243kWh annually, versus 3kWh for the bottom quartile of households. We assume that average electricity use for both quartiles are similar to the average household annual electricity consumption of 2,500 kWh, in line with Ofgem's Typical Domestic Consumption Values updated from 1st July 2026.

Estimated energy flexibility potential by flexibility potential quartile (Ofgem)

Households ordered by flexibility potential	Key flexibility characteristics	Average implied flexibility potential per household per year	Average flexibility potential as a proportion of first quartile potential	Average household income
First quartile	High flex households - high low carbon technology usage, strong shift potential	243 kWh	100%	£61k
Second quartile	Strong laundry flexibility and modest low carbon technology uptake	67 kWh	28%	£58k
Third quartile	Off-peak washing machine users, storage heater users; cautious about automation	21 kWh	9%	£54k
Fourth quartile	Lowest flexibility potential group	3 kWh	1%	£46k

Source: Ofgem Flexibility and Net Zero (FANZ) Survey Findings report (Wave 1)

Flexibility capital: a framework - *Michael Fell, University College London*

Wind and solar are the cheapest forms of generation to build. They also enable significant savings for billpayers who can use electricity while they are generating. The Government [estimates](#) households that can change when they charge electric vehicles and run heat pumps save hundreds of pounds per year, and this can be even bigger if you throw solar panels into the mix.

Not every household has the same opportunity to take advantage of this flexibility. You need to be able to invest in the technology, and have space and permission to install it. And even if you do that, some household sizes, types, and schedules make it harder to change when electricity is used – such as having young children who need cooking for at fixed times. Some households might be able to be flexible, but only with lifestyle compromises.

Flexibility capital: the haves and have nots

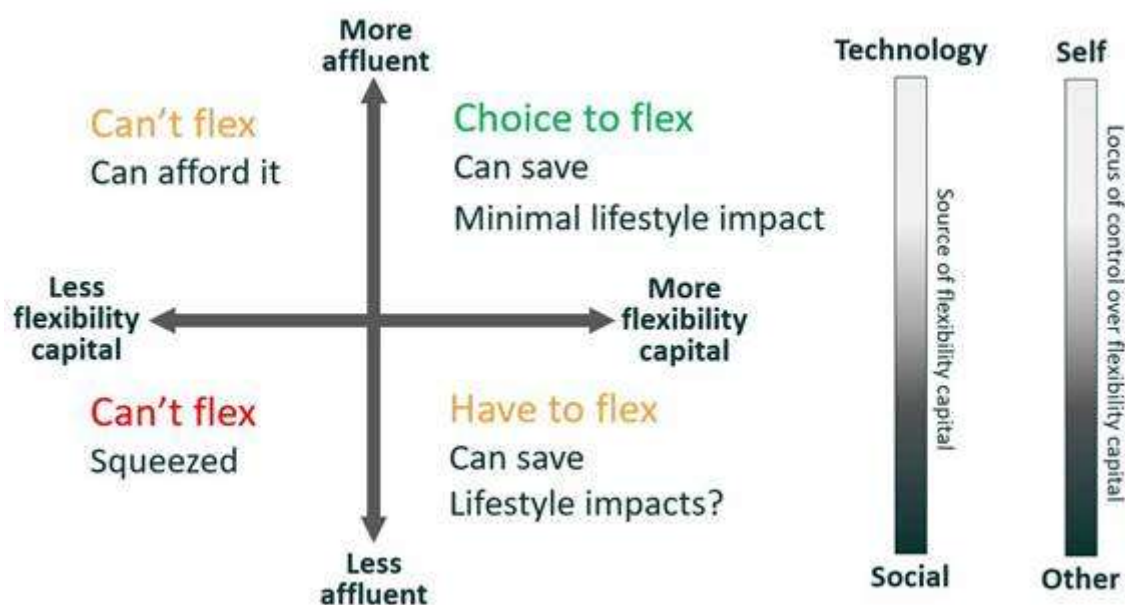
This ability to be flexible (or not) in electricity consumption can be viewed as a form of capital – [flexibility capital](#). Households that have it, under the right circumstances, can realise its value in the form of bill savings or even being paid to use electricity.

What makes up this capital includes technical factors such as low-carbon technology (like electric vehicle or home battery) ownership and housing type, and social ones like household composition, daily routines, and digital confidence. Less immediately tangible elements, like the way households take part in everyday practices such as cooking or laundry, are also key. The Centre for Sustainable Energy's (CSE) "smart and fair capabilities lens" offers a fuller breakdown of important factors (see CSE perspective for more detail).

The diagram below illustrates how this plays out. A household's position depends partly on its financial resources and partly on how much flexibility capital it has. Some have the choice to flex and can save with minimal disruption (such as by using power stored in a battery); others have to flex to help make ends meet, potentially with greater lifestyle impacts; and some can't flex at all. Of the latter, some can comfortably afford not to flex, while others may increasingly struggle if they are unable to take advantage of the savings flexibility can enable.

Luckily, even households who can't be flexible still get some benefit when others can. This is because the more "consumer-led flexibility" we have, the more efficient use we can make of electricity generation and infrastructure, and the less we need to build. But there are still challenges.

While estimates are uncertain, households that don't provide flexibility will see much smaller savings than those who provide a lot, and these will be experienced as slightly smaller increases in bills rather than actual reductions. What is more, households that can be very flexible may end up being subsidised by those who aren't. This is because they will increasingly be paid for flexibility to do short-term balancing of the grid – a cost covered by all billpayers.

Figure 1: Flexibility characteristics

Adapted from Powells and Fell 2019 (<https://www.sciencedirect.com/science/article/pii/S2214629619301185>)

The table below illustrates how the savings and other impacts of flexibility are likely to differ across households with different levels of flexibility capital. Because estimates of the value of flexibility vary, and because it will change over time and between places, this is necessarily a general picture.

Flexibility also plays an important role in general affordability of energy. According to [current estimates](#), a household that switches to a heat pump can expect to pay roughly the same for heating than they did with a gas boiler. Households who were previously underheating to save money risk paying even more, because it can be harder to use certain underheating strategies (like heating restricted spaces and times) with a heat pump. With a flexible tariff, however, [substantial savings](#) can be made even compared to a gas boiler.

Emerging risks

The upshot of this is a number of emerging risks that governments will need to face up to. First, flexibility is the key way of mitigating the affordability challenges of upgrading the power system. Households who can't or don't take advantage of it risk spiraling bills – even while others see their bills falling. This is not a recipe for political support – for upgrade programmes or the governments who oversee them.

Secondly, there are delivery risks to the speed and cost of system upgrades. As more households electrify heating and transport, grid upgrades will be needed. Where households are able to use electricity flexibly, upgrades can be deferred (saving money) and more strategically planned, helping manage supply chain constraints for kit like substation transformers. If many households are concentrated in an area that needs upgrades and do not have [trusted services](#) aimed at making it easier for them to be flexible, such options are more limited.

Table 1: Likely savings and other impacts by household flexibility group

Household group	Likely savings (and scale)	Other impacts
No flex	Low. Indirect savings, shared by everyone, because the whole system is run more efficiently. In practice this is felt as a slightly smaller increase in bills rather than a reduction.	No lifestyle disruption, but at risk of being left behind as more flexible households see their bills fall – and may end up helping to fund the payments made to high-flex households. Non-cost-effective operation is also a risk: this occurs when households have the potential to be flexible (such as having a heat pump), but for various reasons do not deploy it, compounding affordability challenges.
Some flex	Medium. Indirect savings as above, plus some direct savings from shifting their own use.	Service-quality compromise: for some, being flexible can mean accepting some loss of comfort or convenience – for example running appliances at awkward times, or living with a slightly cooler home on occasion.
High flex	High. Indirect and direct savings as above, plus explicit payments for providing flexibility to help balance the grid. Some of this value is effectively redistributed from lower-flex households because the costs are recovered from bills.	Where flexibility is a genuine choice, disruption is minimal (though service providers take a share of the value). For households that have to flex to save money, the same gains can come with greater compromise to comfort or service quality as above.

There is also an economic growth risk. All households need energy, and a constant stream of bill income is available to those companies who facilitate its delivery. Theoretically there is great potential for companies to develop and invest in infrastructure such as [heat networks](#), shared batteries and generation, and other local schemes that would make it easier for all households to benefit from local flexibility – but this is often complicated by regulation, such as around who can supply energy to a home. This acts as a barrier to investment.

A strategic priority

For all these reasons – on top of simple fairness considerations – extending the reach of consumer-led flexibility should be a strategic priority for policymakers. There are some welcome signs of this entering into Government thinking, such as the Warm Homes Plan and Local Power Plan. But the devil will be in the detail in ensuring that households that get access to technology, either at home or locally, will actually reap the benefits flexibility promises.

Michael Fell acknowledges funding from UKRI through the Energy Demand Research Centre (grant number EP/Y010078/1).

What does consumer-led flexibility look like for different household types? *Max Woollard, Nesta*

As more households use energy in a flexible way, the overall cost of electricity should fall for everyone. This is because we all contribute to the electrical generation, storage and transmission capacity of our grid via our energy bills. The more flexibility consumers can provide, the more we can avoid expensive grid upgrades or costly gas fired turbines, and the less we all have to pay on our electricity bills. Consumers can be placed into four rough categories when thinking about the benefits of flexibility might be distributed.

Four consumer categories

1. **Those that have not electrified any of their larger sources of energy demand and don't flex:** This group stands to lose out the most, primarily because they are still using fossil fuels. This will leave them more exposed to energy price fluctuations from geopolitical events, like the war in Ukraine and Iran, than those that have electrified. Additionally, their electricity bill would form a smaller component of their overall bill, so they would stand to benefit less from any shared network cost savings resulting from other consumers engaging in flexibility.
2. **Those that have not fully electrified but do flex:** This group will share the same risks and costs associated with being reliant on fossil fuels, but have started to flex the electricity that they are using. They might have a time of use tariff or engage with their energy suppliers demand flexibility service (DFS) that incentivizes them to shift their demand away from peak times like 4pm-7pm. These people will start to make savings on their electricity bill with activities such as using washing machines or dishwashers outside of typical peak times, although the size of any savings will be limited by how able they are to shift their electrical consumption.

We have already seen from some of [our research with Utilita](#) that smart prepayment meter customers participating in their DFS 'Power Payback' offer were willing to take very manual actions to shift their demand, even switching their power off at the fuse box on one occasion. Although the monetary value from singular actions like washing clothes earlier in the day are small, they do add up across the year and this group will start to see savings compared to group 1.

3. **Those that have electrified their high demand assets, but are not currently flexing them:** Group 3 have electrified their home and may have even disconnected from the gas grid for heating and cooking. They will be less exposed to future energy crises and should benefit more from the shared benefits of CLF due to electricity making up more, if not all, of their energy bills. However, members of this group are still using a fixed rate tariff. This means that they will most likely be paying (in some cases significantly!) more for their electricity than group 4.
4. **Those that have electrified and are flexing it:** This group reaps the most benefits. They share the benefits of group 3, but are also able to optimise their running costs

for things like their electric vehicles and heat pumps. Their savings will depend on how high their demand is and how well they can shift it in response to price signals, but it should be in the hundreds of pounds per year range. Novel [type of use tariffs](#) could introduce automation to help consumers operate their electrical devices in the most cost effective manner. Our research showed that automated tariffs were able to shift a significant amount of electrical demand from heat pumps away from peak periods of the day, without being noticed by the majority of participants. If made brand agnostic and spread across technologies, these types of automated tariffs could drastically increase the ease of consumer led flex.

What needs to happen?

It's hard to say exactly what will happen to energy prices in the coming years, but we do know that those who electrify should start to see their bills come down, and those that flex their electricity should save more than those who don't. Ideally we want to get consumers to progress from group 1 to group 4 (skipping group 3 if they can!). We need to ensure that devices are flex friendly (able to automate to respond to a tariff, be remotely controlled, or use set schedules) to encourage and enable engagement. The potential savings from CLF should not be locked behind ownership of specific high cost appliances or behind a learning curve that only energy enthusiasts can overcome. Those who stand to pay the most are not those that don't flex their electricity, but those that remain stuck using fossil fuels to meet most of their energy demand.

Flexibility for everyone: turning ambition into reality for all consumers - *Danica Caiger-Smith, Energy Systems Catapult*

Consumer-led flexibility (CLF) will underpin a cost-effective transition to Net Zero. In *Innovating to Net Zero 2026*²⁰ we highlighted that households could play a major role in supporting an affordable, reliable and low-carbon energy system - but only if flexibility is designed to work for those households and their many and varied needs and circumstances. Government ambition is that *anyone* should be able to participate in – and everyone should benefit from – flexibility. But evidence shows significant risks that large parts of the population could be locked out of a future smart energy system.

Our Inclusive Smart Solutions (ISS) programme²¹ identified seven consumer groups at heightened risk of being excluded from a future smart energy system:

- Households in receipt of any benefit
- Tenants (private and social)
- People over the age of 65
- Low-income households (<£26,000 annually)
- Those living alone
- Those living in flats or maisonettes
- Those using pre-payment meters

Belonging to one of these groups means being *more likely* to be excluded, not that someone *will* be excluded. And of course, some who don't fall into any of these groups may still be excluded. Notably, some of the at-risk groups identified may not be considered vulnerable in other contexts, for example those living alone or tenants.

The majority of those surveyed belonged to at least one group, and people were more likely to belong to multiple groups than just one. The risk of exclusion **is a mainstream, system-wide design challenge**. At-risk groups can face multiple barriers, like struggling to find out about flexibility, difficulty accessing smart technologies and tariffs, high upfront costs, limited ability to shift consumption and, ultimately, lower rewards for participating.

These barriers litter the consumer journey from becoming aware of flexibility through to participating and benefitting from it. Addressing barriers in isolation won't unlock the full journey or enable consumer and system benefits. As we outlined in response to the DESNZ



Figure 1 We need to consider the consumer journey that will enable flexibility capacity.

²⁰ [Innovating to Net Zero 2026: Scaling flexibility to meet the five peaks challenge](#). Energy Systems Catapult, 2026.

²¹ [Inclusive Smart Solutions: Final Report](#). Energy Systems Catapult, 2025.

consultation on engaging consumers in CLF,²² a coordinated, end-to-end approach should combine inclusive design, clear and trusted communication, appropriate standards and multi-channel support, with explicit consideration of low-income and vulnerable consumers. Targeted, intentional actions should support those at risk and tackle the barriers they face throughout the consumer journey.

Below we summarise the key relevant findings from our Inclusive Smart Solutions programme.

Awareness doesn't mean appetite

Low-income and vulnerable consumers often feel novel solutions aren't for '**people like them**' - benefits may feel irrelevant, or they may feel excluded by how solutions are designed.

People need **relevant, meaningful motivation** to take part. Households already rationing their energy use have limited ability to shift or reduce consumption. Financial rewards based on *how much* energy use is shifted can feel unfair and unmotivating or, worse, could encourage further rationing, potentially putting households at risk.

Heating often tops the list of things that low-income and vulnerable households ration. For some, this makes health conditions difficult to manage. For some, even minimal heating feels unaffordable. And for some - too many - both those things are true. Solutions should **make meeting essential heating needs easy and affordable**. Innovators must consider that smart meter data could reflect underheating. Alternative datasets reflecting suitable baseline heating levels could support fair, effective innovation.

Low-income and vulnerable households can be reluctant to abandon trusted coping strategies. Even when benefits appeal, the perceived safety of established behaviours may be a stronger motivator. For example, despite advice about how to run heat pumps efficiently, some still reverted to thinking about when they wanted their heating system to be on and off, rather than when they wanted to be warm – an approach that many people use to try and control the cost of heating.

Recent research conducted as part of our Inclusive Flexibility project with Northern Powergrid found that, while relevant and motivating benefits can encourage participation, some households may face barriers to engaging with flexibility offers, particularly during periods of financial pressure. In response, Northern Powergrid is exploring a range of measures to make flexibility more accessible, inclusive, and easier for customers to engage with.

Not everyone can own low-carbon technology

Low-carbon technologies give people opportunities to actively shift, store or export energy, allowing them to take advantage of time-varying prices. But not everyone can own technology. Tenants may feel unable to engage landlords to get things installed. Homes may lack suitable space. Capital costs might be unaffordable. Novel approaches that **help people access benefits without owning technology** could extend the reach of flexibility. For example, service-type models like the Changeworks solution tested in the Inclusive Smart Solutions programme could help consumers use and benefit from assets they don't

²² [Consumer-led flexibility: consumer engagement. Energy Systems Catapult, 2025.](#)

own outright – those assets could be installed in shared spaces and benefit multiple households, like in blocks of flats.

Solutions need to be used as intended

Many low-income and vulnerable consumers aren't comfortable or confident using new technologies, so solutions should be accessible and inclusive by design. That goes beyond hardware and interfaces - solutions installed without suitable advice, handovers and training on how to use new systems, and ongoing support may not be used as intended. People may override or opt out of flexibility, intentionally or unintentionally. For example, households reverting to turning the heating on only when they're cold may prevent a heat pump from running flexibly. Alongside unsatisfactory outcomes for them, system benefits may not materialise.

Data sharing will underpin ongoing participation in flexibility. Low-income and vulnerable consumers are often reluctant to share data - concerns may increase when solutions involve sharing different kinds of data with unfamiliar, untrusted organisations. **Sharing and continuing to share data needs to feel valuable.** Strong, clear, visible consumer protection can offer reassurance, but regulation alone isn't enough. Innovators should invest in **building consumer confidence** that their data is used proportionately to offer ongoing value. Trust should be built, not assumed – building that trust requires consumers to feel seen, understood and included.

Smart and Fair: Understanding participation in demand flexibility - *Charlotte Johnson, Centre for Sustainable Energy*

Understanding participation in demand flexibility

Over the last three years, the number of ways households can be rewarded for using electricity more flexibly has grown quickly. A major turning point came with the launch of the Demand Flexibility Service in winter 2022–23, when 1.6 million households and businesses took part in events to reduce electricity use at peak times. Since then, the market has widened. Today people can sign up to a range of managed services or incentive schemes from flexibility service providers. Alongside these explicit flexibility services, energy suppliers are offering a widening range of smart tariffs that also incentivise and reward demand shifting.

CSE (Centre for Sustainable Energy) has carried out research with households who have signed up to these offers to understand who is taking part, how they are participating, and what outcomes they see. We have been particularly interested in two questions: how well the developing market for domestic demand flexibility works for different types of households, and where people need more help to benefit from it.

To answer these questions, we developed the Smart Energy Capabilities Lens ([CSE, 2019](#)). This framework helps us analyse the diverse household or personal capabilities required for different flexibility offers, allowing us to identify and support households at risk of being left behind. The Capabilities Lens comprises five clusters of capabilities:

- Energy & tech usage – How well a household's energy usage profile and existing energy technology and appliances enables 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.

We have seen that participation in flexibility is feasible and often positive, but that participation is not straightforward for everyone. If demand flexibility is to work fairly in practice, people need clear offers, the right technology, and trusted support.

Who is taking part?

Our research shows that a wide range of households have signed up to flexibility offers. These include people across income levels, housing types and household sizes, including both those with low-carbon technologies and those without them. Interest is often driven first

by the chance to save money, but people stay engaged because they also value other benefits, such as learning more about their energy use or contributing to a cleaner energy system. The households that tend to see the biggest rewards are those with electric vehicles and smart chargers or those with high electricity use. Where EV charging can be automated, households can more easily benefit from cheap periods or provider rewards without having to manage everything manually.

At the same time, households with flexible demand are not always well served by the current market. Some people are trying to juggle several offers at once, for example combining a time-of-use tariff with a flexibility service. In practice, that can be confusing. If cheap periods and flexibility events fall close together, households may have little extra demand left to shift and may need to work out which option benefits them most. There are also households with solar panels who already shift demand to make the best use of their own generation. For them, supplier incentives may conflict with what already makes sense at home.

What are the main challenges?

Some households need more support to make flexibility work for them. One important group includes people who use a lot of electricity and do have some ability to shift demand, but struggle to sign up and respond to signals. They may not have a working smart meter which makes them ineligible for most offers, and there are also no smart tariffs available for prepay customers (compared to 18 smart tariffs available for EV users). They may have low digital confidence or limited energy knowledge, making it harder to compare tariffs and use them well. In these cases, smart energy advice matters. It can help households understand their options, choose the right tariff and make practical changes with confidence.

A second group includes households that do have flexible electric heating or other flexible load, but for whom current offers do not work well. Storage heater households are a good example. Many are still on Economy 7 or Economy 10 style tariffs. These can suit overnight charging, but they can also come with higher daytime rates and can limit when heating systems respond. That means households may miss out on newer flexibility opportunities, including times when the system needs higher demand during the day or lower demand overnight ([CSE, 2025](#)). Better controls and more innovative products could give these households a much better deal, increasing the flexibility available to the energy system while also improving comfort and affordability at home, but storage heater users can currently access just one smart tariff (contrasted with five heat pump tariffs currently available).

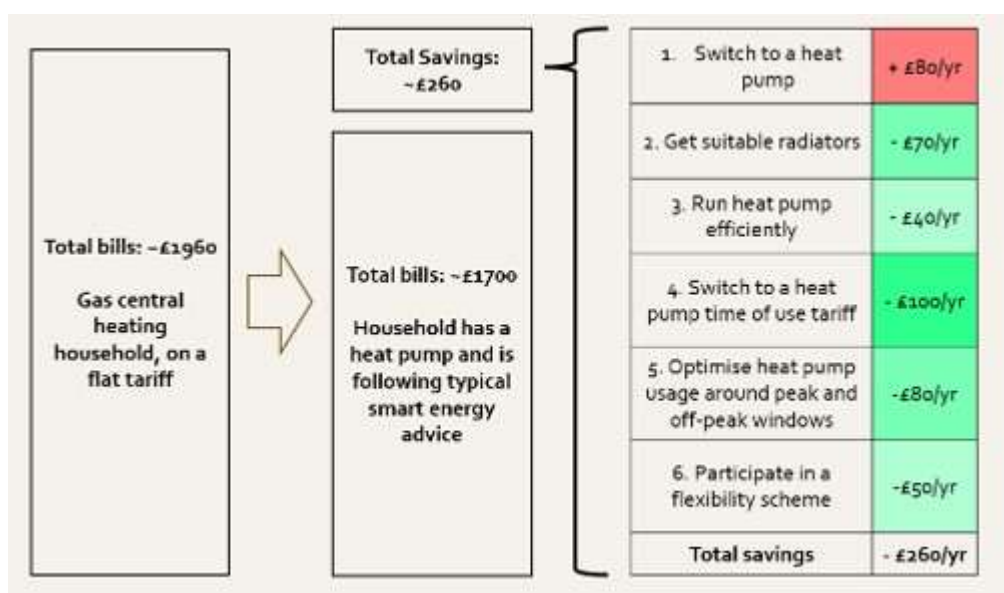
A third group includes households with very low electricity use, who may have little real opportunity to save through flexibility. In a small number of cases, we have seen people already using very little energy try to cut back even further, increasing the risk of harm without creating any financial benefit. That underlines an important point: flexibility should not be treated as a universal option. It needs to be suitable, safe and worthwhile for the household involved.

What support is needed

In all cases, good advice is key to helping people make the right choices. We need to make sure suppliers and flexibility service providers create and offer suitable products and services to different households, and check that households do get the anticipated benefits once signed up. But we also need independent advice to be more widely available. A particular issue is the lack of information on costs, risks, and likely savings. Advice services need long-term funding and better tools, including tariff comparison support. Government

and the regulator need to make better data available to households and the advice organisations that support them.

Figure 2: Likely savings and other impacts by household flexibility group



Our analysis – shown above - highlights the value of good advice for heat pump users. Using the Building Heat Model we developed with the National Energy System Operator, we modelled the potential benefits associated with 6 key actions for getting the best out of heat pump use. Information like this is key helping people make the most of new technologies, tariffs and services.

Overall, CSE's research shows that many households find it easy and beneficial to take up demand flexibility tariffs and services, and these deliver good outcomes for households and the energy system. But more can be done to ensure that people are properly supported, protected, and given information they can trust and apply.

Conclusion

Consumer-led flexibility offers potentially significant gains to households that can participate and nearly one in five households tell us they are already participating. However, the households that tend to see the biggest rewards are those with electric vehicles and smart chargers or those with high electricity use. Ofgem's own modelling shows that half of UK households have less than a tenth of the flexibility potential than the quartile of households with the most flexibility potential.

The expert perspectives in this report provide key insights on the likely dynamics of developments in this area with respect to distributional impacts:

The ability to be flexible (or not) in electricity consumption can be viewed as a form of capital – flexibility capital.

Households that have flexibility capital, under the right circumstances, can realise its value in the form of bill savings or even being paid to use electricity. What makes up this capital includes technical factors such as low-carbon technology (like electric vehicle or home battery) ownership and housing type, and social ones like household composition, daily routines, and digital confidence. A household's position depends partly on its financial resources and partly on how much flexibility capital it has.

While estimates are uncertain, households that don't provide flexibility will see much smaller savings than those who provide a lot, and these will be experienced as slightly smaller increases in bills rather than actual reductions. There is a substantive risk that households that can be very flexible may end up being subsidised by those who are not because they will increasingly be paid for flexibility to do short-term balancing of the grid – a cost covered by all billpayers.

The risk of exclusion is a mainstream, system-wide design challenge.

The Inclusive Smart Solutions report by the Energy Systems Catapult identifies seven consumer groups at heightened risk of being excluded from a future smart energy system - belonging to one of these groups means being more likely to be excluded, not that someone will be excluded.

- Households in receipt of any benefit
- Tenants (private and social)
- People over the age of 65
- Low-income households (<£26,000 annually)
- Those living alone
- Those living in flats or maisonettes
- Those using pre-payment meters

Heating often tops the list of things that low-income and vulnerable households ration. For some, this makes health conditions difficult to manage. For some, even minimal heating feels unaffordable. And for some - too many - both those things are true. Solutions should make meeting essential heating needs easy and affordable.

A range of interventions can help tackle the risk that lower income and vulnerable households get the lowest benefits from consumer-led flexibility

Potential interventions that could help tackle the dynamic above include:

- A coordinated, end-to-end approach is needed to consumer engagement that combines inclusive design, clear and trusted communication, appropriate standards and multi-channel support, with explicit consideration of low-income and vulnerable consumers. Targeted, intentional actions should support those at risk and tackle the barriers they face throughout the consumer journey.
- Ensuring that the potential savings from consumer-led flexibility are not locked behind ownership of specific high cost appliances or behind a learning curve that only energy enthusiasts can overcome.
- Recognising that novel approaches could help people access benefits without owning technology could extend the reach of flexibility, as not everyone can own low carbon technology. For example, service-type models like the Changeworks solution tested in the Inclusive Smart Solutions programme could see consumers paying to use or benefit from assets that they don't own outright – those assets could be installed in shared spaces and benefit multiple households, like in blocks of flats.
- Maximising engagement with low carbon electric technology across income groups and ensuring that devices are “flex friendly” - able to automate to respond to a tariff, be remotely controlled, or use set schedules - to encourage and enable engagement.
- Data sharing will underpin ongoing participation in flexibility but sharing and continuing to share data needs to feel valuable. Strong, clear, visible consumer protection can offer reassurance, but regulation alone isn't enough. Innovators should invest in building consumer confidence that their data is used proportionately to offer ongoing value. Trust should be built, not assumed – building that trust requires consumers to feel seen, understood and included.

Particular groups of households need specific focus

Due to their characteristics, there are particular types of households that the policy and business community should focus on:

- Households who use a lot of electricity and do have some ability to shift demand, but struggle to sign up and respond to signals:
 - They may not have a working smart meter which makes them ineligible for most offers, and there are also no smart tariffs available for prepay customers (compared to 18 smart tariffs available for EV users).
 - They may have low digital confidence or limited energy knowledge, making it harder to compare tariffs and use them well. In these cases, smart energy advice matters.
- Households that do have flexible electric heating or other flexible load, but for whom current offers do not work well. Storage heater households are a key example, as many miss out on newer flexibility opportunities with just one smart tariff available to them at the time of writing compared to five heat pump tariffs. Better controls and more innovative products could give these households a much better deal, increasing the flexibility available to the energy system while also improving comfort and affordability at home,

- Households with very low electricity use, who may have little real opportunity to save through flexibility, and can end up being harmed if they try to cut back even further. Flexibility should not be treated as a universal option. It needs to be suitable, safe and worthwhile for the household involved.

Good advice is key to helping people make the right choices, but there is a lack of information on costs, risks and likely savings

We need independent advice to be more widely available to help a broader set of consumers navigate this new, more complex, energy environment. A particular issue is the lack of information on costs, risks, and likely savings. Advice services need long-term funding and better tools, including tariff comparison support.



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