

Supporting Vulnerable Consumers to Access Dynamic Time of Use Tariffs

Full Research Report

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Report	Supporting vulnerable consumers to access dynamic time of use tariffs
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Executive Summary

Scotland's net-zero targets mean that the ways in which we consume electricity are changing. Time-variant tariffs, which encourage consumers to use electricity at times of the day when grid demand is lower, or when generation from renewable sources of energy is higher, have been entering the market and these are predicted to become one of the main energy supply models in the future¹. Alongside this opportunity of greening the electricity grid come risks that could create new inequalities and vulnerabilities for consumers. This research investigated the implications that dynamic time of use (ToU) tariffs could have regarding vulnerable consumers. We explored the following:

- What are the current attitudes and awareness towards dynamic ToU tariffs amongst vulnerable consumers?
- What challenges would vulnerable consumers face on this tariff? What solutions could address these challenges?
- What recommendations can we draw from this research to help support vulnerable consumers?

The research made clear that awareness around tariffs in general are low, and particularly around dynamic ToU. The tariff was also found to be complex, especially for more vulnerable consumers. Attitudes towards the tariff were mixed and largely depended on personal circumstances and consumers ability and/or willingness to change their behaviour. More specifically, vulnerable consumers seemed less able to change their behaviour due to challenges such as ill health and were worried about understanding the tariff and the unpredictability of bills. Both vulnerable and non-vulnerable consumers would only be likely to switch to this tariff if it saved them money.

In the context of a just transition to net-zero an important question posed by participants and by this research is 'for who's benefit was this tariff created?'. Participants felt that energy suppliers were the main beneficiaries of this tariff, not consumers. This belief, coupled with the literature findings that financial savings from dynamic ToU are minimal without storage technologies indicate that consumers are unlikely to switch to or see a benefit from this tariff, unless supplied with storage technologies or guaranteed savings by suppliers. Implementation of the recommendations made may go some way to enabling dynamic ToU tariffs to play not just a role in the net-zero transition, but also in supporting an equitable one.

¹ The Committee on Climate Change estimates that 53% of future household demand could be flexible in the future.

Key Findings

Awareness

There was very low awareness of dynamic ToU tariffs, with vulnerable consumers slightly less likely to have heard of the tariff than non-vulnerable consumers. This was expected since there is currently only one supplier offering such a tariff in the UK.

Approximately a third of consumers were unaware of their current electricity tariff (30% non-vulnerable, 38% vulnerable), indicating that awareness on tariffs in general could be improved.

Attitudes

Attitudes towards the tariff were mixed. Just over half (54%) of the vulnerable survey respondents stated they would be very likely or likely to switch to the tariff, slightly more (+7%) than non-vulnerable respondents.

The decision to switch to a dynamic ToU tariff appeared to be more closely related to personal circumstances (i.e., being time flexible) than whether someone is vulnerable or not.

Both vulnerable and non-vulnerable consumers would only be likely to switch to this tariff if it saved them money.

The tariff was generally perceived to be unjust by favouring wealthier consumers or energy suppliers and viewed as a lot of effort for little gain - financial savings were seen as being significant only to those who can afford to invest in storage technologies and/or smart appliances and suppliers were seen as the main beneficiary from grid balancing savings.

Barriers

Consumers could face multiple barriers in accessing or using dynamic ToU tariffs. Generally, non-vulnerable consumers viewed a loss of flexibility as a main challenge with the tariff. However, poor health and a need for greater knowledge and understanding were seen as barriers for vulnerable consumers.

Recommendations

Recommendations were co-created together with research participants. These are schematised below and described in more detail at the end of the report.



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1. Introduction

The Scottish Government has committed to achieving net-zero emissions by 2045, with a target to cut emissions by 75% by 2030². Although the energy transition will bring many benefits, these cannot be assumed. There is evidence that, without careful consideration, new injustices and vulnerabilities could be created³. It is therefore essential that we understand these issues to support prevention from the outset and that we continue working to address the issues that already exist in our society and, more specifically within the energy markets.

Time-variant tariffs

New developments are changing the way households consume electricity in the UK. A market for smart home appliances is emerging and a nationwide rollout of smart meters is underway. One opportunity linked to this is the provision of time-variant tariffs to domestic customers. These tariffs encourage consumers to use electricity at times of the day when grid demand is lower or when generation from renewable sources of energy is higher. These tariffs could reduce the reliance on high emitting fossil fuel power plants and thus reduce emissions from the energy sector. The Committee on Climate Change estimates that as much as 53% of household demand could be flexible in the future⁴.

Time-variant tariffs are available in different forms. The most common tariffs are static Time-of-Use (ToU), when the price of energy is fixed at specific times of the day. With dynamic ToU, the price changes based on the availability of energy in the system. This research focuses on dynamic ToU tariffs.

ToU tariffs are of most benefit in homes where there is some sort of storage capability. These tariffs, combined with storage technology, have the potential to provide significant benefits that support the net zero carbon transition and help mitigate against fuel poverty.

Delta-EE have estimated that ToU tariffs would have some of the highest barriers and affect the largest number of consumers compared to other future energy supply models⁵ (Figure 1). Within the challenging context of Scotland's energy transition and fuel poverty targets, understanding whether vulnerable consumers are benefitting from new technologies and receiving the support they require, is going to be vital to ensure a just and fair transition for all.

² Scottish Government (2019) [*Climate Change \(Emissions Reduction Targets\) \(Scotland\) Act 2019*](#)

³ Sovacool et al. (2019) [*Decarbonization and its discontents: a critical energy justice perspective on four low-carbon transitions*](#)

⁴ CCC (2019) [*Accelerated Electrification and the GB Electricity System: Technical Report*](#)

⁵ Delta-EE (2019) [*How accessible are future energy supply business models? A report for Citizens Advice*](#)

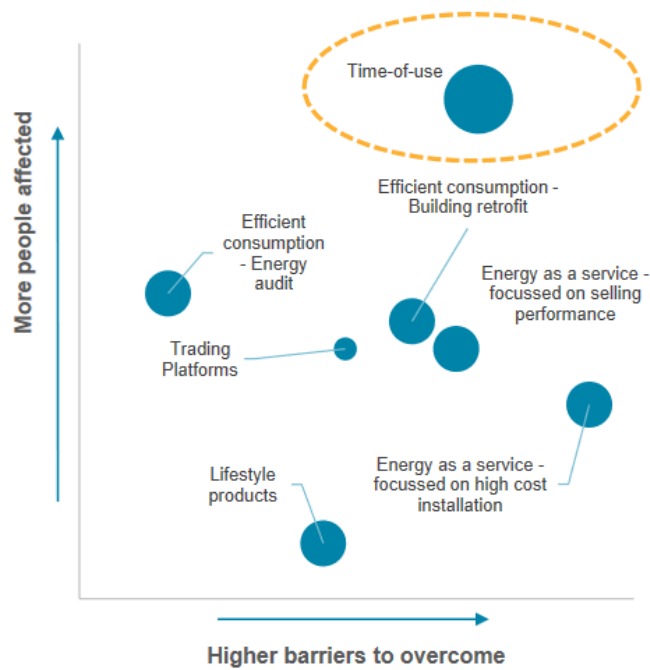


Figure 1: Indicative graph to show how the new energy supply business models compare against each other on level of barrier they pose and number of consumers affected. The size of the bubble represents Delta-EE's prediction of the future importance of that business model Source: Delta-EE

ToU tariffs and vulnerable consumers

ToU tariffs could enable those most vulnerable to fuel poverty to benefit from decarbonisation. However, scoping of existing literature shows that there is very limited research that assesses the impact that ToU tariffs have specifically on vulnerable consumers. The evidence that does exist is mixed.

Some research shows that low-income households can save money on ToU tariffs because their energy usage patterns tend to be during off-peak times (e.g. households at home during the day). However, it has also been shown that vulnerable consumers may struggle to benefit from ToU tariffs⁶⁷. There is a risk that those with higher and less flexible energy needs, such as the elderly or those with disabilities, may face bill increases. Overall, it is unclear how ToU tariffs will impact vulnerable households, and any impacts are likely to differ by vulnerability group.

⁶ Citizens Advice (2017) [The value of ToU in Great Britain: Insights for Decision-makers](#)

⁷ White & Sintov (2020) [Health and financial impacts of demand-side response measures differ across sociodemographic groups](#)

Project aims

The aims of this research project were to:

1. Capture current awareness of and attitudes towards ToU tariffs amongst vulnerable households.
2. Understand the challenges facing vulnerable householders and identify possible solutions to overcome these.
3. Develop a series of recommendations on how stakeholders can best support vulnerable consumers on ToU tariffs and disseminate these.

2. Methodology

The research methodology comprised a literature review, a householder survey, a social housing landlord survey, householder interviews and a focus group.

2.1 Literature Review

Various aspects of ToU tariffs have been the topic of a small number of recent research studies. A literature review was conducted to identify any gaps in previous research, avoid repetition and draw upon existing knowledge to inform our research and recommendations.

The literature review also fed into the development of the surveys and topic guides in the following tasks. The search was carried out using academic (Web of Science, Google Scholar and Scopus) and non-academic (Google) search engines.

2.2 Surveys

Householder Survey

An incentivised online householder survey was prepared based on the research aims and findings from the literature review and distributed using Survey Monkey. The survey was open from August to October 2021 and shared:

- Directly via email to over 30 external organisations that work with vulnerable people
- On Changeworks' media accounts (website, Twitter, Facebook, and LinkedIn)
- With Changeworks' Affordable Warmth Team to distribute to their clients
- With the Scottish Federation of Housing Associations (SFHA) to pass on to housing associations to share with their tenants.

Seventy-six responses were collected, and respondents were categorised into two groups – vulnerable and non-vulnerable. For the purposes of this research, respondents were considered 'vulnerable' if they:

- Had a physical or mental health condition that affected their ability or capacity to carry out day to day tasks
- Rented from a local authority or registered social landlord
- Were in receipt of any form of benefits

Twenty-seven respondents met one or more of these criteria (36% of total respondents) and were therefore determined to be vulnerable consumers. Responses were then analysed by comparing the responses of vulnerable and non-vulnerable consumers. Within the survey, respondents were given five opportunities to provide open comments, for which 61 comments were left. These were thematically analysed, and each comment was coded based on the topics discussed. Three main themes and a series of sub-themes were identified as outlined in figure 2.

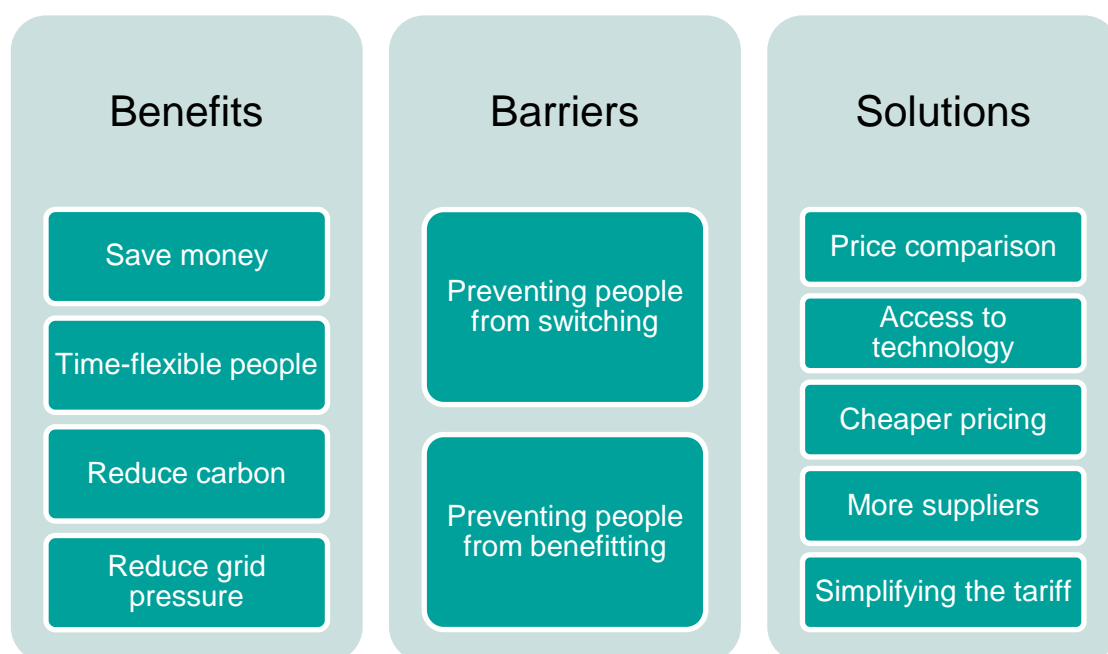


Figure 2: Overview of main themes identified in the householder survey

RSL Survey

An online survey was also conducted with registered social landlords to gain insight into their understanding and awareness of ToU tariffs, their plans to promote switching to ToU tariffs and their capacity to support their tenants in understanding and accessing these tariffs. The survey was prepared and distributed online using Survey Monkey and was open from 13th – 30th October. It was circulated by SFHA and featured in their newsletter twice. Five social landlords responded; the results were analysed in aggregate.

2.3 Focus group and telephone interviews

Findings and trends stemming from the literature review and surveys were used for the development of the focus group and interviews topic guides. These are included in full in Appendices B, C and D.

The focus group was held online via teleconferencing on 25th October with six participants. Three interviews were subsequently conducted with participants that were not able to make the focus group. Notes and transcripts for these were thematically analysed. Figure 3 shows the main themes that came up through this stage of the research.

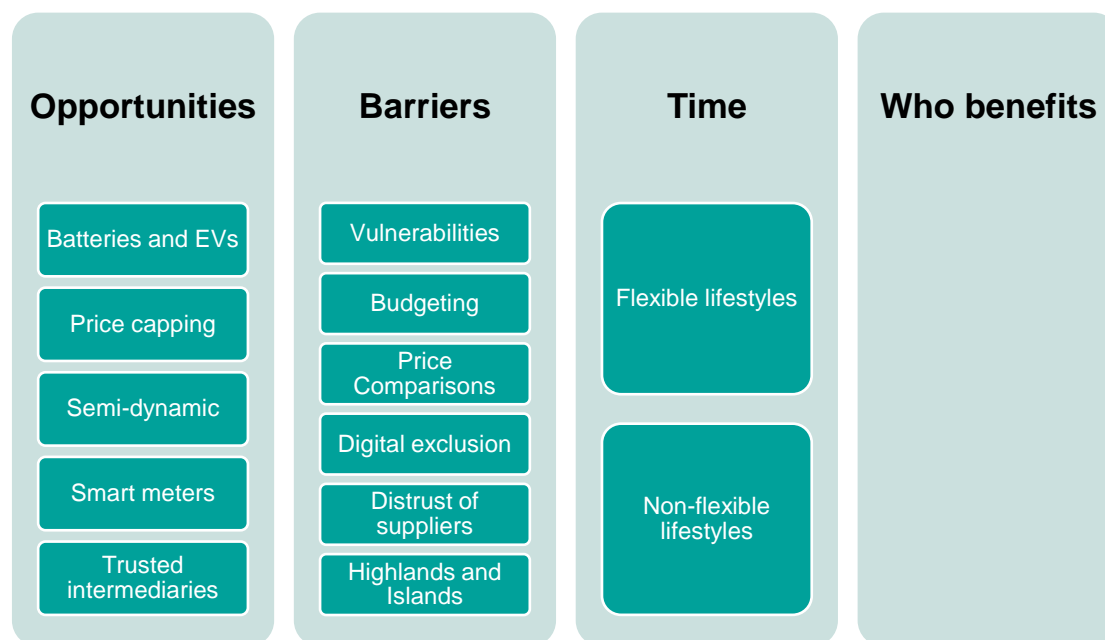


Figure 3: Main themes that were identified during the analysis of the focus group and interview transcripts

2.4 Internal knowledge-sharing session

The findings of this research were shared internally within Changeworks through a knowledge-sharing session held remotely via teleconferencing. A total of 31 attendees joined the session which included frontline energy advisors, Local Energy Scotland staff, Home Energy Scotland advisors, as well as staff from other non-consumer facing teams. This session was particularly important as it ensured that the research findings and recommendations were relevant to the experiences of staff who work with vulnerable consumers day-to-day.

3 Summary of past research

As mentioned earlier, past research on dynamic ToU tariffs and vulnerable consumers is sparse. The research that is present most often regards static ToU tariffs. Even so, a review of current research is summarised below and grouped into the main areas that research has focussed on to date:

- Vulnerable consumers' willingness to switch
- The distributional effects of dynamic ToU tariffs
- The main barriers identified that hinder consumer engagement

A full review of past research is available in appendix A.

Vulnerable consumers' willingness to switch

Looking more specifically at research that focuses on ToU tariffs and vulnerable consumers, conflicting results have been found about their willingness to switch.

One 2015 study⁸ that used a nationwide survey to measure hypothetical consumer demand for a range of ToU tariffs found that neither socio-demographic characteristics nor income were consistently associated with being more or less willing to switch to ToU tariffs. On the other hand, more recent research by Ofgem⁹ has found an association between likeliness to switch and socio-demographic groups.

The distributional effects of ToUs

With regards to specific lower-income groups and vulnerable consumers, there is a lack of studies investigating the relationship between ToU and distributional effects (assessing the impacts that the introduction of ToU tariffs could have on society)^{10,11}.

Most research that assesses the impacts of these tariffs on householders' behaviour and savings have mainly been projected using data models that incorporate consumption smart meter data with socio-demographic data. However, UK smart metering data alone is not sufficient to understand distributional effects of ToU tariffs¹².

For example, research by VaasaETT found that social factors such as age, income, education, household size, load profile and environmental factors such as house type, house size, house age **did not** have an impact on results. Other UK/Irish trials show somewhat mixed results^{13,14}.

Ofgem¹⁵ also assessed the impact of ToU tariffs on customers, differentiated according to sociodemographic group and found a broad distribution of impact within every group, including those with a higher proportion of vulnerable customers.

⁸ Fell, Michael & Nicolson, Moira & Huebner, Gesche & Shipworth, David. (2015) [Is it time? Consumers and time of use tariffs](#)

⁹ Ofgem (2017) [Distributional impact of time of use tariffs](#) (prepared by Cambridge Economic Policy Associates)

¹⁰ Torriti & Yunusov (2020) [It's only a matter of time: Flexibility, activities and time of use tariffs in the UK](#)

¹¹ Hledik & Faruqui (2015) [Valuing demand response: international best practices case studies and applications](#)

¹² Yunusov & Torriti (2021) [Distributional effects of time of use tariffs based on electricity demand and time use](#)

¹³ Bulkeley et al. (2015) *Domestic smart meter customers on time of use tariffs*

¹⁴ Schofield et al. (2014) *Residential consumer responsiveness to time-varying pricing- Low Carbon London Learning Lab*

¹⁵ Ofgem (2017) [Distributional impact of time of use tariffs](#) (prepared by Cambridge Economic Policy Associates)

The research suggested that the following characteristics are associated with (slightly) lower and higher savings:

Table 1: Overview of groups/ characteristics associated with lower and higher savings

Lower savings	Higher Savings
Working from home	Consumers on income support
Students	Unemployed
Rented sector	Individuals looking after home/family
Large households	Families with children
Retired households	Part-time employees
Full-time employees	

Barriers to engagement

Delta-EE¹⁶ identified the following barriers to engagement (ordered from the hardest to easiest to overcome):

- Ability to change behaviour due to inflexible lifestyle
- Requirement to change behaviour (but there being more than one energy consumer in the house)
- Upfront costs of smart/storage technology
- Lack of interest or motivation to engage
- Lack of trust in companies
- Understanding of business model concept
- Perceived loss of control

¹⁶ Delta-EE (2019) [How accessible are future energy supply business models? A report for Citizens Advice](#)

4 Primary Research Findings

4.1 Focus group and interviews

As mentioned above, interviews and focus group transcripts were thematically analysed. The prevalence that each of these themes had during the conversations is shown in Figure 4. Participants spent the most time discussing the various barriers they expected to face on a dynamic ToU tariff. Below, the main themes are discussed.

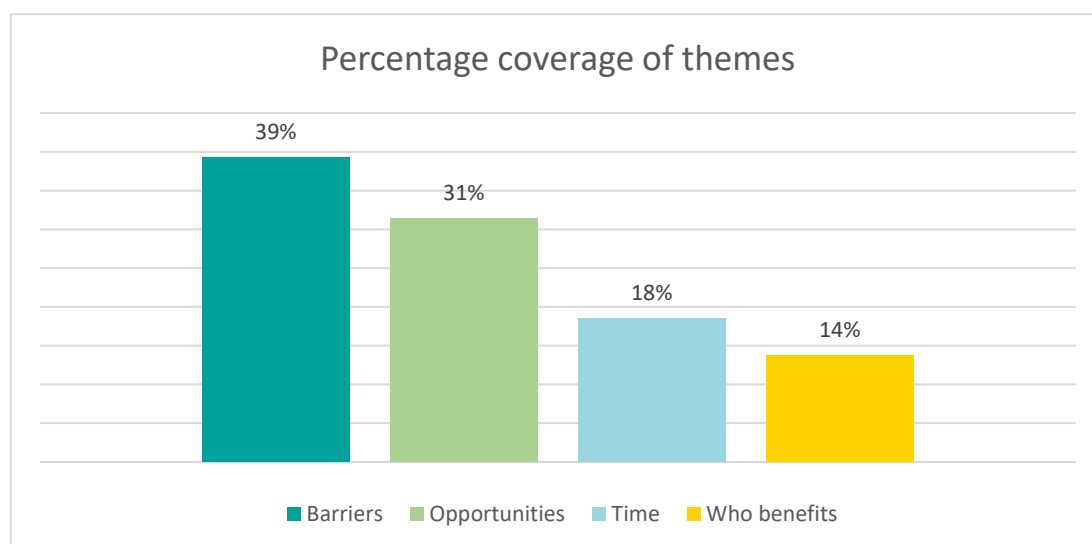


Figure 4: Percentage coverage that each theme had in the analysis of the focus group and interview transcripts

Barriers

Participants spent the most time talking about various barriers they would likely expect on a dynamic ToU tariff. Within this theme, various sub-themes were analysed. Figure 5 shows the prevalence that each of the 'Barriers' sub-themes had during the conversations. Each sub-theme will be briefly discussed in order of prevalence.

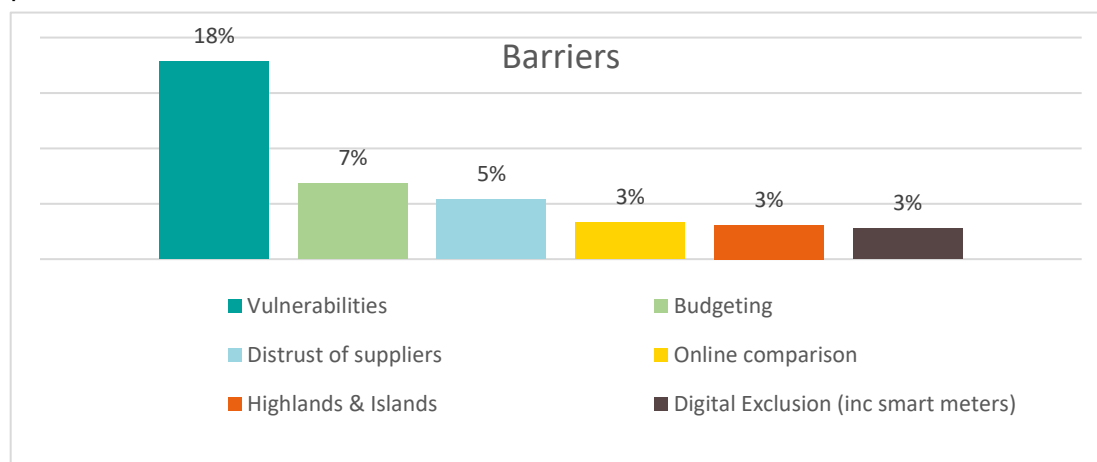


Figure 5: Prevalence of different barriers discussed during the interviews and focus group discussion

Participants felt that dynamic ToU tariffs would not be suited to those experiencing vulnerabilities since the tariff requires a high degree of engagement (e.g. checking the tariffs for the next day) and behaviour change (e.g. changing one's energy usage based on the high/low rates). One participant talked about the impact that such a tariff could have on them, who struggles with their mental health:

“With a mental health condition, I like things set in plan – for prices to change without me knowing [or checking], I would find it hard to cope with that”

Another participant questioned whether those with lower incomes and disabilities would be able to benefit from the tariff:

“How would the less well-off get on with this? A lot of it would be in social housing. [...] They don't have any say in what type of heating they have, what technology, that would be an issue for them? What about the people who are disabled? How do they get to know?”

Other vulnerabilities that were discussed during this research included:

- Elderly
- Living in social housing
- Low/no income
- Mental health conditions
- Young adults
- Special needs and learning difficulties
- Disabilities
- Rented accommodation
- Digitally excluded

Participants felt that dynamic ToU would prove especially difficult to those with tight budgets, since it would be likely that monthly expenditure on energy bills would fluctuate depending on one's ability to take advantage (or not) of the cheaper times.

“Prices changing could be a challenge – I might not know what I'm going to be spending- I like to keep an eye on my electricity [...] I would not feel confident with prices changing each day”

As is well documented in energy research, a major barrier that energy suppliers are facing is the distrust that consumers experience:

“There's a concern. Why are they doing this? What's in it for them? Is it actually going to end up costing me more?”

Participants also felt that they would be less attracted to a dynamic ToU tariff because it is not possible to compare these dynamic tariffs between suppliers:

“Biggest barrier would be the ability to compare suppliers, [...] I'm very comfortable with technology but unless I can see how each supplier compares, it is going to be very difficult to make an informed choice”

Lastly, a few of the participants living in the Scottish Islands, voiced specific concerns. They already experience many barriers to the energy market: higher energy prices, areas of low/no mobile signal/internet connection, delays in the smart meter rollout (essential for ToU tariffs) and lower choice of energy suppliers. All these factors make communities living in these areas less likely to be able to benefit from dynamic ToU tariffs.

Opportunities

Within the research, we explored what aspects or ideas could make dynamic ToU tariffs more attractive and appropriate. Figure 6 shows how prevalent the 'Opportunities' sub-themes were during these conversations.

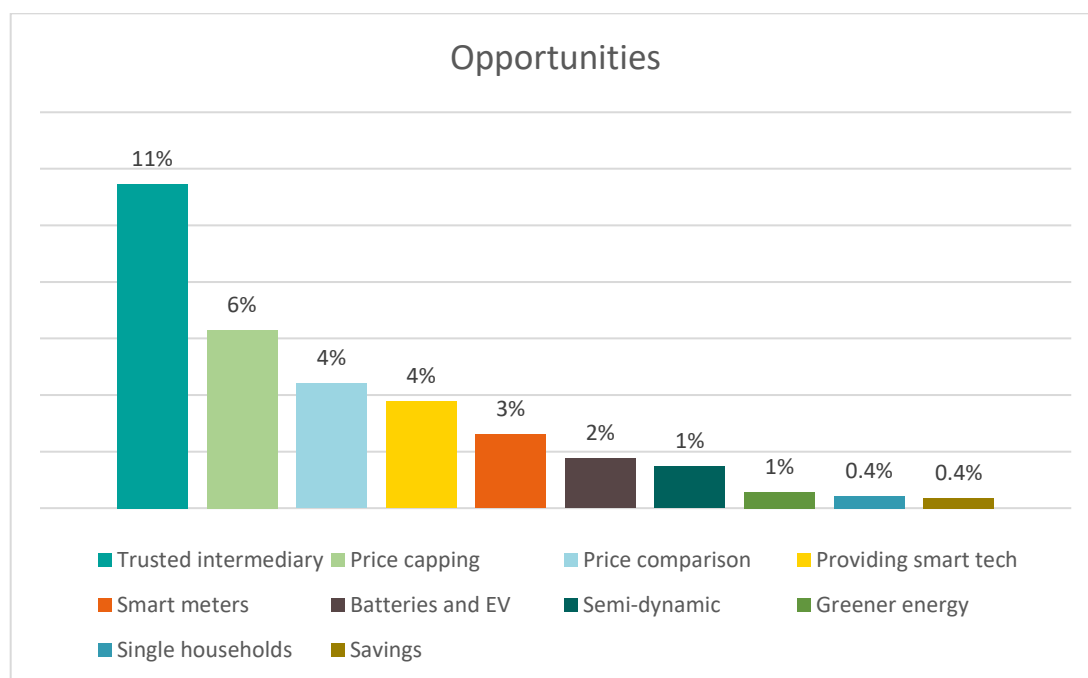


Figure 6: Prevalence of different opportunities discussed during the interviews and focus group discussion

The aspect that participants felt would be of most benefit to the roll-out of dynamic ToU tariffs was the use of a trusted intermediary. As mentioned above, participants did not feel that energy companies could be trusted. Instead, they felt that a charity or governmental agency could help drive forwards the adoption of these tariffs:

“I would trust it more if the information was not necessarily coming from the energy company [...] you feel their vested interest is going to cost you money and maybe there needs to be a more centralised campaign if this is to be the way forward [...] that must not be driven by the energy companies. There is hesitancy in smart meters because there is a concern, what is in it for them?”

Another idea that participants agreed on was a price cap guarantee. This could protect those that are unable to change their energy behaviours or purchase smart technology and bring financial savings to those who can:

“I wonder if we could have a price guarantee: moving won’t be any more expensive than having a fixed rate, but if you use it [dynamic ToU] correctly you could save money. So, you are incentivising people to look into it rather than penalising them”

As seen in the literature, ToU tariffs work best when combined with smart technology, electric vehicles and/or batteries. Participants felt that for these tariffs to become more attractive, funding for batteries and smart technology would need to be provided. One interviewee would only consider the tariff if they had a battery:

“For dynamic ToU you have to monitor to get the best of it. You want to set things up, so appliances come on when cheap. It needs to be on a battery before it would work for me [...] Batteries take changing habits out of the equation. Has to be simple to use – batteries make it simple.”

“In order to make proper use you have to have battery storage or EV that can take the benefits. It could be a false economy if you haven’t got the ability to use the benefits from that tariff”

Very few participants talked about the financial savings that could result from this type of tariff. One of the focus group participants had been on a dynamic ToU tariff in the past but had not been able to assess whether they had made any substantial savings.

Time

Participants and interviewees discussed the role that time plays in their lives and the opportunities of their households to be more or less energy flexible. The participants felt that the elderly would be the most likely consumer group to be “energy-flexible”. On the other hand, concerns were raised around families, full-time workers, and more generally those who value their set routines, i.e. “*routiners*”.

The only lifestyle that our participants mentioned for suiting the tariff was the elderly:

“Being of older generation I can change my behaviour and pick a time”

A focus group participant who had been on a dynamic ToU tariff had found it difficult to not use energy at dinner times with their family. Another participant felt that they would not be able to challenge their children’s behaviour at peak energy times:

“I couldn’t tell the kids they are not allowed to watch tv because the tariff is too expensive”

And another participant simply would not want to have to think about energy matters:

“I don’t want to spend all day thinking about when the electricity is or isn’t going to be expensive. I don’t want to think about when my washing machine will go on the next day. I get into a routine, so I don’t have to clutter my mind.”

Who benefits?

Lastly, although this has been mentioned throughout the themes above, participants and interviewees perceived the dynamic ToU tariff to be unjust in two ways.

On the one hand, the financial savings of the tariff were seen by some of the participants as being possible only to those who can afford to invest in storage (battery/EV) and smart appliances, meaning that a wealthier household, with enough financial resources would be able to benefit from cheaper electricity prices:

“It’s for a certain type of clientele that can understand this and has the time to act on it”

Alongside this, participants felt that, if this tariff has been designed to help balance the grid, then the suppliers are the main beneficiaries of this tariff, not the consumers:

“I’m of the opinion that the benefits are more to the benefit of supplier than consumer I don’t think there is great demand from consumer for this type of supply at present”

4.2 Household survey

A householder survey was completed by 76 respondents, over a third of whom (36%, 27 respondents) were determined to be vulnerable consumers. Responses of vulnerable and non-vulnerable consumers were compared to draw insights into specific opportunities or barriers for vulnerable consumers, whilst also providing greater context on opinions and attitudes towards the tariff more generally.

Awareness of dynamic ToU tariffs

To gather baseline awareness, respondents were asked if they had heard of a dynamic ToU tariff. Regardless of whether the respondent was vulnerable or not, awareness was low, with most respondents having never heard of this type of tariff (figure 7). Respondents were also asked whether they knew how the tariff worked, and as shown in figures 7 and 8, vulnerable consumers were less likely to say they had heard of the tariff compared to non-vulnerable consumers (7% vs 27%), or to say they knew how it worked (4% vs 20%).

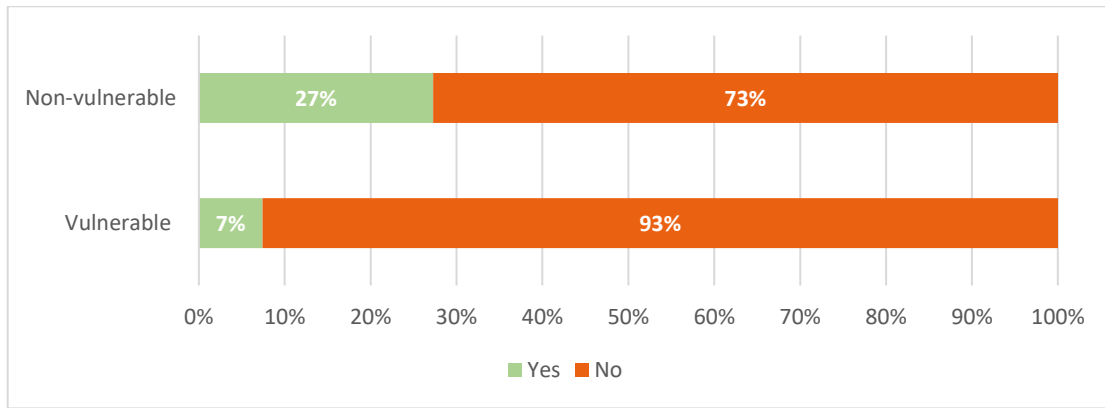


Figure 7: Before this survey, had you heard of a dynamic time-of-use tariff? (N=44 non-vulnerable, 27 vulnerable)

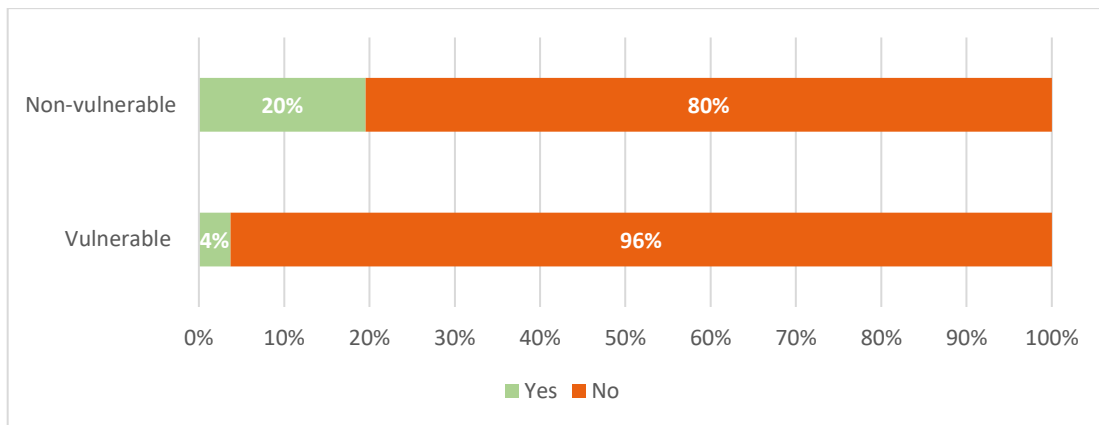


Figure 8: Do you know how a dynamic time-of-use tariff works? (N = 46, 27)

To gauge more general levels of awareness on electricity tariffs, respondents were also asked what type of tariff they are currently on, 91% of the total respondents were directly responsible for managing their energy bills. As shown in figure 9, approximately a third of both groups were unaware of their current electricity tariff (30% non-vulnerable, 38% vulnerable).

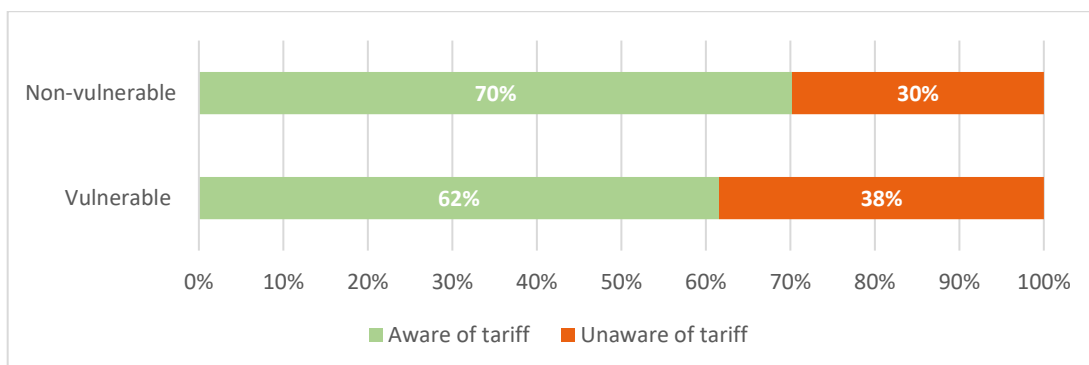


Figure 9: Awareness of current electricity tariff (N=47,26)

Attitudes towards dynamic ToU tariffs

To gather initial attitudes towards dynamic ToU tariffs, respondents were provided with a brief description of the tariff, and then asked how likely they would be to *Supporting Vulnerable Consumers to Access Dynamic Time of Use Tariffs*

switch. Over half (54%) of the vulnerable consumers stated they would be very likely or likely to switch, slightly more (+7%) than the non-vulnerable consumers (Figure 10). Interestingly however, the vulnerable consumers that were not likely to switch, felt more strongly about this than non-vulnerable consumers, with 17% saying they would be ‘not at all likely’ to switch, compared to only 3% of non-vulnerable consumers.

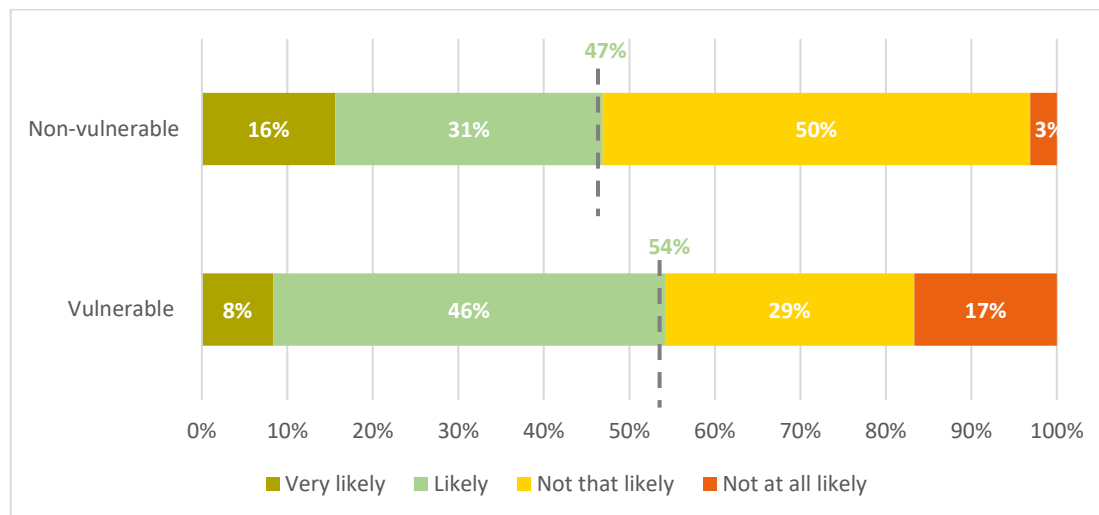


Figure 10: Imagined likelihood of switching to a dynamic time-of-use tariff (N= 32, 24)

Those likely to switch

Reasons vulnerable consumers said they would be likely to switch primarily related to the possibility of saving money. For non-vulnerable consumers, the main positive drivers related to being time-flexible and the possibility of saving money.

“Useful to reduce costs.” – Vulnerable Consumer

“Anything to save money.” – Vulnerable Consumer

“If overall it would be cheaper, I’d happily switch.” – Non-vulnerable Consumer

“Working from home the past 18 months and moving forward only going to be in the office two days a week.” – Non-vulnerable Consumer

This was also supported by results from later in the survey, where respondents were asked how they thought they might benefit from the tariff (figure 11). For both groups, the main benefit was saving money, with approximately three quarters of both groups selecting this option. In comparison to the non-vulnerable group, reducing their carbon footprint was less of an incentive to switching for vulnerable consumers (53% vs 36%) however, it was still the second most important benefit for both groups.

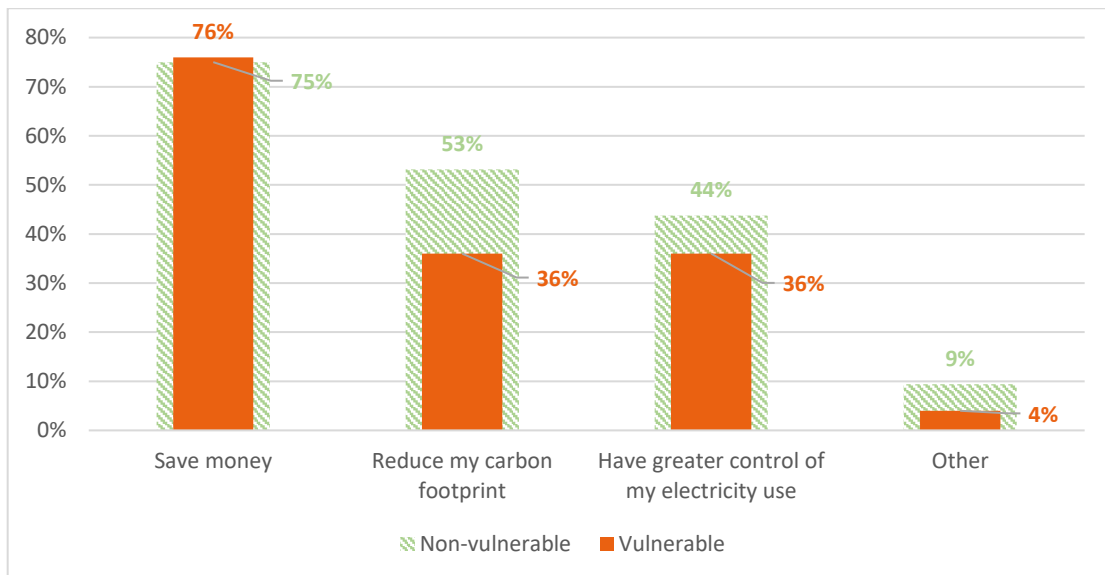


Figure 11: How do you think you might benefit from this tariff? (N= 32, 25 and respondents could select multiple options).

Those unlikely to switch

Reasons for not being likely to switch were more varied. For vulnerable consumers this related to being less time-flexible, the tariff being too complicated, and the lack of certainty over monthly outgoings being of concern. Similarly, there was a wider range of reasons amongst non-vulnerable consumers for being less likely to switch. These included being time inflexible, the tariff being too complicated and requiring too much effort, not being able to benefit from it (i.e. due to not having a smart meter) and bills currently being affordable so there being little incentive to switch.

“Times I use appliances varies hugely day to day.” – Vulnerable Consumer

“I would much prefer the certainty of my energy outgoings rather than the stress of a potential large bill.” – Vulnerable consumer

“If you work away from home, you are more likely to use appliances in the evening. Even allowing for hybrid working, I won't be able to benefit that much from cheaper prices at less popular times as I won't be in the house.” – Non-vulnerable Consumer

“Too complicated. Prefer to be able to use appliances when it suits me.” – Non-vulnerable Consumer

Challenges and barriers for dynamic ToU.

To investigate these barriers further, respondents were asked a series of questions specifically relating to potential barriers or challenges they imagined they might face if they were on a dynamic ToU tariff.

For vulnerable consumers, the main perceived challenge was ‘knowing when the cheapest rates are’, with over half (69%) of the vulnerable respondents selecting this (figure 12). Not having the flexibility to choose when to use appliances, heating etc.

(42%) and knowing how to achieve maximum savings from the tariff (42%) were also perceived as considerable barriers. Non-vulnerable consumers selected not having flexibility (66%) and changing behaviour (56%) as the main perceived barriers to the tariff. The biggest difference in perceived challenges between the non-vulnerable and vulnerable groups was knowing when the cheapest rates are (38% vs 69% respectively).

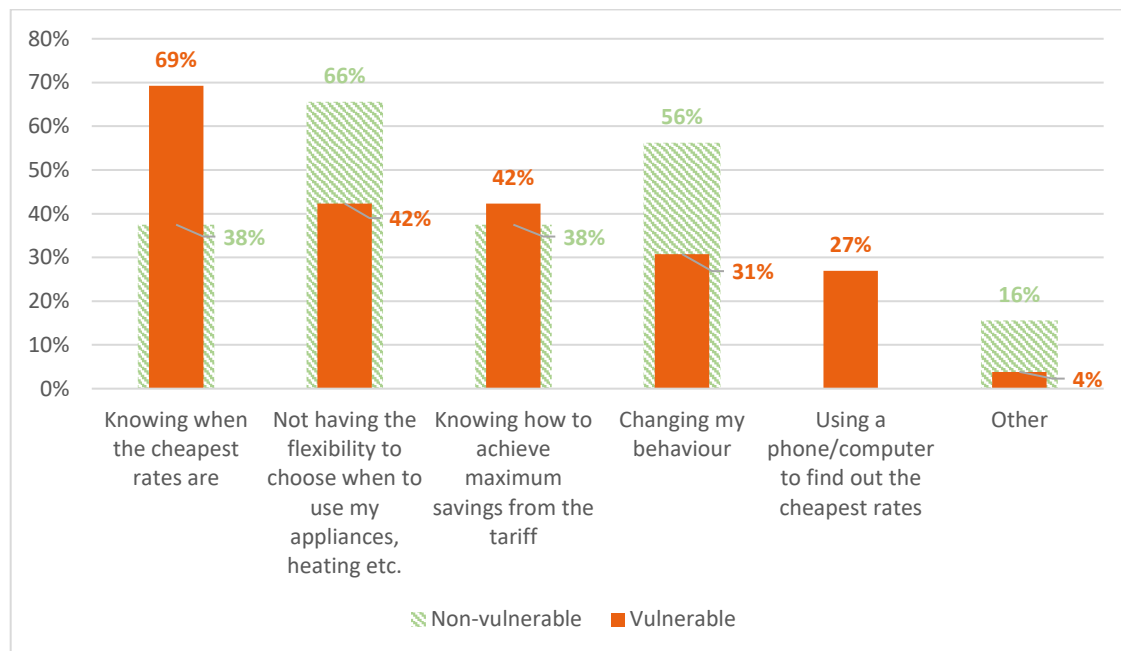


Figure 12: What challenges do you imagine you would experience if you switched to this type of tariff? (N = 32, 26 and respondents could select multiple options)

To investigate challenges related to the behaviour change aspects required by the tariff, respondents were asked about their perceived ability to change when they use their appliances and heating (if electric) and what they imagined the main barriers would be to changing this.

For both groups, the majority of respondents thought they would be very able or able to change when they use their appliances, but not their heating (figures 13 and 14). Non-vulnerable consumers considered themselves slightly more able to change when they use their appliances than vulnerable consumers (75% vs 68% respectively), whereas vulnerable consumers considered themselves more able to change when they use their heating.

Of those who thought they would be ‘not so able’ or ‘not at all able’ to change when they use their appliances/heating, vulnerable consumers were more likely to think they would be ‘not at all able’ than non-vulnerable consumers (12% vs 3% for appliances and 25% vs 19% for heating).

“Single working parent with two under 14 so I feel it wouldn’t be easy to manage. As a single parent everything is on me - bills, chores, managing spending etc simplicity is absolutely key. I’m not sure this would work for me. Though reducing carbon footprint is important.” – Vulnerable Consumer

Interestingly however, even although most respondents in both groups thought they would very able/able to change when they use their appliances, open comments suggested that people are not necessarily *willing* to change their behaviour. Over a quarter (26%) of the 61 open comments related to the fact that the tariff seems restricting and requires a degree of effort and planning. This idea is also supported by the earlier finding that ‘not having the flexibility to choose when to use appliances’ was perceived as the second largest barrier to the tariff for vulnerable consumers and the largest for non-vulnerable consumers.

“I don’t want to feel restricted.” – Vulnerable Consumer

“If the time of lowest cost changes throughout the day, then that will be frustrating, and likely too much effort to bother with, if the tariff difference is only going to save a small amount.” – Non-vulnerable Consumer

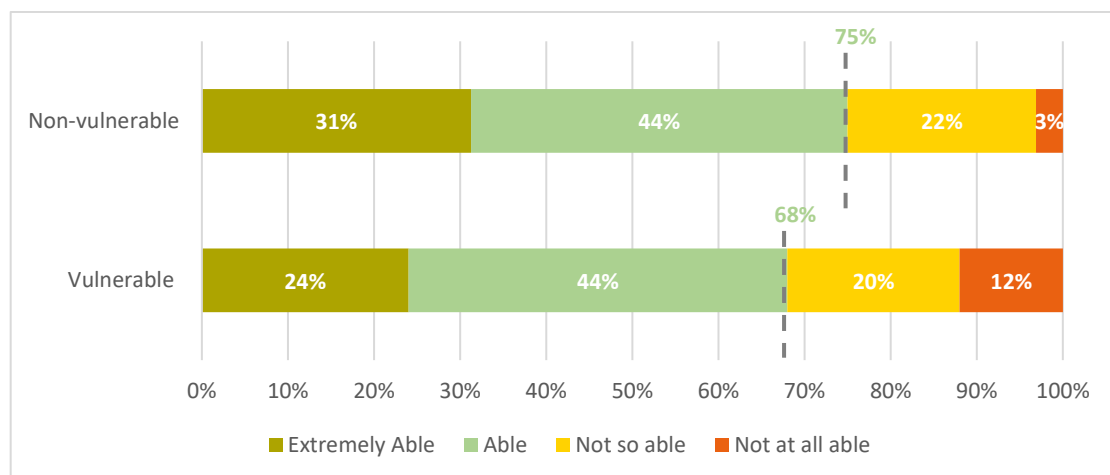


Figure 13: How able or not able are you to change when you use your appliances? (N=32, 25)

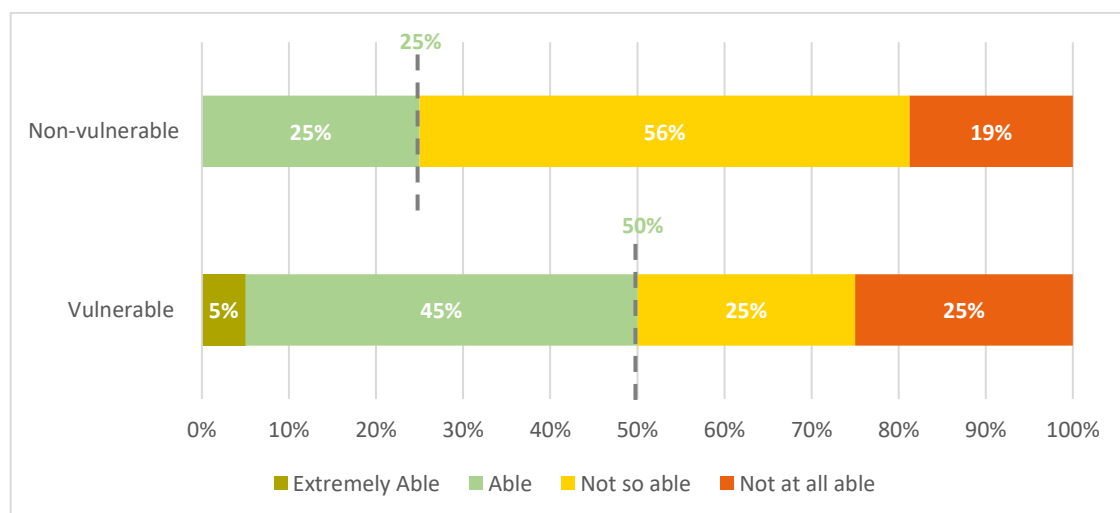


Figure 14: How able or not able are you to change when you use your heating (if electric)? (N =16,20)

When asked about the barriers to changing when appliances and heating are used, the main perceived barrier for more vulnerable consumers was ‘health reasons,’ with

38% of the group choosing this (figure 15). This presented the largest difference between the two groups and was perceived as a barrier by only 3% of the non-vulnerable consumers, for whom the main barrier was identified as being 'out at work' (38%).

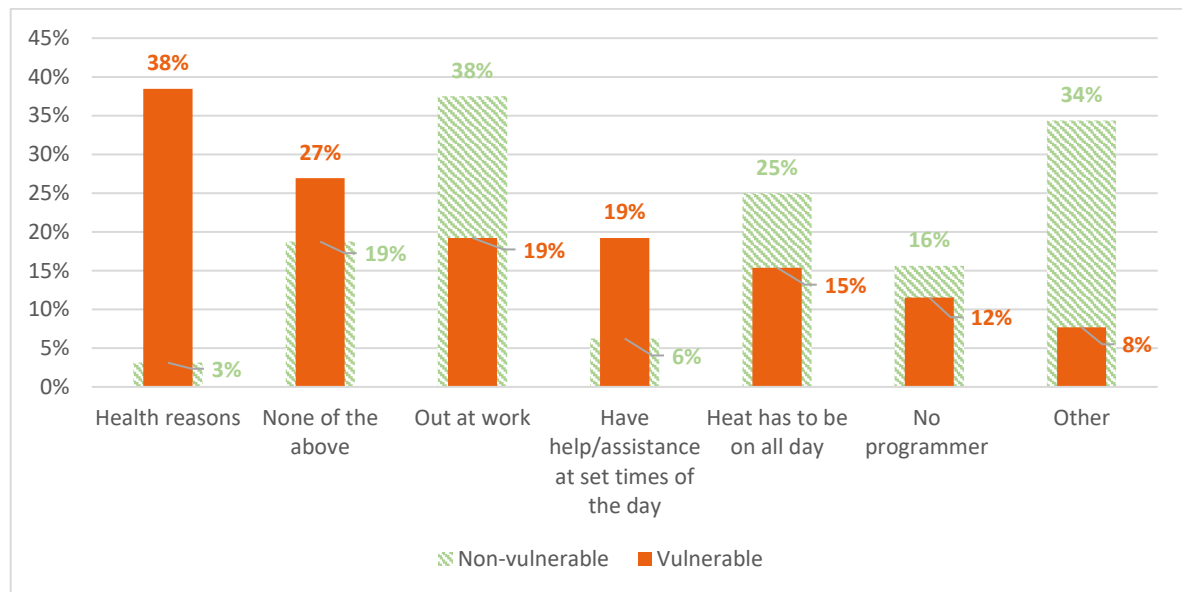


Figure 15: What would you say the main barriers are to changing when you use your appliance, heating, batteries etc? (N= 32,26 and respondents could select multiple options)

A potential barrier for vulnerable consumers in comparison to non-vulnerable consumers was identified when respondents were asked how easy they found the tariff to understand (figure 16). Although over half of the vulnerable consumers (58%) found the information on the tariff extremely easy or easy to understand, this was low in comparison to the non-vulnerable consumers, 94% of whom found the tariff extremely easy or easy to understand. No one from either of the two groups found the information 'not at all easy' to understand, and the biggest difference for a single category was seen in the 'not so easy' category, where 42% of vulnerable consumers found the information not so easy to understand, compared to 6% of non-vulnerable consumers.

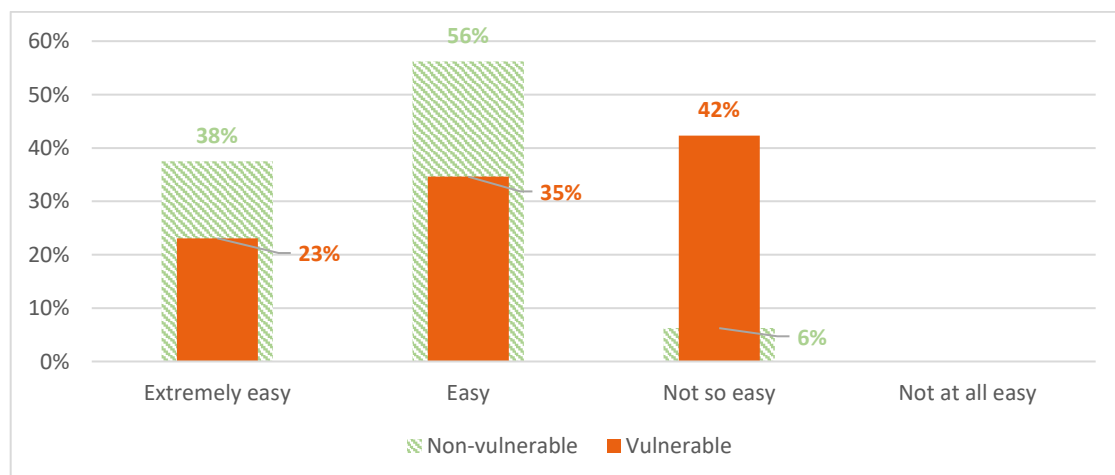


Figure 16: How easy or not easy did you find it to understand this information about the tariff? (N = 32, 26)

Support needed

The survey also looked to investigate what solutions might encourage people to switch to this type of tariff (Figure 17). For vulnerable consumers the most valued answer was having the option to leave at any time with no exit fee (59%) followed by being provided with further information on how the tariff works (44%). This was similar to the responses from non-vulnerable consumers who valued further information the most (56%), followed by the option to leave at any time with no exit fee (47%).

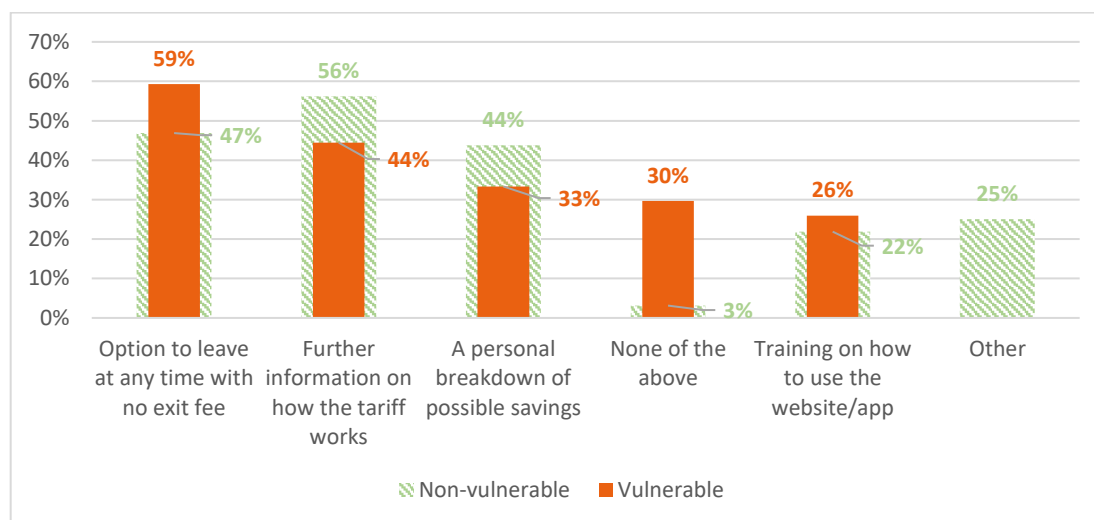


Figure 17: Which of the following would encourage you to switch to a dynamic time-of-use tariff? (N=32,27 and respondents could select multiple options)

Open comments

Barriers

Over the course of the survey, there were five opportunities to provide open comments, 61 comments were left, 15 from vulnerable consumers and the remainder (46) from non-vulnerable consumers, three key themes were identified. The most prevalent theme was 'barriers', with 43 comments relating to this. Two sub themes within this were also identified, barriers that were preventing people from:

- Wanting to switch to the tariff
- Being able to benefit from the tariff.

Barriers preventing people from wanting to switch

Twenty comments related to barriers that would stop people from switching to a dynamic ToU tariff. These comments were primarily related to the tariff seeming restrictive and being more complicated/ requiring more effort than existing tariffs (13 references).

“It just sounds like a lot to manage / something else to do/worry about e.g. checking for prices online for the next day.” – Vulnerable Consumer

“The time taken to check each day would be a challenge as I live a busy life.” - Non-vulnerable Consumer

The remaining comments related to being able to afford existing bills so having little incentive to change (3 references), the price of existing dynamic tariffs being too high (2 references), needing certainty over outgoings (1 reference), and simply not seeing a benefit to the tariff (1 reference).

Barriers preventing people from benefiting from the tariff

Practical barriers were also identified and highlighted personal circumstances in which someone would not be able to benefit from the tariff. The majority of these comments (18 comments) related to being less time-flexible due to:

- Work (7 references)
- Living with other people (5 references)
- Having a fixed schedule (4 references)
- Having no set pattern of use (2 references)
- Health (2 references)

“I do not have a flexible schedule.” – Vulnerable Consumer

“I have bad circulation, so the heating is on 24/7 anyway.” – Vulnerable Consumer

“If home working comes to an end, then effectively things get done when they get done with no real opportunity for flexibility (without battery storage).” – Non-vulnerable Consumer

“There are two very different lifestyles going on in my home which lead to very different usages.” – Non-vulnerable Consumer

In addition to this, respondents questioned their ability to benefit from the tariff due to:

- Not having a smart meter (4 references)
- Not having battery or storage technologies (4 references)
- Not having the correct heating type i.e. THTC (4 references)
- Not having the required connectivity (1 reference)
- Living in a rural location (1 reference)
- Having low electricity use (1 reference)

Benefits

‘Benefits’ and ‘Solutions’ were the second and third themes identified in the open comments sections.

Respondents left twelve comments that related to perceived benefits with this type of tariff. As previously mentioned, the main benefit identified was the possibility of saving money (6 references). The other benefits discussed were the fact that it could be suitable for those who are time flexible (3 references), could contribute to saving carbon (2 references) and could help to reduce grid pressure (1 reference).

“It sounds like an interesting way of saving both money and carbon.”

“Working from home for the past 18 months and moving forward only going to be in the office two days a week means that I can be much more flexible.”

Solutions

Respondents also left eleven comments that mentioned solutions to some of the perceived barriers with the tariff. Three respondents indicated that they would only switch if they knew the tariff was competitive,

“To know what the rates are, if the higher rates are in line with or below what I currently pay then it would be of interest.”

Other solutions included, improving access to technology (3 references), simplifying the tariff (2 comments), making dynamic tariffs cheaper (2 references) and having more suppliers offering the tariff (1 reference).

“A good average tariff level comparable to the lowest standard single rate tariff offers available. Also, the smart meter would need to be fitted at no cost and be of the next generation (the current ones are not as sophisticated as they should be).”

“I might switch if there were a good choice of suppliers offering this.”

“Octopus agile price maxed at 35p. Maybe a lower max price, offset with higher standing charge could help.”

“Having battery storage.”

4.3 Social landlord survey

A social landlord survey was conducted to gain insight into their understanding and awareness of ToU tariffs, their plans to promote switching to ToU tariffs in future schemes where renewable, storage and low carbon technology is being installed, and their capacity to support their tenants in understanding and accessing these tariffs. Five social landlords completed the survey.

Awareness and understanding

Respondents were asked whether they were aware of dynamic ToU tariffs as well as static ToU. Respondents were generally aware of both tariffs (figure 18). One

respondent had never heard of the dynamic tariff and the same respondent left no response to the question on static tariffs.

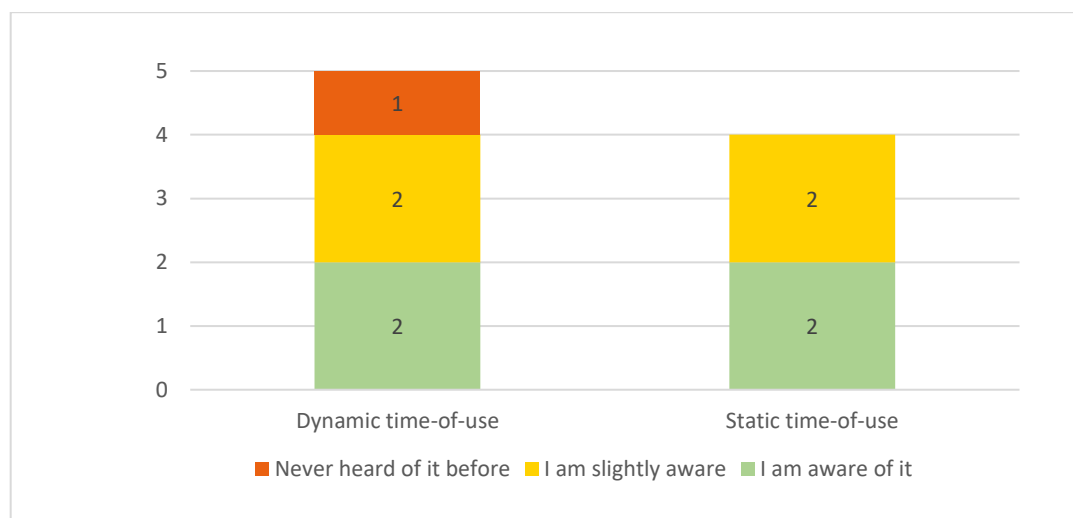


Figure 18: Awareness amongst social landlords on two types of ToU tariff (N=5, 4)

Current and future use of tariffs

None of the respondents had a dynamic tariff in any of their properties, and two respondents had a static tariff in place in some of their properties. One social landlord was using the static tariff in conjunction with air source heat pumps, and the other, with solar panels (no storage capabilities).

None of the social landlords were certain that they would introduce dynamic tariffs in the near future. The majority of respondents (3) weren't sure, one did not respond, and one indicated that they were not planning to use a dynamic tariff in the near future.

Respondents were asked if they thought that dynamic tariffs could have a role to play in future housing schemes where renewable and/or storage technologies are installed. The majority (4) of respondents thought they did, and one respondent did not answer. The reasons that the social landlords thought the tariff has a role to play in this scenario was its ability to save tenants money:

“Because they would provide an opportunity to save on currently eye-watering electricity costs for areas off the gas grid”

“Logical that the energy is stored at the lowest cost tariff for use later”

“Battery storage will enable tenants to make the most of the cheap energy available with a ToU tariff”

Barriers and Opportunities

The social landlords were asked if they thought they would be able to support tenants in understanding and accessing the tariffs. All of those that responded to the question (4) thought that they could ‘just about’ support tenants with the tariff, none thought

they could support tenants ‘very well’ or ‘not very well’, one social landlord did not respond.

In relation to this, social landlords were also asked what difficulties they might experience if they introduced the tariff. Respondents indicated that:

- Time and training would be required to ensure staff were equipped to support tenants with the tariffs (2 respondents)
- The tariff would need to be easy to understand for tenants and that pairing it with batteries and PV would allow this (1 respondent)
- Pilot projects would allow them to test the benefits that could then be used to encourage switching from other tenants (1 respondent)

“For smaller HAs such as ourselves, staff would require a depth of knowledge to support tenants to understand/accept changes to lifestyles/routines as a way of saving on electricity costs. This could be quite intensive and time-consuming.”

“Pilot project required to see benefits and then would have tangible benefits to sell on the tariff to others.”

Social landlords were also asked about any barriers they foresee for tenants if switching to a dynamic tariff. Responses indicated that change can be unsettling for tenants as well as new technologies (if used in conjunction with the tariff) and that the tariff might be too complicated for some tenants – it requires people to change their behaviour, people might misunderstand when to use their appliances to get the cheapest energy, and it makes energy costs unpredictable. It was also mentioned that tenants may also have concerns about the longer-term availability of the tariff, with many smaller energy suppliers going bust over recent months.

Lastly, some suggestions for activities that could support tenants were also given:

- Community launch
- A way for tenants to see their savings
- Real life case-studies from other housing associations
- Local events, webinars, podcasts from a third party
- Providing access to the dynamic tariff for housing associations so as they can better support tenants with how and when to benefit from the cheapest prices
-

4.4 Summary of the main barriers facing vulnerable households

Our research has shown that consumers could face multiple barriers with dynamic ToU tariffs. Generally, non-vulnerable consumers viewed a loss of flexibility as a main challenge with the tariff. However, poor health and a need for greater knowledge and understanding were seen as barriers by vulnerable consumers. The following challenges have been identified as the main barriers that consumers think they would face with dynamic ToU tariffs.

Complexity: Participants and social landlords discussed that the tariff may not be suited to those experiencing vulnerabilities due to the complex nature of the tariff and this was reflected by the survey results from both vulnerable and non-vulnerable groups. Additionally, vulnerable consumers were more likely to find the tariff 'not so easy' to understand, compared to non-vulnerable consumers.

Knowledge and understanding: Linked to the above, vulnerable consumers were more likely to be concerned about their knowledge and understanding than non-vulnerable consumers. Knowing when the cheapest rates occur and how to achieve maximum savings were two major barriers identified for the group. Social landlords acknowledged that they could 'just about' support tenants with the tariff, but that time and training would be required to ensure this support was sufficient.

Budgeting and price comparison: Participants across the research felt that dynamic ToU would prove especially difficult to those with low incomes, since it would be likely that monthly expenditure on energy bills would fluctuate depending on one's ability to take advantage (or not) of the cheaper times. Participants also felt that they would be less attracted to a dynamic ToU tariff because it is not possible to compare the prices of these tariffs between suppliers online.

Behaviour Change: The non-vulnerable group felt less willing to change their energy behaviour to suit the tariff and perceived behaviour change as a greater barrier than vulnerable consumers did. However, vulnerable respondents felt more limited in their ability to change behaviour i.e. because of health reasons (Figure 2).

Distrust: As is well documented in energy research, a major barrier for consumers is the distrust that they experience towards energy suppliers. Participants were very vocal around this theme and there was a greater lack of trust amongst vulnerable consumers than non-vulnerable consumers.

Time-flexibility: Many participants discussed the role that time plays in their lives and the personal circumstances that lead to households to be more or less time flexible. Most of the practical barriers identified in the research related to being less time-flexible due to factors out with households' control i.e. work patterns, health issues, family members.

Highlands & Islands communities: A few of the participants living in the Scottish Islands, voiced concerns. They already experience many barriers to the energy market: higher energy prices, areas of low/no mobile signal/internet connection, delays in the smart meter rollout (essential for ToU tariffs) and lower choice of energy suppliers. All these factors make communities living in these areas less likely to be able to benefit from dynamic ToU tariffs.

5 Recommendations

To overcome some of the challenges (awareness, attitudes, barriers) identified throughout the research, solutions were co-created with the research participants to explore what aspects or ideas could make dynamic ToU more attractive and appropriate to them. The following recommendations have been shaped by these conversations and can be implemented to minimise negative outcomes for vulnerable consumers as the dynamic ToU market grows.

Increasing awareness

Dynamic ToU pilot schemes: more pilot schemes need to be conducted (with and without storage technologies) to evidence whether savings and grid balancing can be made by switching to a dynamic ToU tariff. These should include vulnerable consumers and be funded by the energy suppliers with no additional costs to the households for the duration of the pilot. These pilots should also consider the rural and island communities in Scotland. A trusted intermediary would be best placed to hold responsibility for the monitoring and evaluation of the project.

Research: dynamic ToU tariffs are well established in some European countries, further research could be conducted into best practices and learnings from those most relevant to the Scottish context.

Tariff awareness: trusted intermediaries should be used to increase awareness of tariffs and tariff switching.

Housing Associations: housing providers should receive guidance and information on dynamic ToU tariffs and if introduced they should be able to access live dynamic pricing so they can better support their tenants.

Changing attitudes

Technology: for dynamic ToU tariffs to become more attractive, funding for storage and renewable technologies should be made available.

Incentivisation: Households could be incentivised (financially or otherwise) for using ToU tariffs which support grid balancing. This is a model which is currently in place for large commercial energy users who are paid to minimise energy usage at peak demand.

Overcoming barriers

Price cap guarantee: households should have the option to leave the tariff at any time with no exit fee. Additional support for vulnerable households should also be provided through a price guarantee that ensures costs will be no more than their existing tariff. With the current level of energy prices, this will be crucial for the adoption of Time-of Use Tariffs, and protecting consumers, especially those with vulnerabilities.

Tariff comparison: dynamic ToU tariffs should be included on comparison sites so consumers can make informed decisions on whether to switch. The use of smart meter data to assess whether dynamic ToU tariffs are a viable option for consumers should also be considered.

Other

Fabric first: before considering the types of tariffs available to consumers, fabric upgrades across the housing stock should be prioritised, with particular focus on fuel poor and vulnerable households.

Time of use for non-vulnerable households: our research and experience shows that vulnerable households already struggle with the static time of use tariffs. There is merit in offering dynamic time-of-use to households on a voluntary basis which will attract those that have the financial capital to invest in smart/storage technology and/or those that are highly motivated ‘deep-greens.’

6 Conclusion

The research made clear that awareness around tariffs in general is low, and particularly around dynamic ToU. The tariff was also found to be complex, especially for more vulnerable consumers, and it was suggested that either the tariff would need to be simplified or more education would be needed to help consumers better understand it.

Attitudes towards the tariff were mixed and largely depended on personal circumstances and consumers ability and/or willingness to change their behaviour. More specifically, vulnerable consumers seemed less able to change their behaviour due to challenges such as ill health and worried about understanding the tariff and the unpredictability of bills. Non-vulnerable consumers were less willing to change their behaviour due to the tariff requiring a perceived loss of flexibility. Crucially however, both vulnerable and non-vulnerable consumers would only be likely to switch to this tariff, if it saved them money.

In the context of a just transition an important question posed by participants and by this research is ‘for who’s benefit was this tariff created?’. Participants felt that suppliers were the main beneficiaries of this tariff, not consumers. This belief, coupled with the literature findings that savings from dynamic ToU are minimal without storage technologies indicate that consumers are unlikely to switch to or see a benefit from this tariff, unless supplied with storage technologies or guaranteed savings by suppliers for providing grid services. Implementation of the recommendations above may go some way to enabling ToU tariffs to play not just a role in the decarbonisation transition, but in supporting an equitable one too.

7 Appendices

Appendix A: Review of past research

As mentioned earlier, past research on dynamic ToU tariffs and vulnerable consumers has been sparse. The research that is present most often regards static ToU tariffs. Even so, a review of current research is summarised below and grouped into the main areas that research has focussed on to date:

- Vulnerable consumers' willingness to switch
- The distributional effects of dynamic ToU tariffs
- The main barriers identified that hinder consumer engagement

A full review of past research is available in appendix D.

Vulnerable consumers' willingness to switch

Most of the research undertaken to date focusses on the willingness of consumers to switch to ToU tariffs. This is mainly due to the fact that dynamic ToU is still relatively new to the British market and therefore many of the studies are market research based.

Looking more specifically at research that focuses on ToU tariffs and vulnerable consumers, conflicting results have been found about their willingness to switch.

One 2015 study¹⁷ used a nationwide survey to measure hypothetical consumer demand, for a range of ToU tariffs found the following:

- Dynamic time of use tariff was the least popular (compared to static time of use and other models such as direct load control), as it was seen as difficult to use and intrusive.
- Neither age, gender, housing tenure, employment status, education, social grade, nor income were consistently associated with being more or less willing to switch to ToU tariffs. The study therefore found no evidence that disadvantaged or vulnerable customers are less likely to benefit from ToU as a result of being unwilling to switch.
- People who trust their electricity supplier were more likely to say they would switch to a demand-side response tariff, while people who were concerned about their privacy were less likely to.
- Existing legacy ToU tariff customers (i.e. Economy 10, E7), electric vehicle owners and owners of tumble dryers with timers were all more willing to switch than any other consumer group.

¹⁷ Fell, Michael & Nicolson, Moira & Huebner, Gesche & Shipworth, David. (2015) [Is it time? Consumers and time of use tariffs](#)

- Pre-payment meter customers, the majority of whom are thought to belong to some of the most disadvantaged groups in Britain, were slightly more willing to switch to the tariff than credit customers.

On the other hand, more recent research by Ofgem¹⁸ has found an association between likeliness to switch and socio-demographic groups. They found that the distribution of uptake closely follows the distribution of impact:

- Middle income consumers are expected to be the most likely to take up ToU tariffs, as they are set to gain the most from them. Both vulnerable households and wealthy households are less likely to adopt ToU tariffs.
- Vulnerable customers¹⁹ are generally less engaged in energy purchase and more likely to remain with their existing arrangements.
- Vulnerable customers require higher savings to be successfully encouraged to take up ToU tariffs. They are generally more likely to be disengaged from their utility bills thus, many would not make a voluntary choice to take-up ToU tariffs regardless of the savings.
- Many vulnerable customers would be better off on ToU tariffs, but they may need targeted support to make that choice. Others would be worse off, and thus may need protecting from making that choice. However, the report concluded that once being on a ToU tariff requires an explicit choice, many will be protected by not making that choice.

The distributional effects of ToUs

With regards to specific lower-income groups and vulnerable consumers, there is a lack of studies investigating the relationship between ToU and distributional effects^{20,21}.

Again, given the novelty of ToUs in the UK, most research that assesses the impacts of these tariffs on householders' behaviour and savings have mainly been projected using data models that incorporate consumption smart meter data with socio-demographic data. However, UK smart metering data alone is not sufficient to understand distributional effects of ToU tariffs²².

¹⁸ Ofgem (2017) [*Distributional impact of time of use tariffs*](#) (prepared by Cambridge Economic Policy Associates)

¹⁹ Defined as "households which are significantly less able to protect or represent their own interests and/or significantly more likely to experience detriment, or for that detriment to be more substantial"

²⁰ Torriti & Yunusov (2020) [*It's only a matter of time: Flexibility, activities and time of use tariffs in the UK*](#)

²¹ Hledik & Faruqui (2015) [*Valuing demand response: international best practices case studies and applications*](#)

²² Yunusov & Torriti (2021) [*Distributional effects of time of use tariffs based on electricity demand and time use*](#)

For example, research by VaasaETT found that social factors such as age, income, education, household size, load profile and environmental factors such as house type, house size, house age **did not** have an impact on results.

Other UK/Irish trials show somewhat mixed results. The *Customer-Led Network Revolution* trial, which trialled static ToU tariffs, found no significant difference between customer socio-demographic categories either in peak reduction or likelihood of saving/losing money overall²³. Similarly, Low Carbon London found no significant differences in response between socio-demographic groups²⁴.

Ofgem²⁵ commissioned research looking into the distributional impact of dynamic and static ToUs. They assessed the impact of ToU tariffs on customers, differentiated according to sociodemographic group and found a broad distribution of impact within every group, including those with a higher proportion of vulnerable customers. More specifically:

- A slight association between socio-demographic characteristics and the effect on bills under ToU tariffs.
- The average customer, with a £615 annual bill under uniform charging methods, would on average save about £8 (1.3%) under the static ToU tariff and about £7 (1.1%) under the dynamic ToU tariff.
- Smart appliances allow some modest increase in savings. A storage battery adequate to cover all peak consumption would increase potential savings to £96 for the static tariff and £32 for the dynamic tariff.
- While many consumers would experience bill reductions, a minority of vulnerable or fuel poor customers would experience bill increases.

The research suggested that the following characteristics are associated with (slightly) lower savings and higher savings:

Table 2: Overview of characteristics associated with lower and higher savings

Lower savings	Higher Savings
Working from home	Consumers on income support
Students	Unemployed
Rented sector	Individuals looking after home/family
Large households	Families with children
Retired households	Part-time employees
Full-time employees	

²³ Bulkeley et al. (2015) [Domestic smart meter customers on time of use tariffs](#)

²⁴ Schofield et al. (2014) [Residential consumer responsiveness to time-varying pricing](#)

²⁵ Ofgem (2017) [Distributional impact of time of use tariffs](#) (prepared by Cambridge Economic Policy Associates)

Barriers to engagement

Delta-EE²⁶ identified the following barriers (ordered from the hardest to overcome):

- Ability to change behaviour due to inflexible lifestyle
- Requirement to change behaviour in (but there being more than one energy consumer in the house)
- Upfront costs of smart/storage technology
- Lack of interest or motivation to engage
- Lack of trust in companies
- Understanding of business model concept
- Perceived loss of control

²⁶ Delta-EE (2019) [How accessible are future energy supply business models? A report for Citizens Advice](#)



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