

Time Of Use Tariffs for Domestic Electricity and the Impact on Low Income and Vulnerable Households

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Introduction

This short think piece by AgilityEco sets out our views on how the transition to net zero in domestic heating may result in increased short-term pressures on the grid, stimulating widespread deployment of Time Of Use (TOU) pricing for heat, and how this could in turn affect low income and vulnerable households. It has been produced as a contribution to National Grid's work on Future Energy Scenarios (FES), in response to a request by the FES team. We would welcome comment and debate. Please send any views to enquiries@agilityeco.co.uk.

Today, 85% of Britain's homes are heated by mains gas central heating, rising to 90% for all fossil fuel central heating or room heatersⁱ. These sources of heat have little sensitivity to the time of day, and to a lesser extent the time of year, in which they are used as fossil fuels can be easily and cost effectively stored for future use. As we transition away from fossil fuels, the cost of matching supply with demand may change significantly, and it is important to consider the consequences for the heating bills of low income and vulnerable customers.

Electrification versus hydrogen

There is an important overarching issue before we move onto the specifics of TOU tariffs. TOU is generally seen as an important tool to help the UK cope with increasing electrification of our energy supply. Whereas the gas network has been designed to cope with big daily and seasonal swings in demand, the electricity supply system, which needs instantaneous matching of supply and demand, currently relies heavily on the flexibility of fossil fuel powered generation to meet that exacting challenge. As fossil generation plant is retired and replaced by a combination of nuclear and renewables, both with little ability to provide this flexibility, demand side response and time of use are seen as important coping mechanisms. To quote Ofgem's CEO Jonathan Brearley *"The more we can shift our demand, and potentially our supply, to adapt to a more intermittent world of renewables, the more likely it is that we will make this transition in a cost effective way."*ⁱⁱ

Indeed, it is almost unthinkable that customers will not be asked to play their part in a scenario where, in addition to existing power demand, the electricity system is asked to cope with the additional demand of domestic heat (and transport). Unlike electricity, heat demand is highly concentrated in a few winter months. It is also worth noting that whilst the gas system is designed and planned to cope with 1-in-50 winters and 1-in-20 peak days, electricity capacity is based around only an average cold spell^{iii, iv}.

Consequently, greater reliance on electricity will require very significant capital investment which will need to be tempered by clever ways to better balance supply and demand if those costs are to be minimised. We very much agree that increased electrification is coming, particularly as a result of the move to electric vehicles, and that TOU has an important role to play in system balancing as well as giving consumers opportunities to save money. We also recognise that the real value of TOU will

only be seen if there is significant take up of these tariffs; if they are only adopted by a small number of users the resulting impact on the ability to balance the system will be commensurately small.

The point we believe must always be injected into any discussion on electrification is that with heat, the jury is very much still out on whether the answer is electricity, hydrogen or quite possibly some combination of both. This is recognised by commentators including the Government in its Energy White Paper which says *“by the mid-2030s we expect all newly installed heating systems to be low-carbon or to be appliances that we are confident can be converted to a clean fuel supply”* and *“Electric heat pumps and hydrogen, green gas and shared heat networks all have their part to play. So, while we are clear on the eventual outcome, we will be flexible in how we achieve it, always looking for the most cost-effective, consumer-friendly approach and open to innovative solutions”*.^v

While most of the strategic analysis takes this line, some more frontline Government policy developments seem to assume that the future of heat is electrification and deployment of heat pumps. Although we fully understand the desire to start leading the essential drive to reduce the UK’s carbon emissions, the country really must not sleepwalk into a future that just writes off all the investment we have made in our gas system or the huge benefits in flexibility we gain from it. Such a write off of gas infrastructure would also mean accepting the intermittency of zero carbon electricity generation and the current lack of a cost-effective seasonal electricity storage solution, as well as spending the many billions of pounds needed to establish a fully de-carbonised electricity system.

So, our plea is let’s have the debate about the pros and cons of mechanisms such as TOU tariffs in terms of electricity continuing to be an important part of our energy supply which will require careful cost control. Not a debate where we assume the UK will be all electric and where we need every possible weapon in our armoury to try and cope with the downsides that will inevitably result.

Having got that off our chest

Back to the exam question. AgilityEco’s view is that TOU tariffs have both considerable potential advantages but also pose significant risks to low income and vulnerable households if not taken forward in the right way. White and Sintov’s 2019 US study found that *“TOU ... disproportionately increases bills for households with elderly and disabled occupants, and [results in] worse health outcomes for households with disabled and ethnic minority occupants than those for non-vulnerable counterparts”*^{vi}.

We see these risks arising principally because vulnerable customers:

- may not get the assistance they require to be able to afford the smart home automation and battery and heat storage technologies that will provide essential underpinning of TOU tariffs or the help and guidance they may need to make the best use of those technologies;
- are likely to spend more time in their home and have less scope to use electricity off peak. This would particularly be the case for elderly or infirm householders requiring adequate heat at constant levels if that heat were electric. Use of heat is very different to the ability to turn on a washing machine at a different time of the day or remembering to turn off lights. Consideration also needs to be given to the possibility of a further wave of the current Covid-19 virus, or the arrival of a new virus, resulting in more lockdowns and the need for the most vulnerable to shield at home. In addition, it seems likely that we will see permanent changes in work patterns with more people working from home. All of these

issues around how people use their homes in the future must be central to work on design of TOU tariffs;

- live in the least energy efficient homes. 88% of fuel poor households live in the worst D-G rated housing and 31% are in E-G^{vii}, which consequently have the highest heat demand and the least ability to retain heat (compared to 58% and 22% respectively for non fuel poor households). This makes them, therefore, least able to be flexible in the timing of heat use in order to maintain a comfortable living environment. Homes with the highest heat demand and least flexibility in when heat is used to maintain an adequate temperature will clearly be the least able to mitigate the cost of disadvantageous TOU tariffs;
- may be lured into TOU deals through upfront incentives such as cashback but find that longer term they face extra costs not savings;
- may find that if they don't take up time of use tariffs, other wealthier customers are paying less because of their ability to make best use of TOU tariffs and that they are consequently bearing a greater share of the costs of the system.

To counteract these and other risks we believe that the design of TOU tariffs, and the policies and support that sit around them, should factor in the following:

- any major roll out of TOU tariffs should be supported by a Government programme that ensures that those most in need have the necessary automating technologies in their homes as well as battery storage when this is ready to be deployed at scale. Accompanying support and advice on use will be essential as will a broad programme of education and awareness.
- acceleration of the roll out of smart meters in the homes of vulnerable customers should happen before TOU tariffs are introduced as smart meters will be a key enabler in allowing those households to benefit from TOU.
- how the peak period is defined is likely to be critical, e.g. a 1500 to 2100 peak could have quite different outcomes to a 1600 to 2000 peak. The likely outcomes for vulnerable customers should be carefully considered.
- vulnerable customers should have a form of bill protection whereby they do not face excessive costs because they are unable to benefit from TOUs. The Government's Warm Home Discount scheme already provides a well understood form of targeted support for those struggling with high energy bills and could be extended.
- while opt out systems for TOU tariffs will inevitably generate much larger numbers of participants and therefore greater benefits in terms of system balancing, they should only be permitted if there are sufficient protections for vulnerable customers. As with switching suppliers, it is likely to be many of the most vulnerable customers who again fail to actively engage with the energy market.
- other choices around the type of TOU tariff will also be critical. For instance, it seems likely that any form of critical peak pricing, whereby there is very high pricing for a limited number of peak events, could have a much more damaging impact on vulnerable households outside of the tariff than, say, an introverted tariff with lower prices in the middle of the day.
- vulnerable customers should be given clear advice on the pros and cons of TOU tariffs including the likely long-term costs and savings. This advice will best be delivered through independent sources who will be able to help steer customers through what is likely to be a

competitive market. Organisations like ourselves already have experience of doing this with tariff switching in the current market.

- support for home energy efficiency improvements should continue to be provided to low income and vulnerable households. Improving the thermal efficiency of homes is an essential no regrets action whatever the form of heating or billing with significant savings to the customer and reductions in carbon emissions. The Government's commitment to extending the Energy Company Obligation to 2026 should be accompanied by an increase in the budget.

A final thought on how TOU tariffs might work. Our concerns about electrification of heat, including whether the most vulnerable will be able to avoid peak time use, could be seen as an argument for a separate 'heat meter'. That could facilitate two forms of tariff, a flat tariff for heat and a TOU tariff for other consumption. In theory that could provide the sort of protection for low income households that we are anxious to see. In practice it would come with a number of downsides: extra cost and complexity around billing and customer service; finding space for a second meter; and blunting of price signals designed to save energy and carbon or encourage battery storage - important even for those who struggle with energy bills.

Given that a separate heat charge will have to find its own pricing level, having two meters may well be the wrong solution to the problems faced. But we put it forward as an example of the sort of careful examination of choices that is going to be needed if we move to extensive use of TOU tariffs and want the best outcomes for the most vulnerable households.

In summary

- **AgilityEco believes greater electrification is coming and that TOU tariffs could have an important role to play in reducing carbon and consumer bills.**
- **But there are significant risks from TOU for vulnerable groups and preventing those risks from materialising needs to be at the forefront of tariff design. We have pointed out some practical steps that can be taken and there are no doubt others.**
- **TOU tariffs will not be a panacea for the extra costs and reduced flexibility that comes from electric heat over gas. The big issue to resolve is the UK's heat strategy in terms of electric supply, hydrogen or both.**

ⁱ English Housing Survey 2018 Energy Report (<https://www.gov.uk/government/statistics/english-housing-survey-2018-energy-report>)

ⁱⁱ Ofgem's Vision for a Net Zero Future (<https://www.ofgem.gov.uk/publications-and-updates/ofgem-s-vision-net-zero-future>)

ⁱⁱⁱ <https://www.nationalgrid.com/uk/gas-transmission/document/133411/download>

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https://www.nationalgrideso.com/sites/eso/files/documents/15060_NG_SO_Winter_Outlook_2018_AW07_FINAL%202.pdf

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943807/201214_BEIS_EWP_Command_Paper_LR.pdf

^{vi} White and Sintov – Health and Financial Impacts of Demand-Side Response Measures Differ Across Sociodemographic Groups (Nature Energy article, 2019)

https://www.nature.com/articles/s41560-019-0507-y.epdf?sharing_token=czUHcJKhJnprjdneHndgJNRgN0jAjWel9jnR3ZoTv0OoQy7oOer5IYN0zOUh6adnz98zqx0DKUMhAmN5eTWqOCtu5ct1OPf3u6RLf3n5iz1bwhgbZ1UqkmZLik6cF3ee06xXIFO3UDhwEIFIUH2EQAdzA0cEfiN0zf5tRerMFe7voRYcdWBvJj1mqe1Sjg4XDfL3TfBoQCdAaKU1yuOybl3HMQanUHT-ilfgKSCMh4%3D&tracking_referrer=spectrum.ieee.org

vii [Annual Fuel Poverty Statistics Report 2020 \(2018 data\) \(publishing.service.gov.uk\)](#)

Other Useful References

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[The Value of Time of Use Tariffs in Great Britain - Citizens Advice](#)

Distributional Impacts of Time of Use Tariffs, Cambridge Economic Policy Associates Ltd for Ofgem, 2017

[Distributional Impacts of Time of Use Tariffs | Ofgem](#)