Policy in the Face of Uncertainty: The Smart Meter Dilemma

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In the United Kingdom, the energy trilemma reigns supreme: the UK's energy approach must balance cost, security and the environment, each of which struggles against the others for supremacy. Smart meters — meters that deliver real-time information abut energy use — are supposed to be a solution to a number of these problems at once. Access to real-time information may reduce energy use, reduce energy costs, shift energy from peak times, and reduce emissions [1]. However, test cases of smart meter usage show a range of user experiences, some of them actually increasing energy consumption. The trade off appears to be between saving money and reducing overall energy consumption. Given that there is scientific uncertainty, how should policy makers respond? I argue that the Government must clearly prioritise its reasons for the adoption of smart meters in order to create meters that are most likely to produce a single desired result, instead of attempting to solve all the nation's energy problems.

As part of their efforts to lower carbon emissions, the British government has rolled out a number of energy efficiency measures, hoping to lower demand [2]. Smart meters are the next attempt in a range of solutions, but one that the government believes can address each element of the energy trilemma. A smart meter gives readings on domestic energy usage to an energy company in real time. This information can also be given via a digital in-home display, which can include a range of information. Energy retailers have increasingly considered pairing smart meters with a time-of-use-tariff, which would charge customers based on how costly electricity was to supply at that time. Smart meters are supposed to allow you "to better manage your energy use, save money and reduce emissions" [1]. Lower demand will also widen the UK's capacity margin, improving security of supply. So great is the support for the smart meter solution that the British government has mandated that smart meters be in every home by the end of 2020, approximately 50 million meters [3].

The Government must clearly prioritise its reasons for the adoption of smart meters in order to create meters that are most likely to produce a single desired result, instead of attempting to solve all the nation's energy problems.

Unfortunately, the empirical evidence behind this panacea carries a lot of uncertainty about whether smart meters can change behaviour. Modeling projections suggest that price-responsive demand improves supply because less energy is used at peak times, due to the high prices at that moment in time [4]. However, empirical results from actual trials over the last 5 years are less conclusive. In the US, President Obama's support for smart meter programmes led to the installation of over 5 million meters since 2009, but little change in user habits [5]. This may be for a number of reasons, chief among them being a

lack of a user understanding from both the utility and the consumer [6]. In interviews, users expected a range of information to be available via smart meters, confusing them with in-home displays and expecting immediate cost reductions [7]. This drives home the importance that user information plays, namely, which information is available in real-time to the end user.

Similarly, UK-based studies have found that users are reluctant to change behaviour. The natural inelasticity of domestic energy use can be a barrier to significant behavioural change. In a UK study, even having in home displays did not lead to large changes because users quickly realized the limitations for savings and did not maintain an active approach to energy decision-making [11]. Because most of our domestic energy use consists of regularly used electronics such as kettles, washing machines and dishwashers, an overall reduction is hard to maintain, and planning usage around peak times has proven to be contentious among focus groups in the UK [12]. This can discourage users, and make smart metering with in home displays mildly effective at best.

When smart meters do make a noticeable impact on energy use, it is not always in the way policy makers intend. In Italy, time of use tarrifs enabled users to save money, but at an environmental cost.

However, there is some evidence that displaying comparative information to users makes an impact, more than potential savings. Effects were felt when users in the USA were compared to other, similar users as part of their in home display. In a controlled study, no significant energy use changes took place unless the display also included information on average use at each time. Those houses consumed 7% less energy during a 3-month period [9]. This approach has proved effective in reducing water use in California when users receive smiley faces with their bills when they compare favourably to their neighbours [10].

When smart meters do make a noticeable impact on energy use, it is not always in the way policy makers intend. In Italy, time of use tariffs enabled users to save money, but at an environmental cost. Smart meter in-home displays allowed users to shift their high-energy use activities to off-peak, lower cost times and save money. This effectively solves two-thirds of the energy trilemma. However, this actually led to overall higher consumption, as lower costs increased demand [8].

Conclusion

Given the broad range of results from numerous case studies, all of which use different technology and approaches, how can the British government use this scientific uncertainty in making policy? Policy makers have a range of technology options (smart meters, in home displays, time of use tariffs) and at best one or two case studies on which to base a nationwide energy programme. In this circumstance, prioritisation is key. The energy trilemma takes its name from dilemma for a reason – its three components rarely support one another equally, creating a constant tension. While its possible that an in home smart meter display with a time of use tariff may lower overall energy use as well as shift that use from peak times, addressing all three elements, the case studies above suggest that is unlikely. Currently, the government has presented smart meters as a cure-all, but without a strong decision on which outcome is most important, it is impossible to create the right in home display and the relevant supporting policies [1], [9]. The government must prioritise.

Generally, security of supply is considered the most valuable element of the trilemma, and smart meter usage is extremely unlikely to jeopardise energy security. As such the decision must be made between what is most important – end-user costs or the environment. Lowering end-user costs is extremely popular, and therefore likely to be the priority of any sitting Government. To ensure that costs are lowered, time-of-use tariffs need to be in place, in conjunction with an in home display meter that calculates rates in real time [8]. If the emphasis is on lowering carbon emissions, every effort must me made to reduce overall energy use, not just reduce the cost for individuals. In this case, in home displays should focus on putting normative pressure on Individuals to reduce, displaying energy use in relations to neighbours or comparative house sizes[9]. If the British government wants the best assurance that some behavioural change will occur, the in home displays and subsequent policies need to be specialised for the most important outcome.

About the Author

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