

Briefing Note

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Durham University's social science team has produced its third interim report. In this report, we use a practice-based approach to inform our understanding of how and why energy is used in households and businesses and suggest that energy use is shaped by the interaction of five core elements which we describe in the CCRES Framework, where Capacities, Conventions, Rhythms, Economies, Structures shape the use of electricity and its flexibility. The report also begins to integrate social and technical data analysis.

This report feeds into two CLNR Learning Outcomes. Learning Outcome 1 is concerned with current and likely future demand while Learning Outcome 2 is concerned with demand flexibility.

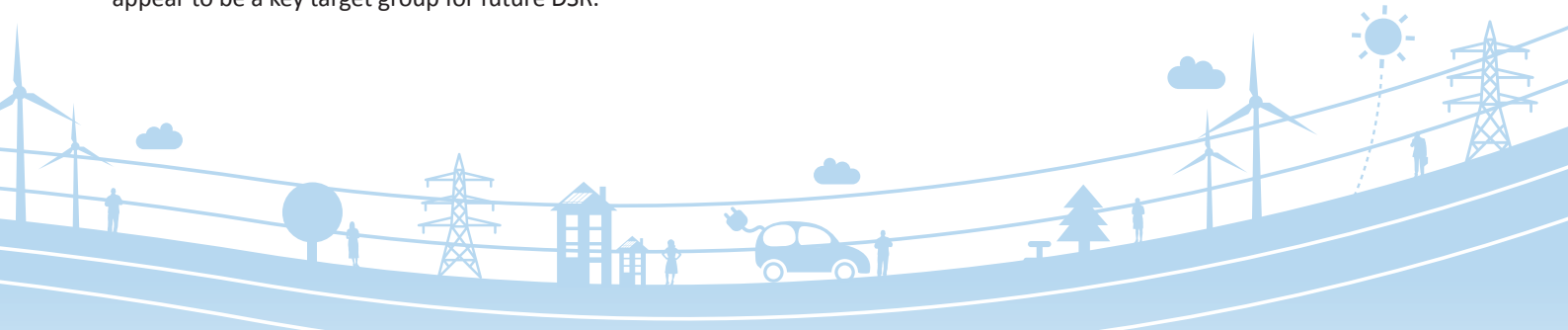
Learning Outcome 1 - Key Findings:

Evening Electricity Use: The rate of electricity consumption in the 4pm – 8pm (peak) period relative to other times of day and night varies widely between households. Consumption is on average 1.69 times higher per hour in the 4pm – 8pm period compared to other times of the day and the distribution ranges from a maximum of 4.86 to a minimum of 0.5.

Income and Evening Electricity Use: Of all the socio-demographic attributes we have analysed to date, income has the strongest association with total and 4pm -8pm electricity demand with higher income households consuming on average 2.9 kWh per day in June and July and 4.7kWh per day in December more than lower income households. Because of their overall contribution to demand in the peak period and the variability in their demand high-income households appear to be a key target group for future DSR.



SME Evening Electricity Use: The proportion of total electricity consumption concentrated in the early evening period varies between businesses, with much greater diversity than in households. Many businesses (41%, or 723 of the sample of 1762) consume less electricity per hour during 4pm–8pm than during the rest of the day or night (a ratio of less than 1:1). In contrast, this was rare (2%) among households.



Smaller businesses (1-9 employees) tend to consume a higher proportion of their total electricity in the early evening peak period and limited consumption overnight (such as those in leisure, and hospitality industries). Larger businesses consume electricity more evenly across a 24 hour period.

Connectedness is seen as a vital service that is electricity dependent. Ensuring connectivity between employees and data and between staff and customers should be recognised as an important requirement

SME DSR and various forms of storage (e.g. batteries for computers and portable devices) may be key to engaging the SME community in DSR interventions.

Learning Outcome 2 - Key Findings:

Flexibility can be seen as a property of everyday practices and takes four forms: shifting the time at which a practice is done, its location, how it is done (e.g. heating food using gas vs a microwave), or by avoiding the practice altogether.

Evening Flexibility: Within the early evening peak period, dish washing, laundry and household chores were the least fixed of the practices studied amongst participants in the qualitative research (n=131). Depending on the task, these could be completed either within 24 hours or within the week. In particular, we found that laundry is an activity that some groups of respondents (most typically working families) felt could be shifted within a 24 hour time-frame, or even between days, in relation to convenience, weather and the weekly working patterns.

In contrast, cooking and dining were reported to be less flexible by participants in the qualitative study.

Effects of Time of Use Pricing: The TOU tariff was effective in moving some practices outside of the 4pm – 8pm period. Our qualitative research suggests that laundry and dish washing practices are most responsive. The evidence indicates that the tariff was not effective in moving cooking times outside the 4pm – 8pm period in a sustained or widespread way, particularly for households with children.

Where practices do not respond to the time of use tariff, this appears to relate to: (a) conventions in terms of how practices are conducted; (b) rhythms of day to day life, including leisure time at home in the evening; and (c) connections to external structures or social groups. Examples are working hours, social activities and school life. This suggests that the degree of alignment between a TOU tariff and already existing socially shared schedules and structures will be important in shaping how flexibility is realised and could be an area for future innovation involving employers and schools.

Income and Flexibility: Higher income groups responded more to the tariff than lower income groups, with high-income households consistently reducing evening 4pm—8pm consumption more than medium-income groups and in turn, medium groups doing so by more than low-income groups. The reduction in 4pm—8pm demand made by higher income groups brought their consumption closer to the consumption of lower income groups. The result is that in the post-intervention period, there was a less clear relationship between income and the consumption of electricity in the early evening peak period.

On average, as well as reducing 4pm –8pm consumption the tariff participants also reduced their total demand.

SME Flexibility: For SMEs, the potential to provide valuable demand flexibility centres on the scheduling, and interruptibility of practices. For example, some processes were described as being re-schedulable if they could be done at any time in the day or week without inconvenience but might be less interruptible if they cannot easily or efficiently be shut down once started (without wasting materials for example).



Figure 1. The CCRES model of energy use

