

Impact case study (REF3)

Institution: University of Oxford		
Unit of Assessment: 14 – Geography and Environmental Studies		
Title of case study: Maximising the impact of smart meters: the UK Smart Metering Early Learning Project		
Period when the underpinning research was undertaken: 2006-2018		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): Dr Sarah Darby	Role(s) (e.g. job title): Associate Professor and Acting Leader of the Energy Programme, Environmental Change Institute	Period(s) employed by submitting HEI: September 2003-present
Period when the claimed impact occurred: 2016-31 December 2020		
Is this case study continued from a case study submitted in 2014? N		
<p>1. Summary of the impact (indicative maximum 100 words) Darby's research on the importance of customer engagement to maximise smart meter uptake and use has provided the principal evidence underpinning the UK government's approach to the roll-out of smart meters since 2016. The research demonstrated that by providing householders with in-home displays to track energy use and training installers to assist them in interpreting those displays, satisfaction with smart meter installation is high. Consumers are then empowered to take measures to reduce energy consumption, with 80% surveyed reporting reductions based on smart meter use. These findings have shaped ongoing government strategy development, placing consumer engagement at the heart of the roll-out of smart meters, as well as informing the approach of the government-appointed consumer engagement body Smart Energy GB and the energy regulator Ofgem. Darby's research has also ensured that smart meter roll-out is tailored to low-income and pre-payment customers.</p>		
<p>2. Underpinning research (indicative maximum 500 words) Achieving reductions in domestic energy use and lowering associated carbon emissions is a central plank of the UK government's climate change policy. However, it has proven challenging to bring about the changes in users' practices leading to and sustaining those reductions. In large part, this is because consumers have typically had no way of comprehending their energy use beyond periodic bills, often based on estimated readings, and averaged over annual use. Darby's research has investigated how consumers can be made more aware of their domestic energy use – and motivated to reduce it – by the supply of smart meters (which track actual energy use) and the provision of training in how to interpret them.</p> <p>Since the mid-2000s, Darby has investigated ways that render energy use more transparent to domestic consumers and identified how that knowledge can translate into lower energy consumption. She provided literature reviews for Defra in 2006 and Ofgem in 2010. The latter was linked to an evaluation of the three-year Energy Demand Research Project in which four of the 'Big Six' energy suppliers carried out smart metering and feedback trials with over 100,000 participants. More recently, her research has focused on how smart metering technologies paired with visualisation tools such as the in-home display (IHD) make precise energy consumption data available to and actionable by consumers [R1]. Smart metering and IHDs need to be differentiated from smart home technologies that automate, interconnect and enable remote control of individual appliances and specific services (e.g. heating) [R2]. The latter technologies primarily seek to provide "comfort, convenience and fun" [R2], with unclear consequences for energy consumption. By contrast, Darby's work has generated strong evidence that smart meters and IHDs operating with a smart energy grid can reduce energy consumption [R1, R3].</p>		

For them to do so, however, householders must be attuned to the benefits offered by smart meters [R1]. To explore domestic consumers' experience of smart meters and energy practices during the early stages of their UK roll-out, the Department for Energy and Climate Change (DECC) commissioned a series of research initiatives under the umbrella of the Smart Metering Early Learning Project (ELP) in 2011.

As part of the ELP, Darby co-designed a quantitative study undertaken by Ipsos MORI that compared the energy practices of 4,016 households across Great Britain: half with smart credit meters and half with traditional meters. Of the smart meter equipped households, 79 were later selected for follow-on, in-depth qualitative interviews. R4 summarises findings about participants' views on their energy use and engagement with the energy market, experiences of smart meter installation, and use of the IHD after installation. Darby also led a small team that prepared the ELP Synthesis Report in 2015 [R5]. The Synthesis Report was produced to analyse smart meter progress to date (in what ways, for whom and in what circumstances) and to identify where further steps were likely to be effective in increasing consumer benefits. In the process, it brought together the findings from R4, as well as a range of UK and international insights, including the results of small-scale ELP trials, insights from the research literature on consumer feedback and technology adoption, and new qualitative research with smart meter installers. Focus groups with installers explored the priorities, challenges and expectations associated with smart meter installation [R6].

The Synthesis Report offered clear recommendations about how to engage householders so that they benefit optimally from the smart meter roll-out and the anticipated "durable energy savings of 3%" [R5, page 8] can be realised, if not surpassed. The recommendations are structured on the basis of the stages in the 'customer journey': before and during installation, use of the information provided, and adaptation of energy consumption. Based on the empirical research, Darby and colleagues also highlighted the importance of adapting technology design to prepayment customers and offering tailored face-to-face support to vulnerable and pre-payment customers during and after installation. They demonstrated the need for "special attention to the needs of households who are vulnerable, in fuel poverty or on low incomes, prepayment customers and those living in rented accommodation" [R5].

3. References to the research (indicative maximum of six references)

R1: Darby, S. (2010) Smart metering: what potential for householder engagement. *Building Research and Information* 38(5), 442-457. <https://doi.org/10.1080/09613218.2010.492660> [output type: D]

R2: Darby, S.J. (2018) Smart technology in the home: time for more clarity. *Building Research and Information* 46(1), 140-147. <https://doi.org/10.1080/09613218.2017.1301707> [output type: D]

R3: Darby, S., Strömbäck, J. and Wilks, M. (2013) Potential carbon impacts of smart grid development in six European countries. *Energy Efficiency* 6(4), 725-739. <https://doi.org/10.1007/s12053-013-9208-8> [output type: D]

R4: IPSOS Mori (2015) *Smart Metering Early Learning Project: Consumer Survey and Qualitative Research*. London: DECC. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/407543/3_Smart_Metering_Early_Learning_Project_-_Consumer_survey_and_qual_research_-_Main_report_FINAL_CORRECTED.pdf [output type: N]

R5: Darby, S., Liddell, C., Hills, D. and Drabble, D. (2015) *Smart Meter Early Learning Project: Synthesis Report*. London: DECC. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/407568/8_Synthesis_FINAL_25feb15.pdf [output type: N]

R6: Darby, S. and Liddell, C. (2015) Communicating "smartness": smart meter installers in UK homes. *ECEEE Summer Study Proceedings, 1991-2001*. Available at: https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2015/9-dynamics-of-consumption/communicating-smartness-smart-meter-installers-in-uk-homes/2015/9-050-15_Darby.pdf/ [output type: E]

Funded by: DECC, PI: Darby, *Smart Meters Early Learning Evidence Synthesis*, 2013-2014, GBP37,340; EPSRC, Co-I: Darby, *User Influence Tools for Enabling Two-Way Engagement with Smart Local Energy System* (1 of the 6 'Plus Projects' attached to Energy Revolution Research Consortium, 22 Universities), 2019-ongoing, GBP21,500.

4. Details of the impact (indicative maximum 750 words)

Darby's research on the importance of household engagement for smart meter uptake and use has fundamentally influenced the approach of multiple actors, including central government departments, consumer engagement body Smart Energy GB, industry regulator Ofgem, and other public and private energy agencies and providers.

The Early Learning Project Synthesis Report (**R5**, lead author Darby, hereafter 'the Synthesis Report') has provided the central evidence underpinning the Department for Environment and Climate Change's (DECC, now BEIS) approach to UK smart meter roll-out since 2016. At the heart of the strategy is the supply of households both with smart meters and in-house display units (IHD) to monitor energy use and also, crucially, with training in how to use and interpret them. The programme was expected to generate GBP4,000,000,000 in energy saving benefits in the period 2016-2020 (the programme has since been extended to June 2021 in the light of the pandemic) [**E1**].

The Synthesis Report built on a longstanding research relationship between Darby and government departments (Defra, and DECC, which later became part of BEIS in July 2016) charged with reducing domestic energy demand using behavioural change approaches. The Report was pivotal to DECC as it offered the first evidence on the importance of effective customer engagement in energy reduction and encouraged the development of its first evidence-based, behavioural change-oriented roll-out strategy [**E1**].

The Head of Benefits and Evaluation at the Smart Metering Implementation Programme (BEIS) until October 2018 attests to the importance of the Report to the roll-out, saying that "the synthesis project has had significant policy value in informing communications with/reviews by political interests (Parliament, NAO [National Audit Office], etc.) about the roll-out, by providing objective, independent evidence" and that it had demonstrated that "the programme is capable of delivering significant long-term benefits to consumers" [**E1**]. The Synthesis Report findings subsequently prompted more detailed research by BEIS on consumer engagement through the 'Smart Metering Energy Efficiency Advice Project' conducted by IPSOS Mori and the Energy Savings Trust. Their final report [**E2**] cited both the Synthesis Report and additional research by Darby on IHD installation practices extensively [**R4**, **R5**, **R6**]. **E2** outlines how Darby's research, "[i]nformed by conclusions drawn in DECC's Early Learning Project" (i.e. the Synthesis Report), was commissioned with the aim of generating and piloting effective customer engagement approaches, exploring appropriate advice types, and generating recommendations for "energy suppliers, advice providers, and other stakeholders".

The findings of the Synthesis Report have also underpinned the practice of Smart Energy GB, who are mandated by BEIS to lead co-ordinated consumer engagement activities on behalf of energy suppliers during the smart meter rollout. Discussing the Synthesis Report, the Chief Executive of Smart Energy GB emphasises how it provided direction for the organisation: "because it was a broad piece of research, and that's its strength, [the findings] were directional, and in order to apply them you would then do considerable other research in order to inform something to be able to design and implement". One example of the uptake of the 'directional' conclusions in the Synthesis Report relates to smart meter take-up among low-income and vulnerable customers. In subsequent research, Smart Energy GB sought to identify further consumer characteristics that might prevent user engagement with smart meters. Their report 'Smart Energy for All' from July 2015 built directly on the Synthesis Report's finding that low-income and pre-pay meter customers were less likely to engage with and/or understand their smart meters, as well as the need to tailor engagement to the needs of such groups, particularly through face-to-face communication [**E3**]. The Smart Metering Implementation Programme's Head of Benefits and Evaluation has confirmed that the focus on tailored engagement with key groups advocated by Darby and Smart Energy GB was rapidly adopted by the Government, Ofgem, and

energy suppliers [E1]. Hence the Chief Executive of Smart Energy GB concluding that "the approaches outlined in the Synthesis Report are absolutely correct" [E4].

In May 2016, Darby was an invited witness to the House of Commons Science and Technology Select Committee's 'Evidence Check' on smart meters [E5]. The Select Committee took note of her witness testimony on maximising customer engagement – and the importance of follow-up support for vulnerable customers – and cited it 18 times in the published report [E5].

The Government's response to the Evidence Check in November 2016 clearly showed that Darby's recommendations had been taken to heart. The response indicated that "in order to reflect the available evidence the Government should ensure that in its bid to complete the smart meter roll-out by 2020 it does not compromise on consumer engagement before, during or after installation, including for small businesses. The impact of smart meters will be limited without this support from installers and Smart Energy GB" [E6]. The response described how as a result of the ELP and the Synthesis Report, the Government had developed advice and guidance materials on working with energy suppliers, and other consumer facing bodies, to make use of these new materials [E6]. The Government had also heeded the Synthesis Report's recommendations about vulnerable groups:

"The Early Learning Project also identified that some consumers would particularly benefit from tailored follow-up support to ensure they are able to realise the benefits of smart meters. The Government is therefore carrying out further work to assess the provision of post-installation support for vulnerable and pre-payment consumers and will seek to ensure good practice is shared across industry. We will also continue to monitor the provision of this support and consider further action if necessary to ensure it meets the requirements of these consumers" [E6].

The Government's response also reported on the benefits of the smart meter programme, stating that eight in ten users said they had taken steps to save energy at home [E6] as of November 2016.

In 2018, the 'Smart Meter Customer Experience Study' [E7] report by BEIS demonstrated the effectiveness of the user-focussed smart meter policy, with 80% of consumers reporting satisfaction with their smart meter directly after installation, and 74% still satisfied a year later. The study showed that a year after installation 70% of customers still engaged with their IHD, with 45% looking at it at least once per week. Receipt of printed information and tailored advice at installation were most strongly associated with continued use of the IHD. The Select Committee 'Evidence Check' report [E5] also cited British Gas data which showed average customer energy savings of 3.1% two years after smart meter installation, compared with controls.

The smart meter roll-out programme has experienced many problems since 2016 including limited availability of second-generation (SMETS2) smart meters, consumers experiencing difficulties with switching between energy suppliers due to differences in metering technology, and – more recently – COVID restrictions. Nonetheless, the predicted average savings have been realised and exceeded by consumers buying electricity from companies with the best-developed customer-focused approaches [E8]. The recommendations regarding key and vulnerable groups articulated in the Synthesis Report [R5] remain a cornerstone of the Government's thinking as indicated by a 2020 BEIS report on smart meter policy from 2021 onwards: "We will work with Smart Energy GB and other partners to develop targeted and more tailored engagement with specific consumer groups, such as vulnerable consumers or those who are harder to reach" [E9]. Ofgem has also proposed that large suppliers should provide data on smart meter installations delivered to credit and pre-payment customers in both start- and end-of-year reporting [E10], a proposal grounded in Ofgem's belief that "it is important that suppliers demonstrate that all customers are able to access the benefits that a smart meter can bring and that no customer groups are being left behind." [E10].

5. Sources to corroborate the impact (indicative maximum of 10 references)

E1: Email from Head of Benefits and Evaluation at the Smart Metering Implementation Programme. 3 September 2019.

E2: Report: Ipsos MORI and the Energy Saving Trust (2017) Smart Metering Energy Efficiency Advice Project.

E3: Report: Smart Energy GB (2015) Smart Energy for All.

E4: Telephone conversation with Chief Executive of Smart Energy GB. 13 September 2019. [Audio recording available upon request]

E5: House of Commons Science and Technology Committee (2016) Evidence Check: Smart Metering of Electricity and Gas [HC 161].

E6: Minister of State for Energy and Intellectual Property (2016) Government Response to Evidence Check: Smart Metering of Electricity and Gas [HC161].

E7: BEIS (2018) Smart Meter Customer Experience Study: A Report on Post-installation and Longer-term Experiences of Smart Meter Customers.

E8: BEIS (2019) Smart Meter Roll-out: Cost-Benefit Analysis.

E9: Report: BEIS (2020) Delivering a Smart System: Response to a Consultation on Smart Meter Policy Framework Post-2020.

E10: Ofgem (2019) Statutory Consultation on the Post-2020 Smart Meter Rollout Supplier Reporting Requirements.