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Vulnerability and resistance in the United Kingdom's smart meter transition

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ABSTRACT

The Smart Meter Implementation Program (SMIP) lays the legal framework in the United Kingdom so that a smart gas and electricity meter, along with an in-home display, can be installed in every household by 2020. Intended to reduce household energy consumption by 5–15%, the SMIP represents the world's largest and most expensive smart meter rollout. However, a series of obstacles and delays has restricted implementation. To explore why, this study investigates the socio-technical challenges facing the SMIP, with a strong emphasis on the "social" side of the equation. It explains its two primary sources of data, a systematic review of the academic literature coupled with observation of seven major SMIP events. It offers a history of the SMIP rollout, including a summary of 67 potential benefits as well as often-discussed technical challenges, before delving into pertinent non-technical challenges, specifically vulnerability as well as consumer resistance and ambivalence. In doing so, the paper not only presents a critique of SMIP, it also offers a review of academic studies on consumer responses to smart meters, an analysis of the intersection between smart meters and other social concerns such as poverty or the marginalization of rural areas, and the generation of policy lessons.

1. Introduction

By almost any standard, the smart meter program in the United Kingdom (UK)—known officially as the "Smart Meter Implementation Program" (SMIP)—represents a monumental undertaking. The SMIP lays the legal foundation to place a smart meter for electricity and for natural gas in *every* home and small business by 2020 (Smart Energy GB, 2017). It represents the UK government's "flagship energy policy" (Murphy, 2016a, 2016b: 2) and will involve installing a combined 104 million pieces of new equipment when counting separate electricity and gas meters, in-home display (IHD) monitors and wireless communications networks (Lewis and Kerr, 2014). The combined total cost is expected to be at least £11 billion, or more than £200 per household (Rose and Thed, 2014). Even the marketing campaign inspires awe, with £100 million committed over a five-year duration of the program, convincing Barnett (2015: 2) to estimate that it is the biggest advertising campaign in the world in the "next five years." Although the expected costs of the rollout are controversial, Lewis and Kerr (2014: 5) have argued that the SMIP is "by far the most complex" and also "costliest" smart meter program, as well as the largest government-run information technology project in history. Smart Energy Great Britain (Smart Energy GB), the "voice" of the smart meter roll out, framed it as "the biggest behavioral change program that this country has seen" (House of Commons Science and Technology Committee, 2016: 13) and "the biggest national infrastructure project in our lifetimes" (Smart Energy GB, 2017: 1). The Department of Energy and Climate Change (DECC, now merged with Business, Energy, & Industrial Strategy [BEIS]) argued that it is the largest transition the energy industry has undertaken in the UK since the conversion to North Sea natural gas (quoted in Darby, 2010).

However, implementation has been replete with obstacles, and progress sluggish at best. Although Smart Energy GB sold the program

Abbreviations and acronyms: AMI, advanced metering infrastructure; AMM, automated meter management; BEIS, Department for Business, Energy & Industrial Strategy; CALMU, Credit And Load Management Unit; DCC, Data Communications Company; DECC, Department of Energy and Climate Change; DNO, Distribution Network Operator; DTI, Department of Trade and Industry; ENIC, Electricity Network Innovation Competition; EDRP, Energy Demand Research Project; EU, European Union; ICT, information and communication technology; IHD, in-home display; LCN, Low Carbon Networks Fund; Ofgem, Office of Gas and Electricity Markets; SMCDB, Smart Meter Central Delivery Body; SMETS 1, Smart Metering Equipment Technical Specification; Smart Energy GB, Smart Energy Great Britain; SMIP, Smart Meter Implementation Program; UK, United Kingdom; VET, Visible Energy Trial

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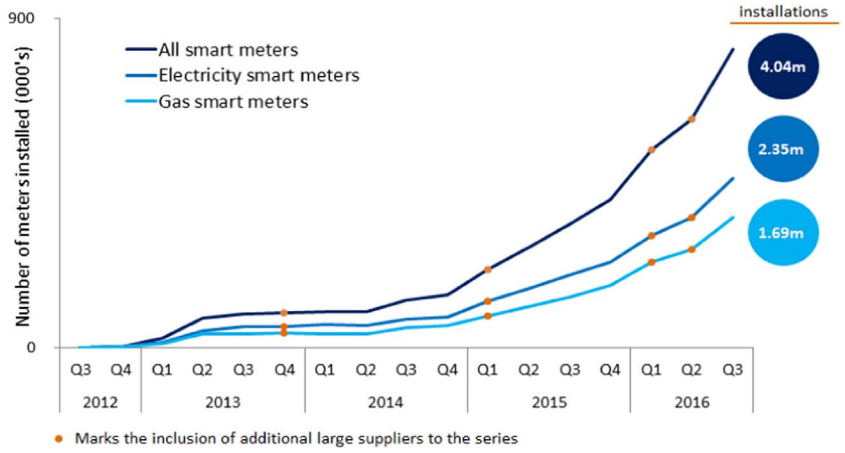

Fig. 1. Domestic Smart Meter Installations in the United Kingdom, 2012–2016.
Source: Department for Business, Energy & Industrial Strategy, 2017

on the grounds that it would enable "huge benefits for consumers and our national infrastructure" and facilitate a "revolution in Great Britain's national energy system," the SMIP has encountered numerous challenges (House of Commons Science and Technology Committee, 2016: 26). The program is years behind schedule and the costs of the rollout are highly contested. The start of the rollout has been delayed several times, from the initial 2014 starting date to November 2016. According to the most recently available Department for Business, Energy & Industrial Strategy data shown in Fig. 1, only 4.04 million meters have been installed as of late 2016, or 7.14% of the target number. In order to meet its targets, suppliers will need to install smart gas and electricity meters at a rate of about 40,000 per *day* for the duration of the program (Citizens Advice, 2017). Alongside this technical challenge, the SMIP also represents "one incredibly tough job" of convincing every household in England, Wales, and Scotland to install a smart energy meter (Barnett, 2015: 3).

Alongside the more frequently discussed technical barriers, what types of non-technical or social barriers has the SMIP encountered? How far have these issues been considered (or not)? What kind of possible implications arise from these considerations? To provide some answers, this study utilizes a mixed methods approach to investigate the socio-technical challenges facing the SMIP in the United Kingdom. The article first explains its two primary sources of data, a systematic review of the recent academic literature coupled with participant observation of seven major SMIP events in the UK. It then offers a history of the SMIP rollout before delving into two core themes, grouped under the headings of vulnerability and resistance. In doing so, it not only presents a critique of the UK's implementation program for smart meters, it also offers a review of consumer responses to smart meters, an analysis of the intersection between smart meters and other social concerns, and the generation of lessons for other smart meter programs.

The main contribution of the article is to inform current policies and practices concerning the SMIP and national energy policy attempts to decarbonize electricity and heat in the UK. The Committee on Climate Change (2016a) warns that current UK policies will fall well short of the fifth carbon budget by at least 100 million tons, a large amount (37.2%) given that the carbon budget expects to save only a total of 268.4 million tons by 2035 economy wide (Committee on Climate Change, 2016b). This means new measures must deliver further efficiency improvements (Staffell, 2017), especially in the domain of heating. We provide insight towards this goal by investigating potentially overlooked non-technical, or human and social, elements in convincing consumers to accept new technologies aimed at making homes and power networks more efficient, sustainable, and secure.

Additionally, the article contributes to debates beyond the UK. Some €51 billion will be spent on smart meter initiatives in the near future across the European Union (EU) (Darby, 2010). In 2013, only about 10% of households in the EU had a smart meter, but the European Commission has mandated that this number rise dramatically to 80% by 2020 (Viitanen et al., 2015). The European Commission (2017) reports that Member States have committed to rolling out close to 200 million smart meters for electricity and 45 million for gas by 2020 at a total potential investment of €45 billion. This study, however, elucidates some of the technical and social elements befuddling attempts to rapidly diffuse smart meters across homes and cities—findings that have relevance for those wishing to better understand the temporality and complexity of both national and household energy transitions (Sovacool, 2016).

2. Research methods

To collect data for our study, a systematic and extensive search was conducted for peer-reviewed academic articles on smart meters in the UK, published between 2008 and 2017, in addition to a supplemental collection of relevant government reports and media news articles. As Petticrew and Roberts (2006) and Sorrell (2007) note, systematic reviews improve the evidence base for policy analysis by enabling better specification and inclusion of a broader range of results (minimizing bias), enhanced transparency about the research process, and a research design that can be replicated.

In order to maximize the size of our sample of literature and develop a thorough review, we conducted a broad search of articles discussing any aspect of the SMIP or smart meters, from engineering and technology concerns as well as social, political, economic, and cultural dimensions. We searched five different academic databases, looking for several sets of keywords within full-length, English-language research articles. We searched article titles, abstracts, or keywords for the terms "smart meter" and "United Kingdom," "England," "Britain," "Scotland," "Wales," and "Northern Ireland". Table 1 summarizes the total number of articles collected from each database—with none excluded—including: Science Direct (15), SpringerLink (2), Taylor & Francis's Informaworld (19), Wiley Online Library (1), and Sage (10). All of the resulting 47 articles were analyzed, and assessed both for topical coverage (what challenges facing the SMIP did they identify, what socio-technical barriers did they discern, if any?) as well as lacunae (what gaps within the literature existed?).

To supplement this systematic review, the authors also attended seven smart meter events in the UK between September 2015 and