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When meters start to talk: The public's encounter with smart meters in France

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ABSTRACT

Efficiency targets proposed as part of international commitments to reduce CO_2 emissions include future changes in individual patterns of energy consumption. This goal is presently being addressed in France through the installation of smart meters. Considering that public resistance or blatant opposition could jeopardize the grid modernization in the whole country, this study focused on the responses of groups of citizens from the two French communities where the new meters were first installed: Château-Renault (rural) and Lyon (urban). This study used the method of reconvened focus groups to inform policymakers about the reasoning of citizens in this situation. The discussions and the material generated by the groups provided very concrete elements on how the participants tried to make sense of the meter device itself and the policy goals, in relation to their daily and social life. The exchanges between participants seemed to fit into three main dialogical pairs, or themata: collective vs. individual (daily life); private (my behaviour) vs. public spheres (others' behaviours); and consumption: individualist vs. collectivist. The collective elaboration throughout the group sessions reinforced the empowerment of the groups and led to considering more collectively-oriented approaches in contrast to the prevailing individualistic lifestyles.

1. Introduction

Since 1990, CO_2 emissions in Europe were reduced by 19% while wealth production increased by 45%. Today, Europe is one of the first world economies, generating only 9% of global anthropic emissions, against 24% for China and 12% for the USA. Consistent with its sustainability-orientated policy, the European Commission has set in 2009 as a goal that before 2020, 80% of all Europeans households have access to electric smart meters, reaching 100% by 2022. Following these European sustainable ambitions, France engaged a nation-wide program in that direction [43].

These sustainability-oriented programs include, among other issues, changes in the way we, as a society, are able to produce energy and how efficiently we consume it, through 'demand side management' (DSM) for example. Still, the way electrical power systems are designed presents various barriers that have slowed down the adoption of these changes. These barriers can be associated with (1) operational issues, (2) technological issues, and the (3) slow innovation cycle existing in the electricity industry.

At an operational level, a well-functioning power system requires that the balance between energy production and consumption must be kept within a very narrow margin at all times [32]. This particular constraint directly affects energy prices due to the supply and demand effect, thus creating 'peak hours' (when the aggregate energy use is high) and 'no-load hours' (when aggregate energy usage is low). Expensive generators are required to provide for the increased energy production in the peak hours. For example, in the Mid-Atlantic States, 15% of the generation and transmission capacity is used during 1% of the time to meet exactly the peaks in demand [52]. This example shows how until recently, the production–consumption balance was only kept by the producers. Demand-side management (DSM), on the other hand, allows this balance to also be kept by the consumption side through the possibility that consumers adapt their energy consumption as a response to the 'real time' energy price. This type of self-regulated system would also insure less risks of blackout, less expensive fares and an overall more reliable system [46].

Moreover, a technological barrier also kept domestic users from willingly shifting their consumption away from peak hours:

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their mechanical counter with manual data collection. This kind of energy measurement only allows the feedback of a household's consumption on a large, pre-defined temporal base (e.g. each month, semester, etc.), being therefore impossible for the consumer to account for hourly shifts in energy fares. This is why the application of 'information and communication technology' (ICT) to the energy metering process has enabled an increase in the implementation of renewable energy, an improved power system efficiency, and a reduction in costs involved in operation and infrastructure expansion. Nevertheless, the power system industry is still known for its 'slow innovation cycles'—lapsing decades or even centuries [29].

1.1. Smart metering and changes in energy consumption

Smart meters therefore play a pivotal role in Europe's achievement of its energy efficiency goals. The real-time display of household energy consumption can provide a feedback loop to consumers in terms of their real-time energy consumption and in terms of the applied billing rate [17,16,25], along with the information they need to shift from peak-hours to other times, when the use of electricity is cheaper.

But these possibilities for the collective change in consumption monitoring and shifting energy use to off-peak times will only be effective if people indeed accept the installation of smart meter devices and engage in changing their energy consumption behaviour. Great insight into how successful the installation of smart meters and 'in-home display' (IHD) devices has been in fulfilling energy efficiency goals is gained from studies describing the reduction of energy consumption through real-time feedback [16,25] and the smart meter roll out in different countries [35,40].

All of these studies demonstrate the positive gains of reinforcing energy efficiency, contributing to the overall positive image of these devices [16,23,31,33,34]. Moreover, in general, technological innovations tend to be positively reported on by the media, which is associated with the valorisation of information or technology labelled as scientific by western societies [9,51].

However, once these innovations are actually implemented, people might react in a different way than was initially expected, as it has been extensively observed in the case of wind energy [6,19]. And considering that smart meters and DSM – in contrast to other efficiency measures – involve communities' behavioural response in terms of shifts in consumption, it is particularly important to better understand communities who use these new meters, and how they make sense of, represent, and domesticate this new technology [2,45,47]. By providing information about people's consumption that would not be available otherwise, smart meters are able to challenge deep-seated habits and implicit consumption beliefs.

This is why the installation of these devices constitutes an interesting opportunity to gain insight into the concrete and abstract drives – beliefs or material constraints – behind energy consumption routines. One of these drivers are the empirical constraints people find in their everyday experience [37]; the others are the social representations, core ideas and values actualized by these practices [39]. A main advantage in considering both the abstract and the concrete levels of everyday experiences is that "knowledge (. . .) needs to be enacted in everyday life, and this enactment involves articulation of positions with respect to truth and falseness of knowledge claims but also considerations about how to act on the perceived challenges" ([45], p. 781, italics added). Social representations can therefore be considered as meaning-drivers for our everyday, concrete experiences.

This paper proposes an in-depth analysis of how people living in the first French localities to be equipped with the new 'smart' energy meters exchanged in groups and made sense of these novelties in their concrete, everyday lives in a French context. As a theoretical framework for the analysis of the focus groups' material, we will use the social representations approach.

1.2. Social representations: how people become familiar with unfamiliar issues

The social changes initiated by the new international policy and technologies conceived for reducing carbon emissions [3,12,42] have influenced the incentives and the implementation of renewable energies on different levels over the last decade [5,6,11]. These changes are being generalized on a legal level [13] but still face resistance and contestation at the local and concrete level [15], revealing the difference between the response of the 'real' public and the 'imagined' public, whose response is anticipated by policymakers [5,14].

The social representations approach focuses on how this 'real' public understands and makes sense of scientific, technological, cultural or legal innovations through common sense rationality [39]. During the process of knowledge appropriation, and in the goal of reconstructing the new object in socially meaningful terms, laypeople often resort to metaphors and images that may have little to do with the original scientific concepts [56]. In this sense, the social representations approach opposes a 'deficit model' approach, which aims to understand the process of science popularization as the introduction of biases and misunderstandings in what is considered to be the rightful comprehension of scientific theories. On the other hand, social representations are conceived as mediators "between the science world and the life world, bridging the 'gap' by transforming expert knowledge into hybrid forms drawing on both science and the life world" ([7], p. 166).

From a dialogical perspective, meaning making is often organized through pairs of opposed meanings [10,36]. According to Moscovici and Vignaux [38], these dual pairs, or themata (i.e. good vs. evil; dirty vs. clean, etc.) structure the way we conceive our worlds, serving therefore also as a basis for analysing representations.

1.3. The present study

Drawing from the concepts of domestication [2,47] and social representations [39], in this paper we will analyse how some of the first French households to have received the new smart meters make sense of these devices and, as such, resource to dialogical pairs (or themata) and actualize them in their everyday, concrete experiences [37].

The importance of analysing the public reasoning and the empirical response to a certain technology lies in the early identification of discrepancies in relation to the response expected at the policy level and what could improve the implementation of smart grid projects on a greater scale [5,35]. Concerns raised by smart meters' early adopters include, for example, health concerns with wireless transmission [26], privacy issues [40], cost concerns, and trust in the involved institutions [4].

Building on previous experiences of smart meters' rollout and how they were able to alter citizens' daily lives [16,25,40], this article proposes an in-depth analysis of how people living in the first households in France to be equipped with the new 'smart' energy meters make sense and respond to these novelties in their real, everyday lives. The primary aim of this study is not to describe how smart meters may influence their attested behaviour, as this has already been analysed in previous studies (see Refs. [16,25,40]). Our focus is directed to the meanings and representations activated by participants when brought to reflect on their empirical experience with these devices [37,47] during a pilot implementation of smart energy meters in France. More globally, this type of research can