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Original research article

Is the Resource Man coming home? Engaging with an energy monitoring platform to foster flexible energy consumption in the Netherlands

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ABSTRACT

In this article we empirically study the notion of 'The Resource Man' put forward by Strengers (2014): a motivated and knowledgeable micro-resource manager, who uses domestic smart grid innovations to manage energy demand in a sustainable, affordable and grid-friendly way. To explore this notion, we analyse a case study where energy cooperative members engaged with an ICT-based monitoring platform focussing on three domestic energy-managing activities – energy monitoring, planning and sharing. We find that although this case provided the best prerequisites for the Resource Man to emerge, none of these activities was sustained during the project. This outcome underlines that the Resource Man perspective held by many actors in the energy industry has a narrow understanding of energy consumption and how it can be changed or made more flexible. We suggest that it is easier to understand householders' engagement with energy through the concept of energy practice or "e-practices". E-practices go beyond managing energy with smart devices, and can include being actively involved in an energy collective, generating, trading, storing or discussing energy. We argue that in general, domestic smart grid technology can play a potential but limited role in effecting changes to complex and interlinked daily practices.

1. Introduction

Many industrialized countries are aiming to 'green' their energy systems, in other words make them more sustainable and less carbon-dependent, by applying renewable energy sources. The transition to a low-carbon energy system raises the issue of matching energy demand with an increasingly intermittent and decentralised supply. The current electricity grids are in many cases relatively old, built for centralised and controllable supply, and not equipped to deal with an actual transition without comprehensive investments [1]. Flexibility is a keyword in developing the existing infrastructure so that it can deal with increasing and shifting peaks in electricity supply and demand. We can see this flexibility in infrastructure solutions like improved grid management; increased grid capacity and ultimately electricity storage; but it also plays a role in the demand side of the energy system [2].

We usually think of managing the demand side of the energy grid by enhancing consumer insights into the amount of energy used and by influencing the timing of energy consumption. Information and communication technologies (ICT) have taken centre stage in this development of eco-feedback. In the Netherlands, grid operators are gradually introducing smart meters to every household, and rapidly increasing ranges of energy monitoring devices and apps that display the collated data are available [3]. Various ways of providing eco-feedback, for instance through in-home displays, have indeed helped users to reduce overall energy consumption to a certain extent [4–6]. ICT-based energy monitoring and managing devices are specific tools that enable a better understanding and control of domestic energy behaviour and decision making. These technologies operate on the basis that they provide new information and/or instructions to individuals, who, having received the information, will change their respective energy usage behaviour accordingly.

This individual, positivist and technology centred approach to understanding energy usage has been challenged by the social sciences [7–10]. Nevertheless, many 'smart energy' projects retain a strong technological focus and envisage homeowners as smart energy users, who can be persuaded to 'take control of' energy consumption through monitors and apps. Strengers' [11] image of the "Resource Man" aptly captures this ideal type of smart energy consumer, seen as being a motivated and knowledgeable micro-resource manager. The image epitomises the assumptions many actors in the energy industry make about the interests and behaviour of their users, whose energy-smart behaviour is enabled

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thanks to smart grid innovations. In the 'resource biased' energy industry's eyes, the smart energy consumer is: "interested in his own energy data, understands it, and wants to use it to change the way he uses energy" [11]. Using ever more accurate energy data, he makes conscious and informed consumption decisions to be more economical and sustainable, and this performance data is shared and compared with other micromanagers.

This vision is quite different from the passive and carefree engagement most people (in the global North) have with energy in their daily lives, and can be challenged on many aspects [11,12]. Most critically, it disregards what people actually do in their homes, the heterogeneity of the prospective users and the actual interest in energy matters among all household members. Electricity in particular entails a "background relationship" whereby it is not experienced directly, but shapes the human experience through its "present absence" [13]. Energy is doubly invisible [14]: electricity and most of the delivering infrastructure are physically hidden from view, and the practices that consume electricity are usually part of inconspicuous routines and habits [15]. Devices to generate, monitor and manage energy at the household level make electricity visible by introducing information and the tools to react to it. This could be crucial for a future grid that arguably relies on its users being smart: flexible, responsible and engaged in the electricity system's functioning.

Grid operators in the Netherlands are exploring this different engagement with energy and in the process, have turned to local energy cooperatives for examples of future smart energy users. These citizen groups engage with energy for a broad range of reasons: taking responsibility for combatting climate change, local economic development, self-sufficiency and reducing energy costs. Many are engaged in developing local generation capacity through solar PV and wind turbines, assisting participants in reducing energy usage, with some even becoming local sustainable energy retailers. Their activities signal an above average engagement with energy, and smart grid projects aiming to explore the active participation of end-users understandably often target these forerunners. Projects involving a local cooperative and smart grid devices can therefore provide empirical insights into Strenger's idea of the Resource Man, and how the emergence of a rational and motivated energy resource manager plays out on the ground.

In this paper we explore a case study of such a smart grid pilot project in the Netherlands, collaboratively conducted by a grid operator, an energy cooperative and a software developer. The pilot project centres around an online platform that allows participants to monitor and share energy data and plan their usage beforehand to be more self-sufficient. The participants are also members of the local energy cooperative and many have solar panels on their own roofs. On paper, this case represents many aspects of the ideal domestic energy manager, and offers an opportunity to further explore the pros and cons of considering smart grid inhabitants as "Resource Men". We investigate which energy management related activities actually emerge in this project, and how this has shaped energy consumption.

To do so, we will first describe the case study and the methods used, before briefly outlining why this case is suitable for empirically studying the idea of the Resource Man. We then move on to our empirical findings by detailing the project participants' actual interaction with the energy platform and how this has in turn affected energy consumption. We close with a discussion and concluding section.

2. Case and methods

We analyse an ICT-based energy innovation, an online energy management platform, to study the emergence of energy management activities. The Dutch SSmE project (Samen Slim met Energie, *Together Smart with Energy*) is a collaboration between distribution system operator (DSO) Enexis, IT developer Shifft, and local energy cooperative DEH (Renewable Energy Haaren). DEH is a citizen group with about 200 members in Haaren, a municipality in the south of Netherlands. Since 2012 the group has been working towards their ultimate goal, namely make their municipality energy-neutral. They have set up activities to promote saving energy, increase renewable energy generation among members, and help residents explore home insulation and domotica. Membership of the cooperative has a voluntary and passive character with no responsibilities; people can simply choose to partake in projects and activities. In 2014, DEH and Enexis joined forces for the SSmE project, in order to develop an online platform supporting the use of community-generated solar electricity, by providing users information through a website and smart phone app. The goals were to reduce the total amount of energy consumed, improve the on-site usage of solar power, and strengthen the ties within this community of energy cooperative members [16]. Importantly, no special financial incentive system like flexible tariffing was implemented besides some small awards as gestures for 'saving the most' or 'being most self-sufficient'. This was a deliberate strategy to keep the organisation of the pilot as simple as possible and explore people's willingness to help achieve a self-sustaining community. By gathering data from smart meters and displaying information on multiple aspects of energy usage, the platform was meant to become a hub for managing energy in the home. In March 2015, DEH and their project partners officially kicked off the process by introducing the online energy management platform to 105 households in Haaren. The platform links DEH members spread out over four areas in the municipality, totalling about 13,500 inhabitants.

The SSmE platform was launched in March 2014 for a one year pilot. Our paper is based on the data gathered in the course of this pilot. During this time we were able to study the project closely by conducting in-depth fieldwork among participants and attending project meetings led by the working group. The research presented here is mainly framed within a qualitative methods approach. Though it includes quantitative data on energy consumption, the main data source was developed using qualitative methods including observations, interviews and other relevant statements. Enexis conducted the quantitative analysis, focusing on the results of thematic 'intervention' weeks. During these weeks, participants were urged to use the platform to achieve certain goals, like 'reducing standby power' or 'being as self-sufficient as possible'. We attended ten project meetings and were both participants and observers of the work being done by the DSO, the energy cooperative representative and the IT developer. This enabled us to gain a great deal of insight in not only how the platform was supposed to function according to its designers, but also how it was actually received and used by householders.

Six months into the project we conducted a focus group interview with seven participants, most of whom were involved and knowledgeable cooperative members. Seven individual, in-depth interviews were conducted with platform users over the course of the pilot. These interviewees were sampled according to the average characteristics of the majority of DEH members: aged (well) above 40, with no young children living at home, well above average income and education, and often a professional or personal affinity with energy or engineering. All the focus group participants were men; two out of the seven individual interviewees were women. All the interviews were semi-structured, guided by a topic list which encouraged participants to discuss their experiences with SSmE, while giving them the opportunity to bring up aspects themselves. The interviews were recorded, transcribed and manually analysed, allotting the various activities of the original platform design into categories. The analysis included verbatim interview reports to enable insight into the empirical