

Smart homes in transition - Investigating the role of households in the development of smart grids in Denmark - DTU Orbit (08/11/2017)

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Increasingly over the last decade, the 'smart grid' has been highlighted in many parts of the world as an important element in a low-carbon transition. The smart grid is a concept that entails the modernisation of the electricity system with information and communication technologies, in order to make the system more 'intelligent' and balance electricity production and consumption better. This new design is thought to address several current challenges to the electricity system, such as the increased integration of intermittent renewable energy sources due to climate change issues, peak demand and black-outs, fuel security, fraud and inaccurate billing. The present PhD project aims to explore the role households play in a sustainable transition of the energy system and takes as its point of departure the Danish smart grid case. Here the smart grid is dominantly framed in relation to the political goal of basing the energy system 100 % on renewable energy, mainly wind power and biomass, by 2050. In a Danish context, households are expected to have a very specific role in the smart grid: the growing production of 'green' electricity, as more wind turbines are integrated in the system, requires that households also increasingly consume electricity through, among other things, the investment in heat pumps and electric cars, whereby they 'electrify' heating and transport. However, to utilise the intermittent wind energy production better and avoid escalating peakloads, households are expected to consume electricity more 'flexibly', with the aid of smarthome energy management technologies and motivated by new pricing structures. This means they should, for instance, have their heat pump turned off during peak hours or turn on their washing machine 'when the wind blows'. Through qualitative fieldwork in the Danish smart grid case and participatory observation in the eFlex project – a user oriented smart grid innovation project commissioned by the energy group 'DONG Energy' involving 119 Danish households – the PhD project explores this techno-economically-driven vision for a sustainable transition of the energy system. By drawing on science and technology Studies (STS) and practice theory, the thesis investigates critically the vision of 'the smart-home-in-the-smart-grid' and points out possible unsustainable development paths that may result from this vision. The thesis also investigates critically the role energy system actors play in constructing consumer images that 'fit' with the system that is being built. Furthermore it is argued that the pervasive framing of the householders' relationship to energy solely in terms of their role as consumers of it is insufficient in terms of understanding the dynamics of everyday life and how it changes. Ethnographic fieldwork in 'eFlexhouseholds' demonstrates firstly how householders can also have more active and innovative roles in the system and, secondly, how smart technologies interact with the continuous changes of domestic practices. The thesis also calls for a break with the 'smart grid roll-out' terminology by unfolding a historical case study of the development of heat pumps in the Danish energy system. Thus, it is argued that the present low carbon transition of the energy system is still a contested issue, and that many development paths besides the 'smart grid path' can emerge in which households will and should play a vital role beyond making the 'right consumer choices'. Finally, a discussion of the policy initiatives that can support a more sustainable societal development and configuration of the energy system is presented.

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