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Rethinking energy services: The concept of 'meta-service' and implications for demand reduction and servicizing policy

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ABSTRACT

The idea that energy is not consumed for its own sake but for the services that it provides has become axiomatic. However, the implications are not worked through into energy policy nor into most analyses of energy demand. Instead, energy service demand is usually isolated from its dynamic and varied socio-cultural basis, rendering it inappropriately static and neglecting the core quality of usefulness that definitions of 'energy service' share. To address these limitations, this paper revisits and extends a sociological conceptualisation of services, referred to here as meta-services. These are composite and cross-cutting formations of convention, expectation and experience and the means of achieving them. Meta-services are more-than-energy services and are shaped not only through energy consumption, provision and governance but also by a range of other non-energy providers and organisations. This calls for demand reduction policies to engage wider coalitions of service 'stakeholders'. In addition, because energy-services co-constitute meta-services, aspirations to deliver the same levels of service but more efficiently risk entrenching, rather than reducing, levels of service demand. Implications for service-based business models (servicizing) and policies are discussed.

1. Introduction

It has long been recognised that energy is not consumed, or demanded, for its own sake but for the services that it provides (e.g. Lovins, 1976; Reister and Devine, 1981; Shove, 1997; Wilhite et al., 2000; Shove and Chappells, 2001). Accordingly, energy services are usually defined as the useful work that energy does with common examples including heating, lighting and mobility. Given such a broad definition there remains much ambiguity and inconsistency in the way the concept is understood and used (Fell, 2017). This has a number of consequences for carbon reduction strategies and energy policy.

Firstly, the way that energy services are conceptualised matters for how energy demand management and reduction are understood and how future demand scenarios are modelled and anticipated. In particular, there is some, albeit limited, debate about the potential of *service demand reduction* for reducing carbon emissions (Haas et al., 2008; Kesicki and Anandarajah, 2011; Kainuma et al., 2013; Fujimori et al., 2014). Such a prospect recognises the difference between demand for the services that energy provides and the quantities of energy demanded from supply systems (or final consumption). This distinction is also crucial to direct rebound effects, which occur as service demand increases in response to reductions in price from improved energy efficiency (Berkhout et al., 2000; Schipper and Grubb, 2000; Herring and Roy, 2007). In the case of service demand reduction, however, *lower* consumption results from changes in the demand for services, not the energy efficiency of delivering them. Whilst most often analysed in economic terms, service demand exists and changes through other historical and social processes that give meaning (or usefulness) to those services (Fouquet, 2014; Heiskanen and Pantzar, 1997; Wilhite et al., 2000). Excluding such understandings precludes possibilities for a wider range of energy and carbon policy options (Wilhite et al., 2000; Shove, 1997, 2004, 2010; Shove and Walker, 2014). Yet when focusing on 'what energy is for' it has become more common to study the social practices in which energy is embedded, and how they are organised, vary and change (Shove and Walker, 2014; Hui et al., 2018) than the nature of service demand per se. This paper argues that further elaboration of *services* is of value. Indeed, it is particularly important for broadening debate about the role of service demand reduction within energy policy.

Secondly, the imperative to (re)consider energy services and how they change is highlighted by concerns over the inadequacies of efficiency policy to deliver sufficiently radical reductions in carbon emissions (Herring, 2006; Calwell, 2010; Sorrell, 2015; Shove, 2017). In the UK, current demand management policy is almost exclusively focused on efficiency (Warren, 2014), but these policies fall well short of delivering the required carbon reductions by 2030 (Committee on Climate

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Change, 2017). This calls for new policies, and potentially new *kinds* of policy. If, as Shove (2017: 8) argues, the challenge of moving beyond energy efficiency measures is to "debate and extend meanings of service and explicitly engage with the ways in which these evolve", then it is crucial to clarify and develop conceptualisations of 'service'.

Thirdly, there is continued interest in the potential of service-based business models of energy provision to reduce resource use and carbon emissions, an idea known amongst other things as servicizing (Plepys et al., 2015; Hannon et al., 2013). Whilst existing Energy Service Companies (ESCos) sell a wide range of 'efficiency services' such as advice, installing equipment, and delivery of energy savings through performance contracts (Bertoldi et al., 2006), there is little sign of movement away from the core business of selling energy, especially in residential markets (Eyre et al., 2009; Plepys et al., 2015). Nevertheless, such a shift in business models, that is, towards selling the functions that energy provides, retains enduring appeal amongst policy makers (e.g. UK Government, 2017) and researchers alike (e.g. Roelich et al., 2015; Plepys et al., 2015). To pursue such an agenda, and to re-formulate the ways that energy services are provided requires a clear definition of what those services are (Heiskanen and Pantzar, 1997) and there are different ways to do this.

In responding to these needs for greater clarity and development of the concept of energy services, this paper extends a recent review of energy service definitions (Fell, 2017) and revisits a set of ideas first introduced by Shove (2003). A concept of 'meta-services' as more-than-energy services is developed: these are distinct from, but still co-constituted by, the functions of end-use devices and appliances. In contrast to other notions of 'final' or 'end' services (Cullen and Allwood, 2010; Fell, 2017; Baccini and Brunner, 1991) this offers insight into: a) the role of substitutions and re-configurations in how services change, and b) the role of a wide range of 'stakeholders' in shaping meta-services and therefore energy demand. In working through the implications, the paper advances debates on the nature of demand reduction policy and service-based business models. The overall aim is to strengthen and clarify the status of 'energy-services' and 'meta-services' as concepts and as practical points of reference for policy interventions in energy demand. This is an important step towards more serious consideration of service demand reduction policies: in their own right and as part of service-based initiatives.

The paper begins, in Section 2, by reviewing prominent understandings of energy services, and suggests that applications are often inappropriately static and at odds with the central meaning and value of the concept: that of *useful* work. In Section 3, a conceptualisation of meta-services is introduced that addresses these limitations and offers an important analytical focus for studying changes in demand. Section 4 considers what this signifies for demand management strategies and for the development of service-based business models. Section 5 concludes by reviewing the key contributions to conceptual and policy debates. Throughout, the paper refers to the example of thermal comfort, reflecting a rich existing debate about its status as an energy service (Shove, 2003; Chappells and Shove, 2005; Shove et al., 2008; Nicol and Humphreys, 2009; Nicol et al., 2015; Nicol and Roaf, 2017).

2. At odds over ends? Definitions and limitations of 'energy service'

This section briefly but critically reviews prevalent ways in which the concept of 'energy service' is used and the limitations this brings for understanding energy demand. Despite general agreement that energy services denote the useful and beneficial 'ends' of energy use, Fell (2017) identifies persistent inconsistencies of definition, evident in the diversity of examples given. These range from the common "mobility, washing, heating, cooking, cooling and lighting" (Haas et al., 2008: 4013) to the more specific "cold beverages, warm dishes, conditioned living spaces, comfortable office rooms, commuting to work or sending an email" (Haas et al., 2008: 4012) to the indirect services of producing goods such as "food, tables" (Lovins, 1976: 78) and the generic "four main energy services" of "heat, power, transport and light" (Fouquet, 2010: 6587). Such ambiguity is reflected in the range of energy services specified when analysing energy demand and policy scenarios: 15 categories are used by Reister and Devine (1981), 32 by Kesicki and Anandarajah (2011) and 50 by Scott et al. (2016).

At least some of this variation, and confusion, reflects two meanings of 'energy service' that are, in fact, rather different (Fell, 2017). First is the "useful work obtained" (Sorrell, 2007: 20) when supplied energy is converted by end-use devices into more useful forms of energy like light, heat, sound, motion and combinations of these in the functioning of appliances like washing machines or computers. Second are the "benefits that energy carriers produce for human well-being" (Modi et al., 2005: 9). Accordingly, Fell proposes a definition of energy services as "those functions performed using energy which are means to obtain or facilitate desired end services or states" (2017: 137). Thus, heating (as an energy service) is undertaken for the purpose of thermal comfort (end state), and lighting (energy service) for the purpose of seeing at night (end service). The difference between heating (or cooling) and comfort has already been well recognised and debated (Chappells and Shove, 2005; Nicol and Humphreys, 2009). Materials balance economics also recognises the distinction between services, as the functions provided by particular products, and end services, as the welfare or utility thereby provided; the latter of which might be achieved through other products, resources and means (e.g. Heiskanen and Pantzar, 1997).

However, such higher-order services or 'ends' are both under-conceptualised and routinely neglected when energy services are analysed. For example, in a striking footnote, Haas et al. explain that whilst "the *actual energy service* is to reach the shop where I can buy a certain product or to reach my office… a common and more technical definition of transport energy services are distances travelled" (2008: 4012, emphasis added). In other words, the purpose of journeys, that is, the very *usefulness* of travel itself, is lost from sight. As Jonsson et al. (2011: 363) argue "the ambition to quantify energy services in the same fashion as other flows in the energy system… has contributed to a one-dimensional view on energy services". They observe that services have other dimensions such as content, quality and motivation. It is also clear that light, heat or miles travelled are not inherently useful or beneficial (in fact, may be just the opposite). Thus, although it is important for the sake of clarity to distinguish between quantifiable end-use functions and the 'ends' achieved, the latter still need to be included when analysing energy services – if the concept is to retain its core meaning as the *useful* work that energy provides. For this reason, the term 'energy service' is used here in a broad sense that encompasses these two kinds of service: the functions produced by end-use devices (denoted by the hyphenated term *energy-services*) and the beneficial 'ends' achieved. But how are these 'ends' to be conceptualised and included within the analysis of energy services?

The concept of final or end services is already familiar in the analysis of energy and material flows. These are categories of consumption that can be achieved in more and less eco-efficient ways, commonly including communication, illumination, hygiene, sustenance or nourishment, mobility or transport, shelter or structure, and thermal comfort (Cullen and Allwood, 2010; Roelich et al., 2015; Heiskanen and Pantzar, 1997; Baccini and Brunner, 1991). Such end services are characterised in various ways (Heiskanen and Pantzar, 1997): as representing or satisfying basic human needs and activities (Baccini and Brunner, 1991; Cullen and Allwood, 2010), standards of living, "desires arising from cultural values" (Nørgård, 2000: 109) or, slightly different again, as "processes and activities receiving service, or being enabled by service" (Jonsson et al., 2011: 363). Despite these differences, there is a tendency to interpret such categories as enduring and universal hierarchies of 'need', desire or function that are always present in some form or must be satisfied in some way. Indeed, Heiskanen and Pantzar (1997: 424) argue that economists and engineers possess "an