Energy Research & Social Science 6 (2015) 100–108

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Original research article

Home -ing in on domestic energy research: "House," "home," and the importance of ontology

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ARTICLE INFO

Article history:
Received 31 October 2014
Received in revised form
12 December 2014
Accepted 12 December 2014

Keywords:
Domestic energy research
House
Home
Sustainability

ABSTRACT

Domestic energy demand is a topical policy issue, with implications for climate change, energy vulnerability and security. Domestic energy demand varies considerably by country, climate, building type, and even when these factors are the same, occupancy patterns and inhabitant's lifestyles also create variation. However, clarifying understanding of the basic locus of analysis: the home, house, dwelling, or household has received little attention to date, despite its relevance to debates on energy demand. This paper explores the theoretical and methodological assumptions of investigating the 'house' compared to the 'home' and the implications for domestic energy researchers. We suggest that the ontological priority given to the 'home' results in scholarship which considers both social and physical aspects that shape demand. Conversely, research prioritising the 'house' is dominated by techno-economic thinking, and overlooks critical social considerations. Recognising this important distinction, we conclude with a plea for scholars to be cognisant of ontology and language, and provide some suggestions for a future research agenda.

1. Introduction

The housing sector is an important area in energy research, accounting for up to 45% of a nation's energy consumption [1]. Domestic energy demand varies considerably by country, climate, building type, and even when these factors are identical, occupancy patterns and inhabitant's lifestyles create a significant variation [2,3]. Domestic energy demand has thus long been an object of research for economists, engineers, and building scientists and in the past quarter century there has been a growth in contributions from social scientists, including psychologists, sociologists, geographers and historians [4,5]. This paper explores the theoretical and methodological assumptions underpinning these diverse contributions. In this paper we therefore argue that there is a lack of critical engagement with *what* is being investigated in domestic energy research, specifically the basic locus of analysis. Terms such as 'housing', 'household', 'home', 'house', 'domestic' and 'dwelling' appear to be used interchangeably. Whilst the meanings of, and distinction between, these terms has received attention elsewhere, they have not been fully explored within the context of domestic energy scholarship.

The main contention of this paper is that notions of home are instinctively linked to more than the house, and such understandings may be used to challenge the dominance of the mainstream techno-economic approach which focuses on improving design, technologies, or other physical aspects of domestic buildings. Accordingly, this paper brings insights from home scholarship: the widely agreed difference between house and home and significant social aspects of home (e.g. comfort, identity, security, privacy) to help progress domestic energy research. Energy demand is not solely dependent on the design and physical features of a building; social expectations and norms also shape everyday routines which has energy implications [6]. We recommend that energy research would benefit from adopting the home (and all the baggage the term comes with) as the focus for investigation, highlighting an appreciation for the socio-technical nature of domestic energy demand. The current techno-economic approach narrows strategies for intervention, whereas consideration of demand as the result of socio-technical systems presents broader range of strategies (e.g. targeting social conventions, meanings of comfort, fashion and clothing).

The paper begins by exploring the dominant approach to domestic energy research, that which prioritises the 'house'

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http://dx.doi.org/10.1016/j.erss.2014.12.003

revealing its theoretical and methodological assumptions. Section 3 moves on to explore the literatures related to the 'home', highlighting and connecting key themes back to domestic energy research. Section 4 presents our novel conceptual framework demonstrating the implications of energy research which differently awards 'home' or 'house' ontological priority. Finally, we offer some possible directions for future research and policy recommendations as a result of adopting the home as the key locus of analysis.

2. Scholarship on the 'house' and energy

Domestic energy researchers are guilty of using house, home, housing, dwelling, and household interchangeably. In this section we use the term 'house' to signify a particular, dominant, way of approaching the topic of energy demand and suggest this reflects certain assumptions. We highlight these assumptions and demonstrate the implication of these in terms of methodological approaches, how householders are perceived, how 'success' is measured and intervention strategies.

A house is the physical building where people live (including flats/apartments in this sense), so research is concerned with material aspects, such as construction, energy supply, heating or cooling system, and appliances. Accordingly, studies of the house have been undertaken mainly by building scientists, engineers and architects [7] who typically employ quantitative and applied methods (e.g. large quantitative surveys, modelling and statistics). For example, modelling designs to improve efficiency or estimating energy demand based on building features and the local climate [8–10].

These contributions are important to regulation and development of policy instruments [11], making buildings, heating/cooling systems and appliances more efficient as well as reducing carbon emissions and inefficiencies in the supply system. Indeed, examples of improvements in energy efficiency are prolific. According to modelling of national energy consumption in the UK by Palmer and Cooper [12], the mean average energy use per home fell from 23,900 to 16,700 kWh between 1970 and 2011. Yet, what energy is used for has changed dramatically in the past 40 years with the heating of more rooms to higher temperatures, as well as an increase in the number and use of appliances. Further, developments in economics, law, public policy, business and urban planning have contributed to the development of mechanisms for the delivery and uptake of building improvements [5]. Again, this research is generally underpinned by quantitative methods, such as large-scale surveys and analysis of secondary data sets although qualitative post-occupancy evaluation is also used [13], albeit modestly.

By focusing on only physical elements, studies of the house are, at best, reliant on unsophisticated understandings of the role of occupants, and, at worst, assume that building users are passive. Typically, householders are recognised as contributing to the performance gap, but addressing this variance is seen as the responsibility of other disciplines [14]. In part, this may be explained because positivist methodologies may struggle to make sense of or account for these complexities. Evidence of householders being perceived as passive is derived from the expectation that householders ought to use the house as 'intended' or designed to be used [8]. If modelled demand does not match actual performance the response is to adapt design rather than engage householders. For instance, there is considerable literature on the importance of designing an appropriate level of control, on making sure interfaces are user-friendly, and in determining what level of control makes occupants most tolerant of their indoor climate [15,16]. Indeed, the intention of building performance models is to give a measure of energy efficiency which is independent from the influence of occupants' behaviours [8].

Building standards suggest that several criteria are needed in combination to achieve a comfortable indoor environment: air and radiant temperature, humidity, air movement, individual clothing and level of activity all play a part (e.g. ASHRAE and ISO standards[1]). Furthermore, there is a dominant focus on thermal comfort and temperature in particular; with comfort becoming commonly defined according to Fanger's [17] "comfort equation" which suggested that 21 °C is the optimal temperature for thermal comfort. While Fanger [17] clearly understood comfort as the result of complex interaction between multiple criteria, his work helped lead to the perception and acceptance of comfort as a definable condition and establishment of universal standards for the indoor environment [6].

By considering building users as passive and occupant satisfaction as a clearly defined standard, it follows that the strategy for intervention (for affordable, secure and low-carbon domestic energy) would be to target the house and pursue mechanical solutions. As Chappells and Shove argue "if comfort is thought of as a *definable* condition, the aim is to *design* indoor environments that deliver it" [78](11, emphasis added). Thus, studies of the house aim to make houses and energy provision more efficient. Part of this includes research on policy mechanisms or how to encourage uptake of insulation or micro-generation technologies but the target of intervention is still the house and 'house researchers' are not concerned with understanding how people use energy or what energy is for [18–20].

This section has set out the dominant approach to domestic energy research, and the implications of theoretical and methodological assumptions of positivist lines of enquiry that are focused on physical drivers of energy demand. These methodologies are undoubtedly valuable, for instance in modelling and evaluating policy instruments depending on technical, economic and regulatory factors [11,21,22]. Furthermore, in modelling, designing, and assessing new technologies and more efficient buildings these contributions from building scientists, engineers and architects are essential. However, a performance gap between modelled building performance and actual energy demand is widely recognised [8,23,24] and this approach is not suited to incorporating the complexity of social drivers of demand, for instance issues of rebound or increasingly energy-intensive expectations for indoor environments. Therefore, we are concerned with finding a locus of investigation that captures the complexity of interaction between both physical and social drivers of domestic energy demand, and turn to literature on the home to inform this conceptual development.[2]

[1] ASHRAE (American Society for Heating, Refrigeration and Air-Condition Engineers) and ISO (International Organisation for Standardisation) are both examples of organisations setting 'standards for thermal environmental conditions for human occupancy' [101] which are becoming increasingly recognised and adopted internationally (Nicol and Humphreys [102]).

[2] There is also a significant body of work on the notion of dwelling, which is in many ways complimentary to developments in literature on the home. For instance, philosopher Martin Heidegger's (1971) seminal article 'Building, Dwelling, Thinking' has sparked similar debates to the difference between home and house (e.g. critiquing conflation of terms, considering circular relation, critiqued by feminists, debates about home-making), but instead emphasises the distinction between dwelling and building. However, there is much debate surrounding definitions of housing, household, domestic, home, house and dwelling, and we do not aim to provide an exhaustive review of this multitude of concepts; hence why we focus only on the terms 'house' and 'home' as a framework to explore trends in domestic energy research.