Representing the demand side: 'deficit' beliefs about domestic electricity users

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Abstract

The increased deployment of renewable energy technologies, particularly at the local or building level, is creating new challenges for the UK electricity supply industry. These challenges include the potential for new demand side roles and responsibilities associated with domestic electricity customers becoming electricity co-producers (e.g. Marvin, Chappells and Guy, 1999; Shove and Chappells, 2002). This paper aims to identify how UK electricity industry stakeholders represent domestic electricity consumers, drawing upon the theory of social representations (Moscovici, 1961/1976) and to investigate to what extent, if at all, these representations are (or might) evolve as a consequence of greater domestic-scale renewable energy deployment. Eighteen semi-structured interviews were conducted with representatives of the UK electricity supply industry. Thematic and content analysis showed that a majority of interviewees represented human behaviour in a 'deficit' manner as either a consequence of a lack of information, appropriate technologies or economic incentives. Although interviewees acknowledged the limitations of these models, they were the dominant means of representing the domestic electricity customer within both non-renewable and renewable contexts. It is suggested that current UK government schemes simply reinforce an information deficit model of human behaviour and fail to change representations of the customer towards a more complex 'sustainable' or 'citizenship' model of human behaviour associated with a participatory rather than managed approach to the demand side. Thus the potential for systemic change from a centralised to a more decentralised system integrating renewable energy technologies was constrained by both industry regulations and by commonly-held beliefs representations and expectations about the typical electricity consumer.

Introduction

Increasing the generation of electricity from renewable or low carbon sources has become a key objective of UK government energy policy, with the goal of 20% of electricity to be supplied by renewable sources by 2020 (Department of Trade and Industry, 2003). Currently, the UK electricity supply system is predominately non-renewable, large scale, centralised and heavily regulated (Patterson, 1999). Corporate mergers and acquisitions since privatisation in the 1990s have resulted in vertically integrated energy supply companies that incorporate generation, transmission, distribution, supply and metering services and that are required to return their operational and financial accounts to the regulator as if each area of operation were independent of each other. Electricity generation from renewable sources offers a challenge to this system since it is often small-scale (has a capacity of less than 50-100MW) and embedded in the distribution network (i.e. situated in localities where the electricity is consumed). From a social perspective, distributed generation has the potential to significantly reduce the spatial and psychological 'distance' between electricity generation and the electricity user. Individual households and communities can use technologies such as building integrated solar photovoltaics (PV) or micro-combined heat and power (micro-

CHP) to generate their own power and become active stakeholders in energy supply. Increasingly, as part of the wider sustainable development agenda characterised by Agenda 21 in the UK, it is understood that such active involvement of individuals and communities in energy generation can create a series of beneficial outcomes at different social, economic and environmental levels, encompassing employment, skills, training, locally suited development, heightened environmental awareness, stronger social networks and local pride (e.g. Energy for Sustainable Development, BDOR, Projects in Partnership and The Planning Co-op, 2001). These localised contexts of electricity generation suggest innovative relationships of co-provision between consumers and energy companies as well as different roles (e.g. owner, user, and investor), responsibilities, control mechanisms and information communication technologies (ICT) that radically differ from those constituted under the existing centralised system (Devine-Wright and Devine-Wright, in press).

DEMAND SIDE MANAGEMENT

Within a centralised system, demand side management (DSM) has been identified as having two principle policy and industry objectives: to reduce demand for electricity (motivated, for example, by environmental imperatives such as limiting air pollution or carbon emissions) and to shift 'peaks' in demand (motivated, for example, by a desire for technical and economic efficiencies in the use of large scale generating plant). Demand management facilitates electricity system efficiency through better matching of demand and supply that reduces the need for back-up generation capacity during peak loads and optimises efficiency of continuously operating generating plant. DSM practices typically combine technical and economic strategies to manipulate demand (e.g. direct load control appliances that can be programmed to be switched on or off to match pricing information and/or consumer preferences; real-time price information or financial incentives for using appliances or systems during peak- or off-peak times of the day). Technically, DSM is believed to have a significant role to play in balancing an electricity network with greater distributed generation particularly where the electricity that is being generated is intermittent (i.e. from renewable sources such as wind or PV). In general, DSM practices have strong informational attributes (e.g. technologies such as electricity meters provide feedback about levels of consumption as KWh, financial savings or cost). Our research seeks to examine why information provision is such a strong aspect of DSM practices. We attempt this by identifying the psychological models and theories that underlie DSM practices as discussed by industry stakeholders. This is approached through use of the theory of social representations (Moscovici, 1961/1976; 2001) that seeks to understand the process by which unfamiliar, abstract and 'scientific' ideas become familiar and integrated into our everyday and shared understanding.

THE THEORY OF SOCIAL REPRESENTATIONS

The theory of social representations was developed to understand how scientific knowledge, about psychoanalysis originally, became 'translated' into common knowledge (Moscovici 1961/1976) amongst three different segments of French society. A diverse range of social science methods have been used to study social representations both singularly and in combination (Breakwell and Canter, 1993; Bauer and Gaskell, 1999) including the thematic analysis of one-to-one interviews (e.g. Devine-Wright, 1998; Vignoles, Chryssochoou and Breakwell, 2004). In our research we considered whether particular psychological models were being represented within the discourse of industry stakeholders and what 'themata', that is, "bits of knowledge or of beliefs shared by people, about which they talk, whether explicitly or implicitly, and which they take for granted" (Moscovici, 2001, p.31) were used to describe domestic electricity customers. Themata have different forms e.g. beliefs, maxims, social definitions, categories or symbols (Moscovici, 2001) which combine as 'patterns' to describe socially shared (consensual) ideas about objects and concepts. In the present context, these patterns were likely to reflect particular models of understanding about human energy/electricity behaviour. As Wynne and Irwin (1996) noted, electricity users are commonly represented within a 'knowledge deficit' model and this they believed needed to be remedied in order to drive forward appropriate consumption behaviour. As the contexts of electricity provision change with more domestic or community scale renewable energy initiatives it is interesting to investigate whether these contexts will challenge the validity of knowledge deficit models or foster alternative models. This is particularly important when intermittent sources of electricity generation are being used that require forms of 'appropriate' consumption behaviour that are 'sustainable' (Jackson and Michaelis, 2003) in order to maximise their operational efficiency.

From a social representations perspective, a 'knowledge deficit' model enables 'inner-directed' anchoring where beliefs are tied to a dominant conceptual framework that contrasts with objectification which is 'other-directed' and invokes alternative perspectives that require pictorial ways of seeing (Vignoles et al., 2004). We aimed to investigate whether this knowledge deficit model was the sole or main representation of electricity users amongst a sample of electricity industry stakeholders and if not, what other ways of understanding human energy behaviour existed. The efficacy of these models was considered in relation to the changing role of customers in the context of intermittent renewable energy generation.

The association of greater frequency and complexity of information with greater 'flexibility' in social relations could be seen as part of the wider information or knowledge deficit model of public knowledge, attitudes and behaviour (e.g. Sturgis and Allum, 2004; Hansen, Holm, Frewer, Robinson and Sandøe, 2003) supportive of increasing information provision as the primary means of facilitating greater involvement in electricity consumption issues such as DSM. Furthermore, the use of the descriptive term 'user' as opposed to electricity 'producer' suggests a commodity based view of energy (Stern and Aronson, 1984) that may be less applicable in the contemporary UK electricity industry that has become more service oriented. It was, therefore, hypothesised that the term 'user' would be invoked infrequently by industry stakeholders and that other terms, such as consumer, customer or participant that implied a less commodity-based view would be more prevalent.

Methodology

PARTICIPANTS

Participants included the industry regulator (OFGEM), distribution network operators (who would need to modify existing technologies or introduce new technologies to facilitate the connection of local embedded generation), utilities (with or without generation capacity from both renewable and non-renewable sources), metering organisations (who design, install and maintain devices that measure the electricity consumed and produced), consumer interest groups and stakeholders who use both renewable energy and metering technologies to manage electricity demand.

Initially participants were selected on the basis of their expertise in demand side management in the electricity sector, as represented by the institutional roles and reputations, and their prior knowledge of the Supergen Networks Consortium that consists of eight UK universities funded by the UK government through the Economic and Physical Science Research Council (EPSRC). Within the Supergen Networks Consortium specific project partners, including ourselves, are investigating the social acceptability, technical feasibility and economic viability of 'demand side participation in the control of distributed power systems'. These participants were then asked to nominate other experts within the industry on a 'snowball' basis. A total of 26 different organisations were approached in this way. Three recommended other organisations as more 'appropriate', five did not reply (including meter companies and control manufacturers) and two agreed to be interviewed but had to be postponed due to unforeseen circumstances. In total, 18 semi-structured interviews were conducted with representatives of the UK electricity supply industry (15 face-to-face and 3 by telephone). The participants represented a wide cross-section of the electricity institutions and included distribution network operators (DNOs) (n=3), representatives of the regulatory body (n=2), utility supply companies (n=2), meter operators (MOPs) (n=2), experts from the metering trade (n=3), load management device designers, manufacturers and installers (n=1), local authority energy managers (n=2), a consultant specialising in metering issues associated with the integration of renewable energy into domestic and social housing (n=1) and representatives of the electricity consumer body (n=2).

RESEARCH PROCEDURE

The interviews were conducted between November-December 2004. Each interview started with brief introductions and a request for the interviewee to describe their occupational roles and responsibilities. The main aim of the interview was to find out what industry representatives thought about demand side management in the UK (e.g. definitions, tools and practices, its effectiveness, issues of responsibility and how DSM could/should contribute to an electricity system with significant amounts of renewable energy generation) and for the purposes of this paper, the results and discussion focus upon both spontaneously generated references to electricity users in relation to DSM and responses to the specific request by the interviewer for the interviewee to describe 'the typical domestic electricity consumer'. As this request was made towards the end of each interview it allowed the interviewee to develop their own way of describing domestic electricity users. Each interview lasted between 30 minutes (telephone interviews) and 60-120 minutes (face-to-face interviews carried out at the participant's place of work).

All face-to-face interviews were recorded and subsequently transcribed whilst the content of the telephone interviews was recorded by hand and written up electronically immediately after each interview. There were approximately 112,500 words in total. To preserve the anonymity of the interviewees they were randomly numbered from 1-18 and quotations are attributed in the following way: interviewee (I) number (12) with actual source of quotations recorded by the first author in hard copy.

ANALYTIC PROCEDURE

The interviews were analysed for the frequency with which terms were used to describe the typical electricity consumer such as 'consumer(s)', 'customer(s)', 'people' and 'user(s)'. This quantitative approach was followed by an iterative process of reading and re-reading of the sections of text within which each of the previously identified terms were used. In the first instance the authors considered whether those on the demand side were being described in ways that were essentially positive or negative. A negative evaluation was established in four ways: firstly, where the terms were pejorative e.g. an absence of positive attributes such as cognitive ability, secondly where the presence of positive attributes was conditional e.g. qualified by IF or BUT, thirdly, where the extent of personal resources or ability was bounded e.g. by time or interest and fourthly, where descriptions implied membership of a different (and inferior) social category e.g. through the use of the term 'them' rather than 'us' or 'we'. A positive evaluation occurred when terms were used to describe a presence and/or excess of cognitive ability e.g. awareness, where these descriptions were unconditional, unbounded and socially inclusive i.e. they applied to themselves as well as to others.

This was followed by a categorisation of the sections of text according to whether the evaluations were being made in relation to a non-renewable or renewable energy context and to what models of human behaviour they implicitly (or explicitly) inferred.

Results

The most frequently used terms for describing those on the demand side were 'consumer(s)' and 'customer(s)' with 'people' being used as a substitute for the other two descriptors. The term 'user' was only used on 18 occasions and these were all in reference to 'end users' as predominately large commercial or industrial users of electricity. Customer was the term of preference for suppliers and DNOs (e.g. of 260 references to 'customer(s)' 55 were made by one utility representative and a further 46 by one DNO representative) whilst 'consumer' was most frequently used (39 of 77 references) by members of the electricity consumer group, representatives of metering manufacturers (12 references) and the industry regulator (9 references). 'People' was used as descriptor a total of 154 times in the interviews, most fre-

quently by the consumer group representative (n = 32) and the renewable energy installation consultant (n = 12). It was noted that participants with interests that were largely technical or economic either failed to used the term 'people' at all or did so infrequently (less than four times).

Most references to the customer were negative by either an absence of ability, interest etc. or by being conditional or bounded by effort, time, location, resources or degree of social influence. People lacked interest, care, action, time, knowledge or understanding and were outside or 'other' to members within the electricity industry. This negative representation of the customer was pervasive amongst all but one of the interviewees who summarised the 'traditional industry view' in the following way:

'*…customers …not interested in … information and they did not care. They would not use this so what was the point. Don't give them any and that sort of thing' (I4).*

This reflected a representation that assumed a lack of interest, a lack of care, limitations on the use of technological systems designed to save energy and a justification for low levels of customer involvement that was present amongst 14 of the 18 interviewees (exceptions were I4 and those with no direct contact with customers e.g. network operators: I6, I7 and I18).

> 'Customers don't have much interest in design they don't care about your technology' (I1)
>
> 'You can exhort people to do certain things change their lifestyle or whatever but at the end of the day it is very difficult to make them do it unless they get something out of it unless everyone involved gets something out of it…people will only do it if they can see some benefit in it for them' (I2)
>
> 'They think 'well sod it this all free renewable and I don't have to take care of it"(I3)
>
> 'Most consumers don't really care… How much is it? £400 per year? How much per month? Phah [noise of not caring]…Not an issue. Does not care. Not an issue.' (I5)
>
> 'Do we have to do it? Because people are lazy.' (I8:3)
>
> 'We will take for nothing something that is worth something to us but we have to structure it in such a way as the customer understands…' (I9)
>
> '… they never look at the smaller figure at the top of the page which actually says how much energy they have used. They never go there. I am in credit.' (I10)
>
> 'Most people who are fuel rich are set in their ways' (I11)
>
> 'There is only so much behaviour change that you can get out of people.. compare it to smoking' (I12)
>
> 'People don't think 'I will put the washer on now. People could not vary their lifestyles' (I13)
>
> '[Technology has to be] simple so that the user can forget about it'. (I14:2)
>
> '…Your piddly little solar panels you know… but you have got people who sit in there all day long with all their stuff their electrics going' (I15)
>
> '[Consumers] wants to have things easy … They want something that is easy to operate, that works and that is easy to understand' (I16)
>
> 'Within our overall corporate responsibility we are prepared to have this feather in our cap that we are happy to work with the fuel poor and all that sort of thing, but not at any price… well you might expect with some folk I expect I guess, heating their conservatories and heating their greenhouses, all things that you as a customer making the best of what you can would do' (I17)

Where there were comparisons between 'us/we' and 'them/they' the former were generally described positively whilst the later were described negatively even in situations where both were 'customers' of supply companies. For example, whilst 'us/we' as customers were: alert, aware, skilled, resourceful, factual, complicated and demanding e.g. 'I want regional renewable energy' 'them/they' as customers were typically: unaware, fraudulent, prone to avoidance/denial, simple and self-interested e.g. preferring comfort over CO_2 savings) (I10).

Of only 10 positive references about the domestic customer, a single interviewee from the meter manufacturing sector accounted for 50% of the occurrences (n=5) e.g. *'People do care' (I4).* The other respondents were a meter services expert (n=1), an energy supplier (n=2) and an energy consumer group representative (n=2) who said *'People are aware of where their energy comes from and how much they use' (I7).*

The analysis of the models of human behaviour implicit within discourse about the domestic customer was combined with consideration of the renewable/non-renewable energy generation context. Two related 'models' were identified. The first (and most prevalent) model operated at the individual level and the second model operated at the collective level. Within each model there were 'versions' which assumed that behaviour change would be promoted through provision of either a) information b) technologies (such as meters) or c) economic incentives.

At the individual level, the 'information deficit' version was prevalent (identified within the transcripts of ten of the interviewees). It described a linear relationship between information provision raising awareness or understanding and resulting in action e.g. requesting additional information, choosing a 'green' energy tariff or installing domestic scale renewable energy generation technology. For example, *'if you just tell consumers that they are paying it [energy efficiency commitment and renewable energy subsidy] then they might actually ring up and say 'well what can I get?' (I3)* However, although prevalent, the limitations on the effectiveness of the 'information deficit' model were also acknowledged by four interviewees e.g. when customers received conflicting information about the effects of climate change from different media sources or 'counter intuitive' information about energy saving from those with an interest in promoting energy consumption namely energy suppliers. This is illustrated in the following excerpt: *'there does seem to be a rise in awareness of obligation to the environment but then you pick up the paper and it says 'this is all a load of rubbish' and 'it is normal' and 'it would happen anyway' and suddenly people get switched off again' (I8).*

The individual level 'technological fix' versions expressed by four of the interviewees were interesting because they were seen to be less effective in promoting behaviour change. This lack of effectiveness was partly attributed to 'deficits' in information provision e.g. about how to work heating controls but also to a belief that to be effective technologies would have to be 'set up and forget'. This

was interpreted as interviewees legitimating an absence of engagement or participation on the part of the customer e.g. *'It [domestic demand side management technologies] has to be 'set up and forget' or 'plug in and forget' especially if people use it everyday and then they learn quickly what they want to do with it' (I14).*

The 'economic fix' version described least cost as the major motivating factor for promoting energy-related behaviour. Economic incentives e.g. subsidies, grants or tax benefits and economic penalties e.g. higher costs of electricity were perceived to motivate customers to act through increasing the likelihood that they would 'care'. In the absence of any significant cost customers would not act in an environmentally responsible manner e.g. *'They think 'well sod it this all free renewable and I don't have to take care of it"(I3).* However, where comparisons were made between the effectiveness of information provision relative to economic incentives respondents believed that information provision would be more effective, for example, *'if you have to change hearts and minds you need to provide them with the information to do this rather than offering discounts which won't always do it. But offering information will so this is a cost that the [energy] supplier has to bear' (I7).*

The collective level models were very similar in the sense that they invoked information provision, technical fixes or economic incentives as the main determinants of behaviour change. However, they differed from individual level models by referring to collective obligations and duties e.g. hitting environmental targets to reduce CO_2, cooperation or shared responsibility as illustrated in the following quotations: *'we are sending a signal saying 'now there is extra wind energy can you use it?' and if people are cooperative they will turn on their washing machine, their TV and everything like that to use the renewable energy' (I1)* and *'[demand side management] will only work if there is shared responsibility which is an interesting concept in itself. You know you can exhort people to do certain things, change their lifestyle or whatever, but at the end of the day it is very difficult to make them do it unless they get something out of it unless everyone involved gets something out of it' (I2).* References to energy service companies (ESCOs) that would provide heat, light and power to customers were extremely limited and only arose in response to prompts by the interviewer. Of two respondents, one recognised the potential of ESCOs to deliver *'environmental value'* that was *'different to how it has been in the past' (I2)* and the other laughed as he admitted that for ESCOs there was 'nothing to tell at the moment' (I3). Both individual and collective models were used in relation to non-renewable and renewable generation sources but the role of domestic customer-producer led I2 and I3 to add additional sustainable factors to their linear models like job creation, reduced CO_2, aesthetics of the local environment and other 'fluffy issues' (I3).

Discussion

This paper aimed to identify how UK electricity industry stakeholders represent domestic electricity consumers, drawing upon the theory of social representations (Moscovici, 1961/1976) and to investigate to what extent, if at all, these representations are (or might) evolve as a consequence of greater domestic-scale renewable energy deployment. The results showed that the term 'user' that had been used within previous social studies of DSM (e.g. Marvin et al., 1999), was not commonly used by participants in the current study. It was limited to the commercial and/or industrial sector rather than the domestic sector where the terms 'consumer', 'customer' and 'people' occurred. Therefore, demand side descriptors should take into account the sector-specific nature of commonly used terms as well as the limited functionality of the term consumer in the context of co-provision associated with domestic scale renewable energy generation. The choice of term is important since different terms imply different expectations about service provision with customer(s) appropriately describing people who require both demand and supply side services as domestic scale electricity generators using, for example, domestic scale wind turbines, CHP or PV installations as well as receiving electricity from the network. Use of consumer or customer reflects the market-driven approach to electricity supply and demand post-privatisation in the UK.

Although customer was prevalent and apt for the role of user-producer of electricity, the results showed a complete absence of descriptors like energy 'citizen' (Morris, 2001) that would have represented active or participatory involvement in electricity demand and supply (Devine-Wright and Devine-Wright (in press). There was also an absence of community-level descriptors of collectivities engaged in electricity demand and supply, as have begun to emerge within the context of UK support programmes such as the Community Renewables Initiative and Community Action for Energy (Devine-Wright, 2005). The absence of reference to such community level descriptors suggests that, despite government-sponsored support programmes being delivered across the UK, active individual or community roles in electricity supply and demand are absent from social representations of those on the electricity demand side amongst some industry representatives. With such a negative and restricted representation of customers it seems likely that renewable energy generation technologies and the metering technologies that they require will continue to be designed to 'fit and forget': an approach that legitimises an absence of customer knowledge, participation or 'care' on the part of the energy provider as a traditional energy supplier, an energy service company or a domestic co-provider. As energy technologies evolve, their design and implementation will be influenced by the prevalence of such a 'deficit' themata i.e. 'core notions or beliefs' (Moscovici, 2001) within the social representation of customers.

The predominantly negative representation of electricity customers was achieved by anchoring beliefs about the customer not only in a in an individually focused 'knowledge deficit' manner (Wynne and Irwin, 1996) but in a wider social 'deficit' representational framework whereby customers lacked socio-cognitive skills (e.g. motivation, awareness or empathy expressed as care), socio-economic resources (e.g. thriftiness, frugality or miserliness) and socio-morals (e.g. fraudulence, deception or collective responsibility). These beliefs were evident in the responses of a wide range of stakeholders within the industry from utility representatives to technical experts as well as amongst those with a particular interest in consumer affairs. There was little evidence that industry stakeholders were aware of more complex mul-

ti-dimensional models of behavioural change (e.g. Gardner and Stern, 2002). New metering technologies and renewable electricity generation was believed to have the potential to alter social relations in the supply and demand of electricity. Respondents considered that new forms of social relations might arise from an influx of new participants in the energy industry (e.g. energy brokers, distribution network operators with exemption supply licenses and local, including domestic scale, electricity producer-users). It was these participants rather than energy customers who were perceived by the respondents as likely to enable systemic change in metering, generation and network technologies, thus requiring a reorientation of electricity commodity provision toward energy service provision. However, the extent of systemic change was perceived to be highly constrained by regulation and as we would suggest, by the essentially negative beliefs and expectations that current representatives of the electricity industry hold about the typical electricity customer.

Conclusion

From a social representations theory perspective, the key 'themata' in the representation of the customer held by a small sample of representatives of the UK electricity industry was one of 'deficit'. There was limited evidence of either a more complex (Gardner and Stern, 2002) or alternative holistic/sustainable representation despite the relative novelty of the renewable energy generation context. Customers were not represented in ways that were 'participatory' or 'communitarian' e.g. there was an absence of references to 'energy citizens' (Morris, 2001) that would reflect active participation in demand or supply activities, both at individual and community levels of analysis. Where innovation was perceived as possible, this was attributed to the entry of new actors or participants in the electricity industry, rather than stemming from the actions of domestic electricity users. Thus the potential for systemic change from a centralised to a more decentralised system integrating renewable energy technologies was found to be constrained by both industry regulations and by commonly-held representations that reflected beliefs and expectations about the typical electricity consumer, beliefs that legitimated the exclusion of customers from a more active participatory role in novel contexts of energy provision.

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