

# Making electricity networks “visible”: Industry actor representations of “publics” and public engagement in infrastructure planning

Matthew Cotton and Patrick Devine-Wright

This interview study with UK electricity distribution and transmission network operators (DNO and TNO) and the regulator Ofgem, examines how key industry actors conceptualise “publics,” “stakeholders” and “customers” and how these conceptualisations subsequently inform their engagement practices with these heterogeneous groups. The results show that regulatory changes to the structure of distribution networks have encouraged greater levels of “stakeholder” involvement. However, DNO regional monopoly powers and the regulatory environment serve to conflate network actors’ representations of “the public” with “customers,” and also “hides” DNO roles in a manner that precludes direct citizen engagement. TNO respondents employ public exhibitions in transmission line siting, although at a stage “downstream” in the decision-making process whereby citizens have little decisional influence. We conclude that network operators adopt the rhetoric of deliberative engagement whilst lacking a clear rationale and effective means to incorporate citizen perspectives in long-term network development or specific infrastructure siting proposals.

**Keywords:** electricity networks, energy infrastructure planning, public and stakeholder engagement, representations of publics

## 1. Introduction

### *Electricity transmission and distribution*

In the United Kingdom, significant technological and infrastructural developments are planned for the interconnected network systems of electricity transmission and distribution commonly referred to as electricity “grids.” In the UK, the centralised electricity networks comprise 181 power stations, over 26,000 circuit kilometres of electricity lines, 575 substations at points where changes in voltage are necessary and over 1000 transformers (National Grid, 2005). The technological infrastructure is three-tiered. First are the electricity *generators* i.e. power stations and larger scale renewable energy sources. Secondly, *transmission systems* are engineered for the bulk movement of electricity at high voltages (usually 400

kilovolts [kV] or 275 kV) from generators to distribution systems and to a small number of large industrial customers. Thirdly, *distribution systems* provide electricity to the majority of customers through lower voltage localised networks (typically 132 kV to 230 kV) (Butler, 2001). Since the privatisation of the electricity industry following the Electricity Act 1989, the previously government-owned and vertically integrated UK Central Electricity Generating Board and Regional Electricity Boards have been superseded by privately owned transmission network operators (TNOs) and distribution network operators (DNOs) respectively. It is the perspectives of key actors within the TNOs, DNOs and the regulator responsible for the networks industry: the Office of Gas and Electricity Markets (Ofgem) that form the central focus of this study.

### *The prospect of change to electricity networks*

UK government strategy for energy generation is undergoing a shift towards increased use of renewable resources and the prospect of new nuclear power. This agenda is driven primarily by economic and environmental restraints on the use of fossil fuels and subsequent CO<sub>2</sub> reduction targets, as well as by concerns with long-term energy security. Changes to the generating capacity of the UK's portfolio of energy resources consequently impact on the planning and management of the transmission and distribution networks and the levels of investment required. This pattern is reflected across Europe with an estimated €500 billion of investment in the networks necessary to meet growing energy demands, sustainability and energy security needs (European SmartGrids Technology Platform, 2006). Network developments include adaptation to greater levels of distributed/micro-generation from localised, small-scale renewables and combined heat and power devices (primarily on the distribution level). Also greater automation of the networks is emerging as a technological goal under the rubric of "smart electricity grids" (Massoud Amin and Wollenberg, 2005); and strategies for demand-side management of electricity supply are facilitated by new "smart metering" technologies that identify detailed electricity consumption information and communicate this detail to the network operator and electricity suppliers for monitoring and billing purposes (McCracken, 2008). At both transmission and distribution levels these network developments require the siting of new infrastructure to reinforce the network, upgrade the existing assets that approach the end of their operating life, and install new connections to electricity users. As such, this article considers network developments primarily in terms of technological infrastructure siting as opposed to the research and development processes around metering technologies, or upgrades to improve the comparative "smartness" of the grid.

On the transmission scale, greater levels of renewable and nuclear energy sources necessitate upgrades to various network components to cope with changes in supply. However, in certain cases, the construction of new infrastructure has generated significant public controversy and subsequent planning delays (Jay, 2004). Public controversy is partially rooted in local environmental factors. Firstly, overhead lines cause visual intrusion in rural and suburban landscapes (Priestley and Evans, 1996) and cause zooming (corona discharge) sounds that create noise pollution and sometimes raise safety concerns amongst local residents (Klüser, 2009). These factors have been shown to affect property and local amenity values in the areas where they are sited (Sims and Dent, 2005). Secondly, potential health risk concerns have been raised: in particular, questions over cancer risks due to electric and magnetic fields emitted by lines (Draper et al., 2005). In addition, opposition to infrastructure siting stems in part from a lack of familiarity with the roles of network operators and hence a lack of trust (Devine-Wright and Devine-Wright, 2009); and also from a lack of expectations amongst local residents for community involvement in planning processes (Devine-Wright et al., in

preparation). In light of these factors, wide-scale public opposition has occurred in a number of cases of overhead line siting. These include the 50-mile 400 kV Lackenby–Picton–Shipton overhead transmission line from Teesside to York in the 1990s, which became mired in public controversy with the affected local authorities formally objecting, along with MPs, MEPs and approximately 8000 people (O’Carroll, 2002); and more recently, the proposed upgrades to lines between the Scottish towns of Beaulay to Denny from existing 132 kV capacities to the higher 275 kV and 400 kV (Devine-Wright and Devine-Wright, 2009).

### *Opposition and engagement*

Given the often publicly controversial nature of infrastructure siting, success is dependent upon generating support (or at least ameliorating opposition) from local communities, public planning bodies, the regulator Ofgem and numerous stakeholder groups. Where such opposition occurs, one oft-cited solution is to improve the level of direct community and stakeholder involvement in the processes and outcomes of decision-making. Within science and technology policy, the practice of involving public and stakeholder actors in decision-making processes has arisen primarily as a means to ameliorate the public scepticism, cynicism, and mistrust that has undermined technology development plans in European countries (Hagendijk and Irwin, 2006). The concept of routine engagement between the public and scientific institutions has grown within UK science and technology policy, in part, following the House of Lords Select Committee on Science and Technology report that identified a “new mood for dialogue” whereby direct engagement with the public over science-based policy making was encouraged to shift from being an “optional add-on” towards being a “normal and integral part of the process” (House of Lords Select Committee on Science and Technology, 2000). The implications of the report represent a move away from top-down, techno-centric decision-making towards genuine changes in the cultures and constitutions of key decision-making institutions (Irwin, 2001). It is therefore increasingly recognised within non-governmental organisation (NGO), academic and policy circles that deliberation on technology-based issues is no longer the exclusive purview of politicians and technical specialists and that decision-making processes require new participatory structures and methods to enable involvement of a broad range of actors including the public (Irwin and Wynne, 1996; Hunsberger and Kenyon, 2008). Engaging “the public” at different stages in policy development, using participatory and deliberative methods has become an accepted and legitimated practice, and the nature of political decision-making over the governance of controversial technological developments has changed as participation becomes institutionalised across government departments (Chilvers and Burgess, 2008). Similarly, private sector organisations have increasingly become accustomed to public engagement as a statutory requirement in planning processes (Owens and Cowell, 2002). Overall, this has resulted in increased opportunities for citizens to participate in the processes of political governance around technology implementation (Rossi, 1997) and also a change in the way that environmental, techno-scientific, resource use and planning objectives are achieved. Also, increasingly within academic and policy circles there is a concerted move to bring public involvement on technology policy issues “upstream” in the development process (Wilsdon and Willis, 2004); whereby non-scientists have input into the innovation and development processes of technology implementation and engage with social and ethical issues before a technology becomes stabilised or “blackboxed” (Law and Hassard, 1999), in a manner that limits public discussion on implementation to limited notions of benefits, impacts, costs and risks (Sclove, 1995) at a stage “downstream” of their development. One of the key aims of this study is therefore to establish the stages at which network operators engage with the public in the development of electricity network infrastructure.

In the UK government's strategy for sustainable development, public and stakeholder involvement is stated as an "essential" component of planning processes (DETR, 1999) and is considered by some in academic and policy circles to be a kind of "gold standard" for decision-making (Felt and Fochler, 2008). Such involvement is often proposed as a means to achieve "lower costs, fewer delays and less uncertainty in the planning process" (Department of Trade and Industry, 2007: 259); and by fostering greater community support, it is often posited as a means to render decision-making processes and resultant policies as legitimate in the eyes of decision-makers (Beierle and Konisky, 2000). In addition to such practical and strategic planning benefits, Fiorino (1990) suggests potential "substantive" advantages, namely that the inclusion of stakeholder and local community preferences and values can elicit important information that is otherwise overlooked in a solely technical analysis, thus making technical decisions more "socially robust" (Beierle, 1999). Citizen deliberation can reveal new kinds of information relevant to the decision that may otherwise be overlooked; overcoming the problems of bounded rationality (Bell, 1999) or inadequate information provision (Owens, 2000). It can also shape technical specialists' sense of social responsibility, consequently having broader effects upon everyday scientific and technical practice within the organisations involved (see Kerr et al., 1997).

There are also significant moral justifications for widening participation in electricity network development. The involvement of the public and locally affected stakeholders has involved appealing to concepts of procedural justice, fairness and human rights (Fiorino, 1990; Pellizzoni, 2003). Public involvement encourages citizens to engage in a two-way dialogue with network operators, helping to foster mutual trust and information exchange that can ultimately improve the reliability, accountability and acceptability of the decisions that are made (Habermas, 2002), and hence allow greater citizen control over the development of local spaces, and fairer representation in technology planning processes.

### *The concept of the public*

At the heart of the analysis of engagement practices in an industry such as this, is a fundamental question over the status of different actors embedded within electricity network systems. Of particular interest here is how industry actors conceive of the "public." When considering interactions between technical organisations such as the network operators and "the public," much of the literature within Science and Technology Studies has critiqued homogeneity of "the public" as a "black box" (Irwin and Wynne, 1996) and hence STS scholarship often recognises a plurality of heterogeneous "publics" (Rayner, 2003). As Burningham et al. (2007) suggest, understanding how technical specialists construct the concept of heterogeneous publics is crucial in any attempt to understand their patterns of public engagement. In particular, Maranta et al.'s (2003) study of the social construction of publics by technical specialists concluded that they are "lay person makers" that construct citizens as "imagined lay persons." Such expert characterisations of publics consequently inform the communication strategies they deploy, as "experts cannot set up imagined lay persons without having a concept of how to communicate with lay persons" (Maranta et al., 2003: 157). Barnett et al. (forthcoming) draw upon this concept of imagined lay publics in a study around the implementation of renewable energy technologies. They find that experts and industry actors conceptualise of publics in different categories, broadly defined in three groups: as "supporters" of renewable projects, "opponents" and a larger group of those that "did not have a view." By contrast, Burningham et al.'s (2007) study of key actor conceptions of "publics" with representatives of different chemical industry organisations, found that concepts of

“publics” and “citizens” were not commonly used by industry actors. They found instead that “customers” and “neighbours” (those living close to industrial facilities) were frequently mentioned. “Customer” and “neighbour” categorisations were not, however, synonymous with “publics” or “citizens.” “The public” were linked with ideas about public opinion and public pressure, and were constructed as the bearers of opinions and values which might impact upon the company. The public consists of those individuals acting within the public realm, i.e. “the man in the street” was differentiated from the consumer within the supermarket or private individual within the home. Their study showed how key industry actors represent the public multidimensionally, and that these conceptions were inextricably bound up with both characterisations of their knowledge and modes of engagement with them (Burningham et al., 2007).

In terms of electricity network industry actor representations of “publics,” Devine-Wright and Devine-Wright’s (2005) interview study of DNO, electricity supplier and metering organisations around issues of demand-side electricity management found that the most frequently used terms for describing non-industry affiliated members of the public were “consumer(s)” and “customer(s)” with “people” being used as a substitute for the other two descriptors. They also found that technical and economic specialists either failed to use the term “people” at all or did so infrequently. Most references to the “customer” were negative, either expressing an absence of ability or interest, or by being conditional or bounded by effort, time, location, resources or degree of social influence. They conceived “people” as lacking interest, care, action, time, knowledge or understanding and hence were outside or “other” to members within the electricity industry (Devine-Wright and Devine-Wright, 2005). These findings are mirrored by Marris et al.’s (2001) work on agricultural biotechnologies, that shows how persistent received ideas are commonplace amongst key industry and stakeholder actors about what constitutes the nature of the public and public values towards controversial technologies. These received ideas include the construction of the public as ignorant about scientific facts; as polarised “for” or “against” technological developments; demanding of “zero risk” scenarios; basing their opposition upon non-scientific, ethical or political factors; and as the malleable victims of a distorting and sensationalist media (Marris et al., 2001). Together, these dominant ideas about publics are characterised by “deficit model” assumptions (Wynne, 1982) that regard the public as passive, ignorant and worried (Irwin and Michael, 2003). Deficit model assumptions about public understanding of science and technology are linked to concepts of scientific and technical literacy, i.e. the ability to understand scientific and technical matters “correctly” in the manner in which they are communicated by experts (Bucchi, 1996), and thus technical specialists are represented as knowledgeable experts. By working under this assumption, the key task becomes more and better communication of expert knowledge to the public in order to allay misinformed, “irrational” objections and encourage them to adopt a more positive attitude towards technical proposals (Royal Society, 1985).

This framing of the public has often led to what are termed “Decide–Announce–Defend” planning strategies (Wolsink, 1996) apparent in the Lackenby–Picton–Shipton and Beauly–Denny examples; involving technical expert input into siting followed by public relations exercises to communicate the decision, and subsequent defence through processes of public inquiry against the local backlash to the proposals. By framing publics in such a manner and adopting these types of decision-making strategies, the underlying assumptions of public reactions to proposals invoke the (widely critiqued) Not In My Back Yard (NIMBY) concept: a characterisation often used by proponents of facility siting as “a succinct way of discrediting project opponents” (Burningham, 2000: 55). Characterising publics as NIMBYs assumes

that they generally support the construction of network infrastructure in principle as being beneficial to society, although in practice proposed facilities to provide these services are opposed by local residents (Wolsink, 2000). NIMBY is a controversial label because it oversimplifies public responses to siting, and (wrongly) characterises local opponents as disruptive, selfish and ignorant (McClymont and O'Hare, 2008). It is however, a term in widespread use, and a common characterisation of opponents to infrastructure siting. Given the nature of network organisations as primarily composed of technical, scientific and economic specialists, this study is designed specifically to test these assumptions about the network operators' representations of heterogeneous, non-industry actors concerned with localised infrastructure siting.

### *Electricity industry structure*

Relationships between network actors and publics are further problematised by the structure of the electricity industry itself. As mentioned previously, the deregulated utility service provision in the UK has followed the privatisation of the electricity industry during the 1990s. Industry structure is characterised by network operators having a strong spatial presence in their service areas, leading to what Graham and Marvin (1994) term utility "embeddedness." This embeddedness is due to the low level of potential revenues and high capital costs that have discouraged new market entrants to invest in network infrastructure or take on new customers there, and hence whereas electricity markets were characterised by public monopolies before 1990, since deregulation, distribution and transmission have remained as de facto private monopolies (Graham and Marvin, 1994).

Competition for electricity *supply*, by contrast, has been opened up to market competition following the Utilities Act 2000. The previously integrated electricity companies are now required to have separate licences for their supply and distribution businesses in order to stimulate market competition. Electricity consumers now have a range of around 70 electricity suppliers to choose from (Auditcube, 2009), and the majority cover the whole UK. Whereas the electricity consumer has a wide choice of supply companies and the means to compare electricity unit prices through Internet comparison sites, an underlying cost as part of their bill is a charge to the transmission and distribution operators. This price remains controlled by licensed network operators working as regulated regional monopolies, and this cost remains largely "hidden" to customers. The network charge (in part) goes towards the construction of new network infrastructure, and so network expenditure on infrastructure is heavily regulated by Ofgem in order to protect consumer price interests. The fact that this cost is "hidden" reflects broader public unfamiliarity with network operations. Through focus group discussions and survey research with citizens around perceptions of network technologies, Devine-Wright and Devine-Wright (2009) have shown that many citizens presume a high level of ministerial involvement in managing "the National Grid," with little awareness of the existence or roles of network operators or Ofgem. What emerged was a sense of "vagueness" around issues of ownership, operation, and responsibility for electricity distribution from participants, in contrast to a greater awareness of technological components such as pylons, wires and substations. One factor that this paper shall consider, therefore, is the extent to which the network operators are "hidden" from their customers owing to the industry structure and regulatory environment in which they operate.

### *Research aims and hypotheses*

Despite the importance of electricity networks in meeting sustainability and energy security goals, there is a surprising paucity of social scientific studies around the roles of network

operators and the ways in which citizens are involved in network planning processes. The primary aim of this study, therefore, is to explore through qualitative analysis, the ways in which network actors construct identities for non-industry affiliated groups and individuals, for example as “the public,” “customers” or “stakeholders” and then to assess how these concepts inform the rationales, methods and practices of “engagement” that occur. Within the context of this study we refer to the aforementioned groups as heterogeneous conceptual categories. However, like Burningham et al. (2007), we acknowledge that our analysis of the concepts of publics, stakeholders and customers involves an element of “ontological gerrymandering” (Woolgar and Pawluch, 1985), i.e. we investigate these phenomena as though they were unproblematic topics for investigation, whilst also maintaining that the concept is socially constructed by our interviewees. With this caveat in mind, it is hypothesised that given the nature of network organisations as primarily composed of actors with technical and economic expertise, their conceptions of non-industry actors will be framed in terms of deficit model and NIMBY assumptions about the roles, values and actions of these groups towards network operator organisations. It is also hypothesised therefore that this will lead to engagement practices characterised by “downstream” (Stirling, 2004) citizen involvement in the processes of infrastructure planning and development at stages whereby non-network actors have little decisional influence, using strategies of information provision and placation (Arnstein, 1969). It is through a qualitative analysis of data drawn from interviews with key network actors that these hypotheses are tested.

## **2. Methods**

To begin, a standardised interview protocol was constructed with questions asked sequentially in five areas, to establish:

- 1) The role of the organisation and the interviewee’s role within it;
- 2) Specific recent and planned developments, in terms of technology, infrastructure, planning and policy;
- 3) The concept of “publics”: accessing representations, experiences and expectations of citizens, customers, communities and stakeholders;
- 4) Examination of participants’ models of engagement, how these have evolved and how they are applied in practice;
- 5) Participants’ direct experience in public and stakeholder engagement activities, and their attitudes towards future activities.

Using a snowball sampling strategy, access to participants was based upon information gained from early interviews. Individually tailored letters were sent to potential interviewees, followed by telephone and e-mail contacts. Interviews typically lasted 40–50 minutes and were conducted either face-to-face with representatives at their respective offices or at the University of Manchester, or through recorded telephone conversations where access was limited.

Twenty-two semi-structured interviews were conducted in total (with two additional informal, unrecorded discussions not included in the sample), with representatives from the parent companies of each TNO and DNO within England, Scotland and Wales, the regulator Ofgem and an additional interview with a non-network operator representative who was nevertheless professionally involved in projects concerning overhead line siting (and wished for their organisation to remain anonymous) shown in Table 1. Participants were sampled

**Table 1.** Industry composition of interviewee sample

Organisation	<i>n</i>
National Grid	5
Scottish and Southern Energy	3
CE Electric	2
Electricity North West	2
Western Power	1 (a second interview was declined)
Central Networks	2
EDF Energy	2
Scottish Power	3
Ofgem	1 (a second interview was declined)
Non-network representative	1

*Note:* A higher proportion of representatives were from National Grid, which as the largest of the transmission network operators, merited greater attention in order to balance against the larger number of distribution network operators.

across a range of different occupational backgrounds within the network-related organisations, including (but not exclusively) stakeholder relations, customer service, network planning, research and development, network engineering, environmental assessment and governmental and regulatory affairs.

The interview data were transcribed and coded using MaxQDA software, based upon a constructionist epistemology and “thematic” coding structure (Coffey and Atkinson, 1996; Boyatzis, 1998) to inductively draw together emerging themes from the data set for further analysis and discussion, the results of which are presented in the following sections. Utterances are anonymised and participants are denoted as DNO, TNO, Regulator or Non-network, and given a number for differentiation.

### 3. Results

The results are first differentiated by DNO, TNO and regulator responses, followed by a more general industry-wide discussion.

#### *Regulatory change and the shaping of DNO engagement practices*

From the DNO perspective, network development is framed by the future-oriented planning process termed the Distribution Price Control Review (currently the fifth of such reviews – DPCR5) run by Ofgem. DPCRs operate on a five-year cycle, and set the total revenue allowances that each DNO can collect from customers to finance their activities. Through this process Ofgem incentivises DNOs to innovate in network efficiency and balances the requirements for network capacity, electricity security, reliability and quality of service (Fletcher, 2009). At the time of writing, the current price control expires on 31 March 2010 and so DPCR5 is currently under way to set the controls for 2010–2015. DPCR5 is in some respects, separate from the licensing obligations of the network operators. As one DNO representative states:

DNO 4: The energy network has, particularly in the licence side ... been pretty static. They provide the network and access to the network and allow people to work on the network and fix the faults on the network; that has stayed pretty standard.

DPCR5 controls expenditure on infrastructure in addition to the licensing obligations of the network operators. One factor that differentiates DPCR5 from previous price control review processes is the inclusion of a greater element of stakeholder engagement in setting the revenue allowances and investment priorities for the DNOs than in previous cycles.

DNO 5: Ofgem have an expectation this time that the DNOs do more stakeholder engagement than they have previously.

DNO participants expressed that prior price control reviews were based upon technical criteria defined by DNOs and then tested by Ofgem consultants, in a largely techno-centric approach. It was clear that DNOs have been instructed by Ofgem to engage more with stakeholders this time, although the specific rationale for greater stakeholder engagement appears unclear to both DNO and regulator participants. The most cited reason, however, was the influence of broader government strategy towards engagement with energy planning and development. It appears therefore that the motivations for stakeholder engagement seem to have been “transferred” from other aspects of the energy and sustainability agendas:

Regulator 1: With [DPCR4], there was an element of stakeholder [engagement] within Ofgem through areas of research. Certainly this time round it was something that was felt that as, I think, a focus on consumers and ... with the whole sort of agenda around the energy act that came out last year. The government focus on these issues has increased .. I think it was part of a sort of organic approach [where] there needs to be a lot more critiquing and focus on the consumer side of the decision-making. From Ofgem’s point of view, I couldn’t pinpoint where there was a decision saying, this is why we’ve decided to do this.

This statement illustrates the ways in which stakeholder engagement is becoming an institutionalised practice as part of the wider political agenda for the energy sector. Whereas the industry and the regulator had previously engaged in a two-party dialogue about network development, increasingly new actor interests are being incorporated into the price control process.

#### *With whom do the DNOs engage?*

In DPCR5, DNO representatives reported the identification of a range of different stakeholder groups for ongoing consultation. All DNO representatives reported that their organisations have been involved in stakeholder engagement processes. For some DNOs it appears that the mapping of stakeholders was ad hoc, involving engagement with organisations within which they maintain regular business relationships. In other cases, systematic stakeholder mapping was undertaken and a more representative group of business and consumer interests was involved in consultation, using participatory methodologies such as stakeholder workshops:

DNO 5: We did some stakeholder events where we invited, not end customers as such, not small customers, but lobby groups. And we did invite major customers, supply companies, generators, developers and local authorities and MSPs and MPs.

Generally speaking it appears that stakeholder mapping processes for the DNOs follow a rationale that O’Mahony (2004) terms the “stakeholder route to corporate responsibility,” whereby the stakeholders are defined through relationships of trust and goodwill built with groups or individuals that are expected to have an impact on business operations. What is clear, however, is that there is a marked difference between the types of engagement processes that occur between the DNOs and their identified stakeholder organisations, and those that

occur between the DNO and non-institutionally affiliated representatives of “the public.” To explore this difference it is therefore necessary to examine how the participants characterised “the public,” and use the data to test the aforementioned assumptions about their conceptualisation of public actors.

### *DNO representations of “publics”*

The critical and predominant feature of the DNO participants’ representations of “the public” is that “publics” or “citizens” are conceptually contiguous with “customers”:

Interviewer: Do you have any direct communication with the broader public outside of the identified stakeholder groups?

DNO 6: You mean customers?

[Same question in a different interview]

DNO 3: Because we are a regulated monopoly, effectively, anyone who’s an electricity user within our region is a customer of ours. We wouldn’t draw a distinction between members of the public and customers.

This finding contrasts with Burningham et al.’s (2007) study of expert representations of “the public” by chemical industry actors. Whereas they found that industry actor representations of the public were multidimensional, and that publics differed from customers/consumers, no similar distinction is made by the DNO participants in this case. The underlying reason for this is likely based within the regional monopoly powers of DNOs. Whereas the chemicals industry had “neighbours” living close to facilities, and “customers” that bought their products, electricity networks are deeply “embedded,” meaning that the overwhelming majority of the UK public are connected to electricity networks, and hence are “captured” within geographically bound network operator regions. On the transmission level, a TNO representative further illustrated this point. TNO 1 compared electricity to a commonly available consumer product “like baked beans” stating that in contrast to individual consumer choice over consumer goods, “society needs these power lines built.” Electricity differs from “baked beans” in the sense that if a consumer product such as this is publicly unfavourable, consumers have the option of not purchasing it, hence solving whatever social problem it causes. Electricity by contrast is transient, the infrastructure is sited in a local place but the benefit is diffuse and distributed across society. The implication being, that the infrastructure is instrumental in discursively “making” the citizen a de facto customer, which limits consumer power to make social choices about how networks develop and in turn influences the means and methods with which the industry engages with them.

In terms of influence within the DPCR5 process, this has significant ramifications for customer involvement in decision-making. In some cases there were opportunities for “customers/publics” to provide feedback on the consultation options proposed for network expenditure by DNOs. In DPCR5 these included options like reinforcement of substations to prevent flooding, or the changing of oil insulated to non-oil insulated cables. What was clear, however, is that consultation on these options occurs “downstream” in the sense that customers/publics gave feedback on options that were predefined by the network operators, i.e. those that they considered were of interest to the “customers” as a specific stakeholder group. These options were defined as:

DNO 5: ... the nice to haves, the optionals, and did customers think they were things that we should be doing or not.

In terms of methods, the consultations with customers were often in the form of a web-based questionnaire on the company website; however, responses to the consultation documents

were often limited. For example one DNO representative reported 200 responses, but this is within the context of the DNO customer base of 5,000,000 people (EON Central Networks, 2009). It was also unclear how customers were encouraged or directed to respond. Although DNOs are required to publish their longer term development plans (funded by customer money) in the public domain, it appears that DNOs do not seek “active” consultation through formalised mechanisms of consumer representation and feedback in decision-making. This appears therefore either to be non-existent (in the case of some DNOs) or else feedback only comes from a tiny minority of the overall customer base.

In terms of siting new infrastructure, DNOs reported that they are required to connect new domestic and industry consumers under their licensing obligations, and plans for new connections are included in the planning applications for (for example) new housing and industry developments. Opportunities for public involvement in the siting of distribution infrastructure (such as lower voltage lines supported by poles) is limited to those opportunities for public consultation in the planning application process. It appears from the DNO interviewees’ responses that no additional engagement around siting generally occurs. Of particular note however is that DNOs have a system of wayleaves: contractual licences involving an annual payment to the owner or occupiers of land where infrastructure is sited, to cover the financial impact of having equipment on their land. Direct engagement around infrastructure siting is therefore limited to the developer (of the buildings requiring connections) in the first instance, and to land owners that host overhead lines or substations. Citizens are allowed to object to local planning authorities, but it appears from the DNO participant responses that they do not directly consult with local citizens prior to the planning application.

#### *Representation of publics and engagement processes by TNOs*

On the transmission level however, where overhead lines and supporting pylons have generated greater public controversy, it appears that a different planning strategy is in place. The public’s involvement in planning for new transmission line connections can be characterised again as “downstream” engagement (see Stirling, 2004) in the sense that they are engaged at the level of specific site proposals. To summarise the TNO 2 representative’s response about the planning of line siting:

- Planning is approached on a “strategic level first” – whereby a broad route corridor is proposed.
- Following consultant input into the technical design, “key stakeholders” are approached that can take a “national, regional, strategic view.”
- “Once you get to a point where you’ve got a broader consensus at that strategic level,” local authorities are then consulted.
- “Toward the end of that process ... we would contemplate holding public exhibitions and opening the doors to absolutely everybody ... and only then start canvassing opinion.”

The TNOs’ planning structure for new transmission lines is largely techno-centric and “top-down.” Implicit in this decision-making structure is a prioritisation of actor involvement from both technical experts and those with strategic geographical and political knowledge about regional interests and the impact upon local spaces (i.e. statutory consultees or MPs). TNO 3 stated that at the level of specific site proposals, in some cases different local options will be offered i.e. in one particular part of an area or another (such as one side of a town or the other). They noted, however, that this kind of option appraisal potentially pits residents in one area against those in another, and thus was considered to be “divisive” within or between

communities. The exclusion of local community involvement at the “strategic” level was similarly construed as a morally motivated practice:

TNO 2: We don’t think it’s right that we worry and upset everybody in this 314 square kilometres about, “Are they going to end up building it in my back yard, and in my area?” ... We think it’s right that we start talking to the public once we’re drawing some firmer conclusions about where this thing should appropriately be built.

At the heart of this planning process is an inherent NIMBY assumption: that local citizens are worrisome and self-interested in the protection of local spaces from the visual intrusion of overhead lines; and that they lack the ability to think on a strategic, technical or regional level about line siting. In order to alleviate this problem therefore, there is evidence of deficit model assumptions as one TNO representative suggests:

TNO 4: You need to get over the information so that people can go on fact, rather than hearsay and whatever. I think the company is going in, right, well, we’ll get the right information in there to try and make it as positive an experience for everybody, and to get the reasoning over.

As the TNO 1 representative suggested, the TNO operates under an assumption that citizens affected by local siting of infrastructure are NIMBYs, though they explicitly expressed that the term was not used in a negative or pejorative sense. They understood that power lines were unwanted by local residents, but felt that the overall benefit to society from power line construction is something that opponents could agree is beneficial. They therefore work on the assumption that this can be communicated effectively, that information provision and public involvement in exhibitions will alleviate knowledge deficit and NIMBY problems, and that these factors will lead to reduction of local conflict and generate greater support for power line siting with a view towards overall societal benefits. Moreover, the communication rationale of “getting the reasoning over” prioritises rationality over emotiveness, as has already been shown to be the case with regard to public engagement exercises around the development of onshore wind farms (Cass and Walker, 2009).

### *Ofgem’s engagement practices*

In addition to the roles of TNOs and DNOs, some DNO participants in particular alluded to the importance of the regulator’s role. Of particular interest is how the DNOs are “hidden” from everyday interaction with electricity customers in normal day-to-day operations. DNOs’ primary engagement with customers on a day-to-day level occurs solely in situations where customers experience either intended or unintended loss of supply, for all other instances it is the supplier rather than the network operator that deals with customer queries and complaints:

DNO 5: The customers are almost not meant to be aware that we exist. The idea was that would stimulate competition, and you don’t want network operators running around with branded vans which match their supply business. So that was a restriction that Ofgem put on the market in the late 90s, so, as a consequence of that, all the distribution companies are one step too far, probably, removed from their customers. So they’re all grabbing the stakeholder engagement as a move back in the right direction.

Similarly, the “hidden” nature of the network is reflected in the ways in which network charges are recovered from electricity customers:

DNO 9: You have a supply of electricity as the hub, so you pay your bill to the supplier and then we recover our allowed revenue from the suppliers rather than sending a separate bill for the network charge. So in many ways the network part is slightly hidden in our relationship to the general public.

These statements allude to the embedded industry structure that shapes engagement practices with the customer/publics. Network operation and electricity supply are required to have different licences, and it appears that Ofgem has raised concerns that DNO engagement with customers is an anti-competitive behaviour. What we see is that the embeddedness of the networks industry discursively represents citizens as customers, and the monopoly power of the operators is therefore strictly limited, through regulation, to a narrow focus of dealing with problems of supply (i.e. an intentional or unintentional “blackout”). The institutionalisation of stakeholder engagement across the broader energy sector, however, is driving change in this area. What will be interesting to see is whether or not the regulatory environment will change sufficiently in the future to encourage greater engagement with customers in their capacity as “citizens” with an interest in network infrastructure development, rather than solely as customers, whose primary concern is lowered prices through regulated market competition.

What the interviews have shown is that the DNOs currently perceive Ofgem as the proxy representative of “the public.” In essence, the regulatory environment passively discourages DNOs from direct engagement with publics as “citizens” with an interest in network development, in the sense that Ofgem is construed by some DNO participants as the *de facto* representative of the broader public interest in energy network operations. Other DNO participants stated that Ofgem actively discourages DNO-led engagement processes:

DNO 9: Ofgem in many ways are kind of the proxy for consumers in general ... they are interested in us talking to the stakeholders that they’re not engaging with, in their general public research ... they’ve made it fairly clear that the DNOs doing the same thing again wouldn’t be something that they would consider as valuable information to them or anybody else.

Rather than allow DNOs to engage the customer and run the risk of anti-competitive practices across the network and supply businesses, Ofgem runs its own consumer-focussed research through feedback groups called the “Challenge Panel” and the “100 Everyday Customers” group:

Regulator 1: We call it 100 everyday customers ... we’ve asked the research company to recruit members of the public to cover a range of users, socio-economic groups ... there’s 100 of them across the country, in five groups, and essentially they’ve been recruited randomly from members of the public, but to a representative spec. The idea is for them to become energy experts, but still with their feet on the ground, as it were, to test a range of consumer issues in the energy sector.

Ofgem’s consumer research panels have focussed primarily on issues of price protection and market competition, and the behaviours of consumers around switching energy supplier (Ipsos MORI, 2008); although they have also researched longer term issues in network planning. In addition to the DPCR processes, Ofgem has engaged in energy scenario research termed the Long-Term Electricity Network Scenarios (LENS) project, assessing long-term network development in light of sustainability and climate resilience goals. In LENS, academic researchers, industry participants, government, Ofgem and “other stakeholders” were involved in discussing longer term network issues and regulatory frameworks allowing companies to make investments with a view to meeting future challenges (Ault et al., 2008).

The inputs into the construction of the scenarios included facilitated stakeholder workshops. Electricity consumers were considered to be the primary stakeholder group in the project, and much of the focus of the electricity scenarios was upon the changing roles and behaviours of consumers (particularly in terms of their active management of electricity demand); however, there was no evidence of direct participation of consumers in the project itself, and it is unclear as to how they were represented directly at all. Similarly a project called “Project Discovery” has been set up by Ofgem to explore issues around future uncertainty and security of energy supply through scenarios evaluating long-term climate risks and the impact of current crises in financial markets. Ofgem states that the project “will be fully open and there will be every opportunity for industry, consumers and other stakeholders to have their say” (Ofgem, 2009: 2), although there appears to be no direct mechanism through which citizens are recruited for input into the deliberative process around future energy challenges. Instead it appears that technical stakeholder and industry views are the ones being actively sought. What we see from Ofgem therefore is customer engagement primarily on supply, price, market and consumer behaviour issues, and industry and “stakeholder” involvement further “upstream” in long-term planning, technology development and strategic network expenditure. “Consumers” are *allowed* to comment, although the mechanism for their consultation appears to be after the issues have been “framed” and deliberated upon by technical specialists.

#### *Rationales for engagement and non-engagement by network actors*

From both DNO and TNO perspectives, some participants expressed clear rationales as to why customer engagement on the more “upstream” aspects of future infrastructure developments is problematic, from both a design and operational perspective. The motivations *not* to engage with customers/communities can be categorised as follows:

- 1) Customer objectives and goals are too disparate or difficult to manage owing to their large numbers and the associated costs involved:

TNO 2: Where do you start on routing and consulting around all of those sorts of things on a very large scale project, when the local authorities that you might pass through and the communities that you may pass through are mainly, many and varied and, ultimately, you’re not going to bother 99% of these, but you, but you are going to end up somewhere?

- 2) There are no licensing obligations for network operators to engage with the public in the selection of specific infrastructure sites:

DNO 1: Predominantly if we’re replacing our assets, we tend to do it within our existing operational sites, for which we have permitted development, so we don’t actually have to ask anybody, and if we’re doing a new substation for a load customer, then it will usually be built in a part of their planning requirements.

- 3) That the customers themselves either lacked the motivation or were unable to engage:

DNO 7: The people who are willing to come are going to be people who have problems and ... the majority of people probably wouldn’t even dream of coming to an engagement session ... unless a problem has occurred why would you spend two hours of your valuable time going to a meeting?

- 4) That customers are represented externally by the regulator and that Ofgem actively discourages public engagement activities and associated research.

Despite these factors however, most participants recognised that engagement with stakeholder groups (and to a lesser extent local communities) had a number of advantages.

DNO 10: Excellent; really very good. I think people appreciate it. For some reason, whether it is a single customer or a council, they don’t expect a large organisation to actually turn up personally and speak with them.

Despite the myriad reasons not to engage, most participants reported positive feedback coming to their organisations, and a recognition that public and stakeholder engagement activities must both expand and be improved upon in the future.

#### 4. Conclusions

##### *Technical change and actor roles*

Of particular interest among these findings is the conceptualisation of the public actors as “customers” and how embedded networks and regulatory structures continue to keep network operators “hidden” from citizens. The first important factor to consider is that the sheer size and total integration of electricity infrastructure into society makes citizens de facto customers of the network operators. In the case of other locally unwanted land uses such as chemical manufacturing facilities in the Burningham et al. (2007) example, the industries have customers (buying products), neighbours (affected by facility siting) and publics (whose values and opinions shape political actors and hence broader business practices). Electricity is different. The regionally embedded network operators don’t perceive themselves as having “neighbours” in the same way as the chemical facilities might, as the networks are so integrated into the social and infrastructural fabric of their exceedingly large customer base (i.e. millions of regional customers). The “man on the street” that is representative of “the public” as the external holder and bearer of values, is not distinguished from the customer, and so the interests of citizens and customers are conflated. This conceptualisation is reinforced by Ofgem which actively prevents DNOs (but not TNOs) from direct customer engagement beyond dealing with power losses, because of concerns over anti-competitive behaviours affecting competition within supply markets. Thus, from the DNO perspective, Ofgem actively operates as the proxy for the consumer, and “the public’s” interests are mediated through the regulatory arrangements between network operators and Ofgem. The DNO, therefore, remains “hidden” from the electricity consumer. Also, although Ofgem engages customers around issues of price protection, consumer behaviours and electricity supply markets, it appears that it does not actively and directly engage “consumers” in future network planning scenarios or specific infrastructure siting proposals.

##### *Engagement rationales*

From the TNO perspective, the representatives suggested that their organisations based their strategic planning over line siting through techno-centric input from specialists and “high level” stakeholders and then implemented public engagement at localised stages of infrastructure siting, giving opportunities for public consultation through open exhibitions held in locations close to proposed line corridors. Though TNO representatives spoke more frequently of “public” interests (as opposed to customer interests) and often posited themselves as industry leaders in public engagement, “the public,” however, appear to have little direct involvement in decision-making over infrastructure siting. To use Arnstein’s “ladder” terminology, the TNOs engage in “lower rung” strategies “downstream” in the decision-making process. Lower rung engagement is characterised by information provision, placation and

information sharing (Arnstein, 1969); in contrast to “higher rung” participatory processes involving collaboration, decision-making partnership and co-management. Their decision-making therefore involves decide–announce–defend strategies, based upon NIMBY assumptions of local publics as self-interested, worrisome and unable to adopt a strategic or societal perspective. At public exhibitions, information about proposed line routes is presented alongside opportunities for local community representatives to ask questions, and in a consultative capacity, to comment upon proposals. What is less clear, however, is how the feedback is utilised in infrastructure planning processes. A significant finding therefore is that in neither the TNO nor DNO case was it apparent that “publics” were given any “decisional” influence.

The reasons for “low rung” engagement conceivably lie in how formalised stakeholder engagement processes have filtered in to network planning from the broader government-led sustainability agenda for the energy sector. The differing rationales for engagement are commonly classified as substantive, strategic or normative (Fiorino, 1990; Friedman and Miles, 2006); i.e. engagement motivated by a need for practical decision-making input, to placate opposition and reduce costs, or to benefit environmental and social justice for affected citizens. It appears however from these data, that none of these three motivations have been clear driving factors in the move towards greater stakeholder involvement. One key finding, therefore, is that a fourth motivation of “deliberative rhetoric” can be tentatively suggested; that from the DNO and Ofgem perspective the broader institutionalisation of participatory–deliberative decision-making processes across government departments and through industry practice in the energy sector has led to (as one regulator respondent put it) an “organic” approach to stakeholder-focussed thinking. One however that appears to lack a clear rationale and methodological plan.

From the TNO perspective engaging the public and stakeholders appears to be a more established practice, but these processes remain at a level that precludes “decisional” influence by local community members in infrastructure siting. Of importance, therefore, is a consistent argument within the literatures in science and technology governance and environmental management that illustrates how improvements in decision “quality” can be shown from clear links between public participation and decision outcomes; and that this in turn improves the general level of satisfaction with the process, and fosters mutual trust between citizens and governing institutions (Rowe and Frewer, 2000; McCool and Guthrie, 2001). Although both TNO and DNO respondents have demonstrated an overall positive desire to engage and to improve the consistency and quality of their engagement programmes, significant challenges remain, with high profile public protest occurring over recent large-scale infrastructure planning projects, leading to public enquiry, prolonged planning delays, additional expense, and local community distrust in network organisations. Though the tone expressed towards public engagement was generally “positive,” we suggest that this is an example of what Hindmarsh and Matthews (2008) refer to as “deliberative speak”: a strategic language comprising a rhetorical array of terms reflecting deliberative principles and ideals of active public engagement that is accompanied by a lack of appropriate processes and practices of active public engagement to adequately address them.

From the DNO perspective, the substantive conclusion of this research is that the relationship between network operators and “the public” is problematised by their embedded regional monopoly powers and the mediation of “customer interests” through the regulator Ofgem. This relationship “hides” the network operators from the public and strongly influences both the ways in which industry actors conceptualise the public and hence the engagement mechanisms that they employ. Ofgem actively discourages DNO–customer engagement and yet encourages stakeholder engagement in order to set expenditure priorities and hence the governance of network development. This clear division between “the stakeholder” as a group worth engaging with, and “the public” or “the customer” as one that is not, is a distinction

that serves to exclude citizen voices from the technical development of the network unless mediated through Ofgem-framed customer research. On the TNO level, public engagement takes place in infrastructure planning and development, but from the reported engagement practices by TNO respondents, these methods provide little “decisional” influence for local citizens. To conclude, both the rhetoric and practice of public and stakeholder engagement across the networks industry lack a clear rationale, as well as a means of identifying relevant citizen perspectives and mechanisms to deliberate and incorporate public perspectives “upstream” in decision-making processes.

## Acknowledgements

This study has been funded by the Engineering and Physical Sciences Research Council as part of the SuperGen FlexNet: Thinking Networks project.

## References

- Arnstein, S. R. (1969) “A Ladder of Citizen Participation,” *Journal of the American Institute of Planners* 35(4): 216–24.
- Auditcube (2009) “Electricity Suppliers List,” URL: <http://www.auditcube.co.uk/electricity-suppliers-list.html>
- Ault, G., Frame, D., Hughes, N. and Strachan, N. (2008) “Electricity Network Scenarios for Great Britain in 2050: Final Report for Ofgem’s LENS Project.” London: Ofgem.
- Barnett, J., Burningham, K., Walker, G. and Cass, N. (forthcoming) “Imagined Publics and Engagement around Renewable Energy Technologies in the UK,” *Public Understanding of Science*.
- Beierle, T. C. (1999) “Using Social Goals to Evaluate Public Participation in Environmental Decisions,” *Review of Policy Research* 16(3–4): 75–103.
- Beierle, T. C. and Konisky, D. M. (2000) “Values, Conflict, and Trust in Participatory Environmental Planning,” *Journal of Policy Analysis and Management* 19(4): 587–602.
- Bell, M. M. (1999) “The Rationalization of Risk.” Ames, Iowa, Iowa State University.
- Boyatzis, R. E. (1998) *Transforming Qualitative Information: Thematic Analysis and Code Development*. Thousand Oaks, CA: SAGE.
- Bucchi, M. (1996) “When Scientists Turn to the Public: Alternative Routes in Science Communication,” *Public Understanding of Science* 5: 375–94.
- Burningham, K. (2000) “Using the Language of NIMBY: A Topic for Research, Not an Activity for Researchers,” *Local Environment* 5(1): 55–67.
- Burningham, K., Barnett, J., Carr, A., Clift, R. and Wehrmeyer, W. (2007) “Industrial Constructions of Publics and Public Knowledge: A Qualitative Investigation of Practice in the UK Chemicals Industry,” *Public Understanding of Science* 16(1): 23–43.
- Butler, S. (2001) “UK Electricity Networks,” *POSTnote* No. 163 (October): 1–4. London: Parliamentary Office of Science and Technology.
- Cass, N. and Walker, G. (2009) “Emotion and Rationality: The Characterisation and Evaluation of Opposition to Renewable Energy Projects,” *Emotion, Space and Society* 2(1): 62–9.
- Chilvers, J. and Burgess, J. (2008) “Power Relations: The Politics of Risk and Procedure in Nuclear Waste Governance,” *Environment and Planning A* 40: 1881–900.
- Coffey, A. and Atkinson, P. (1996) *Making Sense of Qualitative Data: Complementary Research Strategies*. Thousand Oaks, CA: SAGE.
- Department of Trade and Industry (2007) *Energy White Paper: Meeting the Energy Challenge*. London: The Stationery Office.
- DETR (1999) *A Better Quality of Life: A Strategy for Sustainable Development in the United Kingdom*. London: Department for the Environment, Transport and the Regions.
- Devine-Wright, H. and Devine-Wright, P. (2005) “Representing the Demand Side: ‘Deficit’ Beliefs about Domestic Electricity Users,” in *ECEEE 2005 Summer Study Proceedings: What Works & Who Delivers*, pp. 1343–8. Mandelieu, France: European Council for an Energy Efficient Economy.
- Devine-Wright, H. and Devine-Wright, P. (2009) “Social Representations of Electricity Network Technologies: Exploring Processes of Anchoring and Objectification through the Use of Visual Research Methods,” *British Journal of Social Psychology* 48(2): 357–73.

- Draper, G., Vincent, T., Kroll, M. E. and Swanson, J. (2005) "Childhood Cancer in Relation to Distance from High Voltage Power Lines in England and Wales: A Case-control Study," *British Medical Journal* 330(7503): 1290.
- EON Central Networks (2009) "Central Networks – Distribution," URL: <http://www.eon-uk.com/distribution/>
- European SmartGrids Technology Platform (2006) "Smart Grids: Vision and Strategy for Europe's Electricity Networks of the Future." Luxembourg: European Commission.
- Felt, U. and Fochler, M. (2008) "The Bottom-up Meanings of the Concept of Public Participation in Science and Technology," *Science and Public Policy* 35(7): 489–99.
- Fiorino, D. (1990) "Citizen Participation and Environmental Risk: A Survey of Institutional Mechanisms," *Science, Technology & Human Values* 15(2): 226–43.
- Fletcher, R. (2009) "Electricity Distribution Price Control Review Methodology and Initial Results Paper." London: Ofgem.
- Friedman, A. L. and Miles, S. (2006) *Stakeholders: Theory and Practice*. Oxford: Oxford University Press.
- Graham, S. and Marvin, S. (1994) "Cherry Picking and Social Dumping: Utilities in the 1990s," *Utilities Policy* 4(2): 113–19.
- Habermas, J. (2002) *On the Pragmatics of Communication*. Cambridge: Cambridge University Press.
- Hagedijk, R. and Irwin, A. (2006) "Public Deliberation and Governance: Engaging with Science and Technology in Contemporary Europe," *Minerva* 44(2): 167–84.
- Hindmarsh, R. and Matthews, C. (2008) "Deliberative Speak at the Turbine Face: Community Engagement, Wind Farms, and Renewable Energy Transitions, in Australia," *Journal of Environmental Policy and Planning* 10(3): 217–32.
- House of Lords Select Committee on Science and Technology (2000) *Science and Society 3rd Report*. London: HMSO. URL: <http://www.publications.parliament.uk/pa/ld199900/ldselect/ldscetch/38/3801.htm>
- Hunsberger, C. and Kenyon, W. (2008) "Action Planning to Improve Issues of Effectiveness, Representation and Scale in Public Participation: A Conference Report," *Journal of Public Deliberation* 4(1): Article 1.
- Ipsos MORI (2008) "Customer Engagement Survey: Report Prepared for Ofgem." London: Ofgem.
- Irwin, A. (2001) "Constructing the Scientific Citizen: Science and Democracy in the Biosciences," *Public Understanding of Science* 10(1): 1–18.
- Irwin, A. and Michael, M. (2003) *Science, Social Theory and Public Knowledge*. Maidenhead: Open University Press.
- Irwin, A. and Wynne, B. (1996) *Misunderstanding Science: The Public Reconstruction of Science and Technology*. Cambridge: Cambridge University Press.
- Jay, S. (2004) "The Forces Shaping Local Planning Policy on High Voltage Electricity Installations," *Journal of Environmental Policy and Planning* 6(3): 207–26.
- Kerr, A., Cunningham-Burley, S. and Amos, A. (1997) "The New Genetics: Professionals' Discursive Boundaries," *Sociological Review* 45(2): 279–303.
- Klüser, R. (2009) "Current Challenges for Efficient Electricity Grids," *Poiesis & Praxis* 6(3–4): 265–71.
- Law, J. and Hassard, J. (1999) *Actor Network Theory and After*. Oxford: Blackwell.
- McClymont, K. and O'Hare, P. (2008) "'We're Not NIMBYs!' Contrasting Local Protest Groups with Idealised Conceptions of Sustainable Communities," *Local Environment* 13(4): 321–35.
- McCool, S. F. and Guthrie, K. (2001) "Mapping the Dimensions of Successful Public Participation in Messy Natural Resources Management Situations," *Society and Natural Resources* 14(4): 309–23.
- McCracken, R. (2008) "Smart Meters: Gizmo or Revolution?," *Energy Economist* 317(1): 23–5.
- Maranta, A., Guggenheim, M., Gisler, P. and Pohl, C. (2003) "The Reality of Experts and the Imagined Lay Person," *Acta Sociologica* 46(2): 150–65.
- Marris, C., Wynne, B., Simmons, P. and Weldon, S. (2001) "Public Perceptions of Agricultural Biotechnologies in Europe: Final Report." Lancaster: University of Lancaster.
- Massoud Amin, S. and Wollenberg, B. F. (2005) "Toward a Smart Grid: Power Delivery for the 21st Century," *IEEE Power & Energy Magazine* 3(5): 34–41.
- National Grid (2005) "Seven Year Statement." Warwick: National Grid.
- O'Carroll, M. (2002) "Revolt Public Statement, July 2002," URL: <http://www.revolt.co.uk/textfile/sup0702.txt>
- Ofgem (2009) "Project Discovery Status Report." London: Ofgem.
- O'Mahony, J. (2004) "The Stakeholder Route to Corporate Social Responsibility," *Risk & Regulation* 7 (Summer): 10. London: London School of Economics, Centre for Analysis of Risk and Regulation.
- Owens, S. (2000) "'Engaging the Public': Information and Deliberation in Environmental Policy," *Environment and Planning* 32(7): 1141–8.
- Owens, S. and Cowell, R. (2002) *Land and Limits: Interpreting Sustainability in the Planning Process*. London: Routledge.
- Pellizzoni, L. (2003) "Uncertainty and Participatory Democracy," *Environmental Values* 12: 195–224.
- Priestley, T. and Evans, G. W. (1996) "Resident Perceptions of a Nearby Electric Transmission Line," *Journal of Environmental Psychology* 16(1): 65–74.

- Rayner, S. (2003) “Democracy in the Age of Assessment: Reflections on the Roles of Expertise and Democracy in Public-sector Decision Making,” *Science and Public Policy* 30(3): 163–70.
- Rossi, J. (1997) “Participation Run Amok: The Cost of Mass Participation for Deliberative Agency Decision Making,” *Northwestern University Law Review* 92: 173–249.
- Rowe, G. and Frewer, L. J. (2000) “Public Participation Methods: A Framework for Evaluation,” *Science, Technology & Human Values* 25(1): 3–29.
- Royal Society (1985) *The Public Understanding of Science*. London: The Royal Society of London.
- Sclove, R. (1995) *Democracy and Technology*. London: Guilford Press.
- Sims, S. and Dent, P. (2005) “High-voltage Overhead Power Lines and Property Values: A Residential Study in the UK,” *Urban Studies* 42(4): 665–94.
- Stirling, A. (2004) “Opening Up or Closing Down? Analysis, Participation and Power in the Social Appraisal of Technology,” in M. Leach, I. Scoones and B. Wynne (eds) *Science, Citizenship and Globalisation*, pp. 218–31. London: Zed.
- Wilson, J. and Willis, R. (2004) *See-through Science: Why Public Engagement Needs to Move Upstream*. London: Demos.
- Wolsink, M. (1996) “Dutch Wind Power Policy: Stagnating Implementation of Renewables,” *Energy Policy* 24(12): 1079–88.
- Wolsink, M. (2000) “Wind Power and the NIMBY-Myth: Institutional Capacity and the Limited Significance of Public Support,” *Renewable Energy* 21(1): 49–64.
- Woolgar, S. and Pawluch, D. (1985) “Ontological Gerrymandering: The Anatomy of Social Problems Explanations,” *Social Problems* 32(3): 214–27.
- Wynne, B. (1982) *Rationality and Ritual: The Windscale Inquiry and Nuclear Decisions in Britain*. Chalfont St Giles: British Society for the History of Science.

## Authors

Matthew Cotton is an Associate Research Fellow at the University of Exeter’s School of Geography. He is currently working on the Engineering and Physical Sciences Research Council funded SuperGen FlexNet – Thinking Networks project, researching the roles of public actors in the development of electricity network technologies in the UK. He holds a PhD in Environmental Science from the University of East Anglia and has previously published articles on issues of public engagement and the ethics of radioactive waste management in the journals *Environmental Values* and the *Journal of Risk Research* and on the development of human enhancement technologies in *Poiesis & Praxis*. Correspondence: Matthew Cotton, School of Geography, University of Exeter, Amory Building, Rennes Drive, Exeter, Devon EX4 4RJ, UK; e-mail: m.cotton@exeter.ac.uk

Patrick Devine-Wright holds a Chair in Human Geography at the University of Exeter and has a PhD in Social Psychology from the University of Surrey. His research interests include human aspects of place, specifically the concepts of place identity and place attachment, and the social acceptance of sustainable energy technologies, including issues of NIMBYism. He has participated in and led research and consultancy projects for a wide range of funding bodies including EPSRC, ESRC, EU, DEFRA/DTI, the European Commission, the Department for Energy and Climate Change and the Irish Sustainable Energy Agency. He was co-investigator in the “Community Energy Initiatives” project funded by the Economic and Social Research Council under the Sustainable Technologies Programme (2004–2006) and principal investigator of the “Beyond Nimbyism” interdisciplinary research project (2005–2009) that investigated public engagement with large-scale renewable energy projects. This project led to several significant outputs, including an edited book to be published by Earthscan in 2010.