

UKERC Decision Making

Mapping energy participation:

A systematic review of diverse practices of participation in UK energy transitions, 2010–2015

April 2017, version 2

Helen Pallett

Jason Chilvers

Tom Hargreaves

EXECUTIVE SUMMARY

This report addresses the question: what does public participation in energy transitions look like at a relational 'whole systems' level?

Rationale

The task of transitioning to more sustainable and low carbon energy systems has become a defining challenge of our age. It demands changes in how societies produce, store, distribute, use and relate to energy on an unprecedented scale. It is increasingly recognised, however, that transforming energy systems is a fundamentally social problem as well, requiring social science insights that attend to the societal dimensions of energy system change. Where once citizens would have been seen as passive consumers with little role in broader energy systems, they have now become a central concern for those interested in building more sustainable futures.

There are now significant demands for evidence about what publics think, know, say and do in relation to energy systems and their governance. Yet, just as this interest in the human and social side of energy systems is becoming mainstream, there is an unease that energy publics are much more complex and harder to pin down than previously thought. Mainstream social science approaches and policy responses have not caught up with the sheer diversity of forms of public engagement with the energy system. Studies of citizen engagement with energy systems often remain fragmented and compartmentalised, undermining the ability of social science research on societal engagement with energy to address 'whole systems' and the ability of governing institutions to fully engage with and respond to diverse citizens and interconnected energy policy challenges.

This report forms part of a project that applies such systemic thinking to the field of public participation related to energy for the first time. It presents research that sought to systematically map diverse practices of public engagement with energy, their emergence and interrelations within energy systems. The study was informed by a relational framework for understanding energy participation at a systemic level and took the form of a UKERC systematic review of public engagement in the UK energy system 2010–2015. The analysis of systematic review evidence identifies and illustrates key patterns of UK energy-related participation, and explores the

connections between different cases of energy-related participation and their relationship with the broader energy system.

Approach

The framework applied in this report moves beyond mainstream approaches to energy participation, to develop a new approach that brings together relational and systemic perspectives. It emphasises the ways in which participatory practices are not fixed or pre-defined, but rather are emergent and continually being made and performed. The framework highlights three central aspects of energy participation, which are seen as equally important, and as mutually shaping one another:

- a) What is participation for (*the objects of participation*)?
- b) Who is involved in participation (*the subjects of participation*)?
- c) How is participation organised (*the formats of participation*)?

This framework opens up to the existence of diverse, emergent and interrelating participatory practices, that form part of and interact with wider spaces of participation set within a broader energy system. Beyond individual instances of energy participation, it points to broader ecologies of participation, within which multiple cases of participation interrelate with each other and with wider systems. This moves from seeing systemic participation as simply about eliciting public views on energy systems in discrete invited events to inform particular moments of decision or action. The challenge becomes one of also mapping the diversities, relations and productions of already existing practices and spaces participation within energy systems.

Method

The approach to the systematic review was informed by the methodology developed by the UKERC Technology and Policy Assessment (TPA) programme, which has been widely used in systematic reviews of evidence around different energy policy topics. The first part of this process was the scoping note which developed and refined the framework. Feedback from a panel of experts from academia, policy and practice further refined this framework and the subsequent review methodology. The searching and screening phase of the review aimed to identify examples of UK public participation concerning energy, using synonyms for each of these terms to

account for the diversity of framings of ‘participation’, ‘the public’ and ‘energy issues’. Because of the focus of this project on the diversity of public participation around energy, searches were conducted through both academic and non-academic search engines to identify cases from the academic literature, grey literature and media. All of the 258 cases identified through this process included some form of citizen engagement with the energy system, and took place in the UK between 2010 and 2015.

The final corpus of 258 cases was analysed using the framework in order to map the different forms of participation, the public and energy issues reflected in the different cases, as well as mapping relations across the wider energy system. More detailed analysis on a subset of 30 cases was conducted to gain more insights into the construction and effects of different participatory collectives, how they interact, and relate to the wider energy system. The sample of 30 cases was not statistically representative of the whole corpus, rather it was selected to capture the diversity of features of the whole corpus, to include cases which appeared to be particularly influential, and to reflect emerging trends.

Findings

The systematic mapping evidence base demonstrates the diverse and distributed ways through which civil society and wider publics are involved in shaping and governing energy transitions. This review has unearthed vital insights about existing forms of participation round the energy system from the academic literature, as well as bringing other significant cases of engagement practice to light. But the evidence also highlights the existence of a number of reasonably stable and dominant visions of the public, framings of energy issues, and modes of democratic engagement which characterize the UK energy system and drive much of energy policy. The key findings of the report are summarised below.

How does the public participate in energy transitions?

Our systematic review shows clear patterns of participation across the UK energy system, not only exposing the sheer diversity of energy-related participation, but also revealing critical ‘systemic inequalities’. The evidence shows some forms of participation – such as opinion surveys, deliberative processes, consultations,

behaviour change, and community energy – to be more prevalent than others (see Figure 1). This raises questions over the political economic dimensions and inequalities in resource distribution, which open up and close down forms of and opportunities for participation in energy transitions. There are also forms of participation that are emergent, excluded or endangered in the UK energy system – such as co-design, activism and protest, and arts-based forms of engagement.

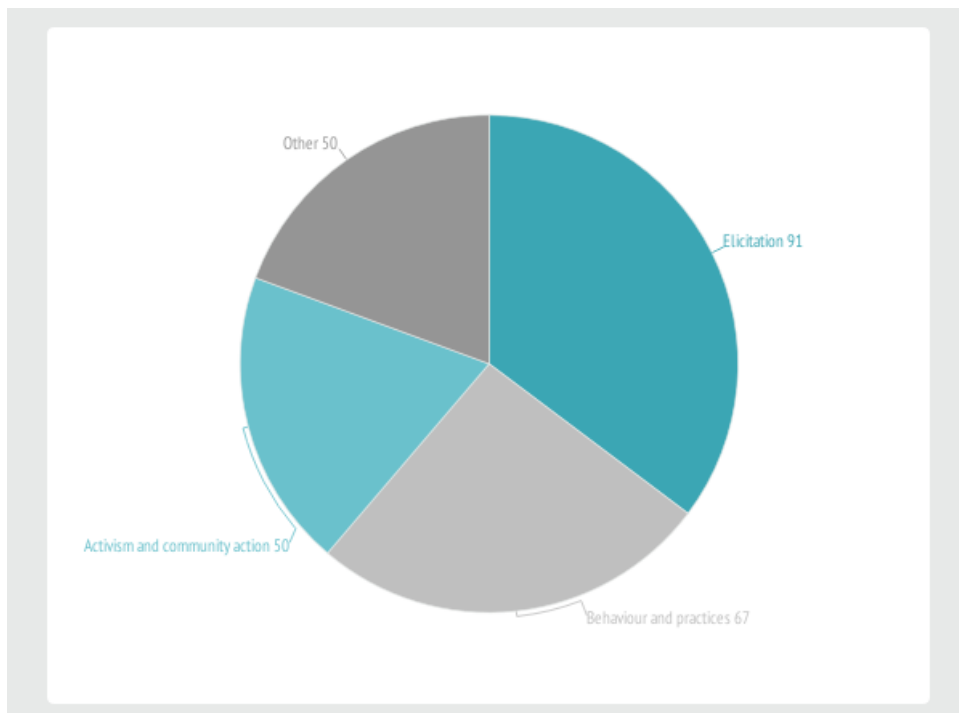


Figure 1. Forms of participation in energy transitions.

What is the public participating about?

The evidence clearly shows that all forms of energy participation are framed in powerful and highly partial ways. No one form or process of participation can capture multiple perspectives and visions of UK energy system change once and for all. Figure 2 shows the wide range of energy issues covered by the cases analysed. Reports of individual participation processes should come with a warning label that other framings and meanings are available. Some cases are narrowly framed while some were more openly framed or aimed to stimulate discussions about whole systems, but all say things about energy transitions and futures. Furthermore, the cases represented a wide diversity of visions and understandings of the energy system itself, from a mainly technical system to one embedded in particular

landscapes and social contexts, or one consisting of multiple interconnected social practices. Particular dominant views of the energy system and energy system change are reflected in Government-led cases as well as some of the other cases from business and academia. These tend to emphasise technological and behaviour change as the primary mechanisms of energy system change, often down-playing alternative models of progress or drivers of change, such as ideas about de-growth or energy justice, as reflected in some of the less publicized cases.

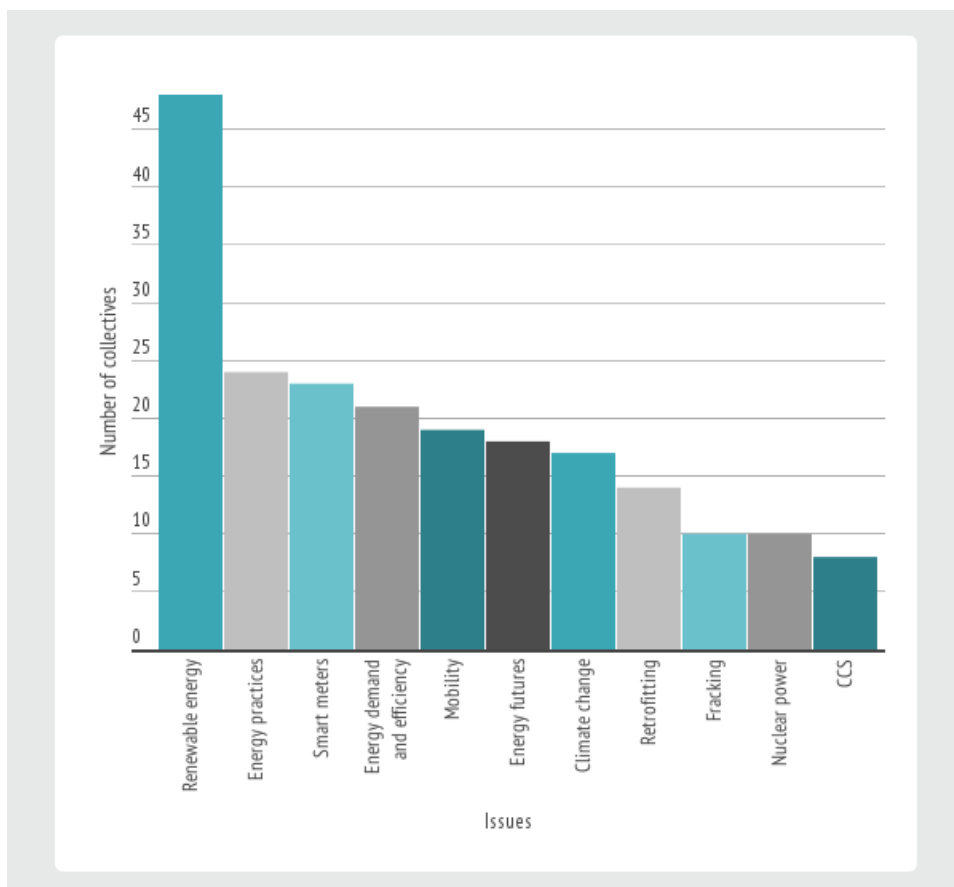


Figure 2. Main issues in energy participation.

Who is participating?

The systematic review evidence powerfully demonstrates that there is not a single UK energy public out there waiting to be discovered and more accurately represented or shifted on to more sustainable paths. Our mapping reveals diverse identities of the public as users of energy technologies, consumers, householders, an aggregate population, and unaffected or neutral publics, but also as affected,

active or marginalized communities, active citizens and activists (see Figure 3). It also shows the challenge of knowing and moving energy publics is more difficult than identifying or forming groups of individuals as we see in market segmentation, survey and deliberative work. This is because ‘the public’ and subjects of participation are an outcome of – not merely an input to – practices of public engagement with energy. There are certain persistent assumptions about the public which need to be recognised when understanding the results of public engagement exercises. For example, activists are often dismissed as dangerously irrational or mainly focused on local ‘NIMBY’ issues. But this can become self-reinforcing in the way that these forms of engagement are received, interpreted and reported on. This creates broader systemic exclusions around who gets to speak about energy transitions, and how their visions will be interpreted and publicized.

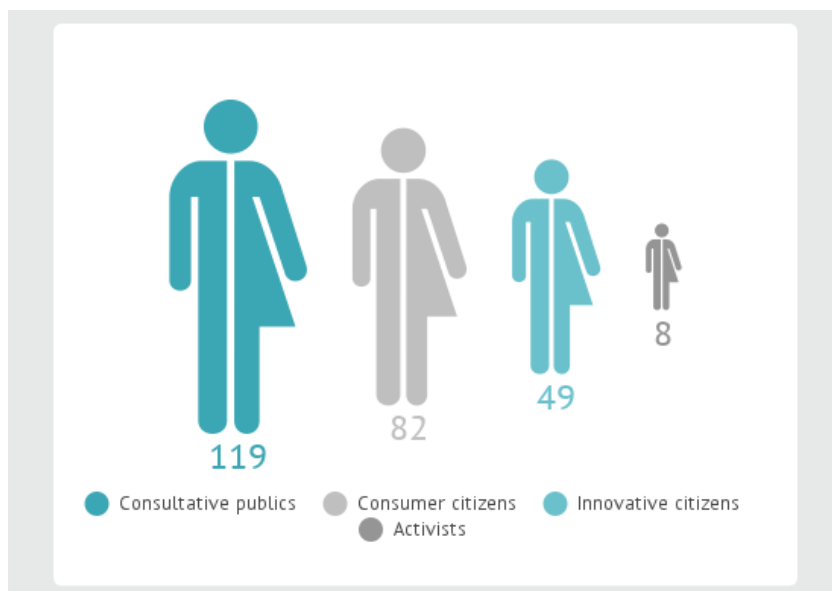


Figure 3. Who participates in energy transitions?

How are instances of participation connected?

The systematic review evidence shows that understanding citizen engagements with energy in terms of discrete isolated cases limits comprehension of both the dynamics of energy participation and the societal dimensions of energy transitions. Interconnections between instances of participation and wider systems matter in terms of revealing the multiple ways in which a particular energy issue such as fracking is being debated across the energy system – or even identifying cases were

alternative collectives and framings of an issue are being denied. This message complements wider moves in energy research towards ‘joined-up’ systems thinking approaches, but also highlights how interrelations in wider ecologies of participation matter in shaping the forms of public engagement with energy that get enacted. For example, some of our cases which have emerged from social practice driven studies show how changes in technologies and social practices in one part of the system – for example home microgeneration, or changing modes of paying for electricity supply – have implications for other social practices and forms of engagement in energy transitions, such as energy use in the home.

How does the energy system shape participation?

The forms and ecologies of participation that become established as credible and legitimate are powerfully shaped by (and in turn shape) political culture. For example, public opinion surveys and increasingly public dialogue processes are a widely adopted mode of public engagement around the energy system, often used by government actors and academics. These are generally trusted as a legitimate and authoritative means of engaging and representing the public and so are often used to justify policy decisions or positions. However, these approaches form part of wider ecologies of participation in the energy system, which make broader assumptions about the role of the public and the appropriate framing of energy issues. This can often result in more active or unruly publics like activists or alternative framings of energy issues being excluded from broader national debates.

Recommendations for policy

This systematic review reveals some emerging challenges for policy-makers engaged with citizens and with the task of the low carbon energy transition. However, from these challenges emerge some recommendations which can help policy-makers and practitioners to understand and engage with increasingly diverse public engagements with energy transitions, as well as harnessing citizen action and ingenuity which this report has found in abundance.

- There is a need for **new tools to map diverse public engagements with energy** as

policy-makers can no longer rely on formal, invited and discrete public engagement processes as their primary mode for incorporating citizen voices in policy making. This systematic review in itself represents one such mapping approach, using documentary evidence and secondary data. A number of other methods for mapping diversities of public and civil society involvement in socio-technical systems and controversies – such as issue mapping, controversy mapping, sentiment analysis, and social network analysis – are emerging and should be applied through further research and experimentation in the energy domain.

- There is a need for **more experimental participatory practices** which strive to be open and reflective about their assumptions with regard to the public and the issue at hand. This involves paying attention to connections with other instances or ecologies of public engagement with energy, anticipating the potential effects of the engagement not only on the issue or commitment under discussion but for broader ecologies or constitutions, and having an awareness of alternative ways of framing energy, engaging citizens and imagining the public.
- There is a need for **more responsive and responsible ways of governing energy transitions**. As the mapping evidence in this report shows, publics and participation in the energy system are continually emerging – imagining, knowing and doing in different ways. The challenge is to develop systems that can know, respond and work with these diverse, continual and ongoing forms of energy participation not see them as something to be controlled or denied.

Recommendations for research

This systematic review lays out some important future avenues for energy-related participation research and practice.

- There is a need for more **in-depth, ethnographic and interpretive analyses** of participation across the full range of different cases, settings and spaces revealed in our systematic review.
- These insights could be further enhanced and deepened through **comparative and cross-national studies** which compare the UK energy constitution to other political cultures, and also study transnational circulations and flows of models of participation and energy issues.
- **A programme of active interventions producing experiments in energy-related participation** is also needed in order to take forward some of our above

recommendations and generate further empirical insights around the emergence of different forms of energy participation and their relationships with the energy constitution.

- There is a **need to reconfigure the infrastructures of 'social intelligence' that systems of governing energy currently depend on**, necessitating for example the need for an observatory to continually monitor ongoing and emergent societal engagement with energy. Such a project would move beyond the opinion poll and the simplistic acceptance vs behaviour change dichotomy to develop a more nuanced, dynamic and systemic way of representing and engaging publics in energy transitions.

Contents

EXECUTIVE SUMMARY	2
Rationale	2
Approach	3
Method	3
Findings	4
Recommendations for policy	8
Recommendations for research	9
1. Introduction	13
2. Literature review and conceptual framework	19
2.1 Mainstream approaches to energy participation	19
2.2 Relational approaches to energy participation	20
2.3 Systemic perspectives on participation	21
2.4 A framework for understanding ecologies of participation	23
3. Systematic review methodology	29
3.1 Scoping	29
3.2 Expert feedback	30
3.3 Searching and screening	31
3.4 Corpus analysis	35
3.5 Case study analysis	36
4. Findings: Mapping UK energy-related participation 2010–2015	40
4.1 Where does energy-related participation happen?	41
4.2 What are citizens participating about?	50
4.3 How are citizens participating?	59
4.4 Who is participating?	66
4.5 Interrelating ecologies of energy participation	71
4.6 What are the key features of the UK energy system as constitution?	79
5. Conclusions	83
5.1 There are clear systemic patterns and inequalities of energy participation	84
5.2 Alternative framings and meanings of energy system transitions are available	85
5.3 Energy publics are actively and systemically constructed	86
5.4 Systems and ecologies of participation matter	87
	11

5.5 The UK energy constitution and political culture shape societal engagement	88
5.6 A systems of participation view opens up new methodological innovations	89
5.7 Reflexive and experimental participatory practices are needed	89
5.8 We need more responsive and responsible ways of governing energy transitions	90
5.9 New avenues for energy participation research and practice are opened up	91
Bibliography	92
Appendix	97
A List of cases in full corpus	97
B Summaries of full case studies	106

1. Introduction

Transitioning to more sustainable and low carbon energy systems has become a defining challenge of our age. It demands changes in how societies produce, store, distribute, use and relate to energy on an unprecedented scale. The Paris COP21 climate change agreement in December 2015 (UNFCCC, 2015) has focused minds around this need for radical action. The sheer scale of the problem has sparked a global race to innovate and initiate grand programmes to accelerate the technological breakthroughs needed to decarbonize energy systems (e.g. Mission Innovation, 2015). Research efforts in turn tend to be skewed towards quantitative and modelling based approaches in engineering, physical sciences and economics, to deliver urgent assessments of carbon reduction potentials and costs of contending energy mixes and transition pathways (Skea et al. 2011; IEA/OECD, 2015; Pye et al, 2015).

It is increasingly recognised, however, that transforming energy systems is a fundamentally social problem as well, requiring social science insights that attend to the societal dimensions of energy system change (Miller et al. 2015; Sovacool 2014). Where once citizens would have been seen as passive consumers with little role in broader energy systems, they have now become a central concern for those interested in building more sustainable futures. This is often expressed as a concern over potential public resistance and the need gain societal ‘acceptance’ of urgent yet difficult energy policy decisions and technological changes (DECC 2015; Ipsos Mori 2011; TNS BMRB 2014). Another prevalent trope is the desire to change the energy behaviours of citizens, shifting or ‘nudging’ them onto more sustainable patterns of use (Cabinet Office Behavioural Insights Team/DECC, 2011). Others emphasise the actions of citizens themselves to drive sustainable energy transitions in more distributed and ‘bottom-up’ ways, through community energy, grassroots innovations and so on (Hopkins, 2008; Smith et al. 2016). Beyond this, are calls for deeper democratic steering and public accountability over the direction and purposes of our energy transitions and associated questions of equity, justice and control (Stirling 2014).

These contrasting imperatives produce significant demands for evidence about what publics think, know, say and do in relation to energy systems and their governance. Yet, just as this interest in the human and social side of energy

systems is becoming mainstream, there is an unease that energy publics are much more complex and harder to pin down than previously thought. This is related to the increasingly diverse, multiple, and blurred roles that people are taking up across contemporary energy systems (Chilvers and Longhurst 2012; Marres 2012; Walker and Cass 2007). This includes diverse forms of public engagement with energy through consultation processes, opinion polls, behaviour change programmes, social marketing campaigns, social media, planning protests, activism and public demonstrations, lobbying, investment decisions, the co-design of energy technologies, participatory energy modelling, visioning exercises, open innovation processes, citizen science initiatives, hacker spaces, smart energy technologies, eco-homes, community energy schemes, and so on.

It seems that mainstream social science approaches and policy responses are struggling to catch up with this more diverse and distributed situation. Studies of citizen engagement with energy systems often remain fragmented, each attending to specific parts of 'the system' through their theoretical orientations, methods and forms of empirical evidence. For example, behaviour change studies tend to centre on the workplace, the home and efforts to reduce energy demand; public opinion research and deliberative democracy approaches focus on sites of invited public deliberation and questions of 'social acceptability' that most often feed in to government and industry decision-making; whereas social movement studies and transitions management approaches respectively hone in on sites of protest or activism and sites of social innovation.

Such compartmentalisation of energy participation and its potential forms is undermining the ability of social science research on societal engagement with energy to address 'whole systems' and to constructively contribute to interdisciplinary and transdisciplinary energy research and policy. Furthermore, this compartmentalised view limits the ability of governing institutions to fully engage with and respond to diverse citizens and interconnected energy policy challenges.

This report forms part of a UKERC project that seeks to directly address this problem and associated challenges. The overall aim of the project is: *to explore conceptually, methodologically and empirically what it means to think about public engagement and participation in energy transitions from a relational 'whole systems' perspective*. In this sense we bring questions on societal engagement into UKERC's core ambition to develop a 'whole systems' perspective – moving beyond addressing aspects of energy supply, demand, distribution or governance in isolation to account for interrelations and independencies across energy systems and scales of decision-making (see Skea et al. 2011; Watson, 2015). The project

builds on existing work on societal and civil society engagement with the UK energy system conducted in the EPSRC *Transition Pathways* consortium (Chilvers & Longhurst, 2012, 2015, 2016) and in the UKERC Phase 2 project *Transforming the UK Energy System – Public Values, Attitudes and Acceptability* (Parkhill et al. 2013; Pidgeon et al. 2014; Demski et al. 2015).

The previous UKERC project sought to build “greater understanding of public acceptability of whole energy system change” (Parkhill et al 2013: 2) through eliciting the views of invited non-partisan members of the public in a national questionnaire survey and deliberative workshops. In addition to public preferences over future forms of energy supply, infrastructure, demand and efficiency, the research identified social values on which the public acceptability of future energy transitions might depend, namely: reduced resource use, efficiency, environment, security, autonomy, fairness and justice, and long-term improvement. A key advance that the project made was to move beyond eliciting public views on about particular technologies or components of the energy system – such as nuclear power, renewables, and energy demand response – to gather a sample of public views on whole energy system change. In doing this, the project adopted a particular systemic approach to energy participation – i.e. *invited participation in discrete events to elicit selected public views about energy system transitions*.

Our current project complements these findings but goes further in defining a systemic approach to energy participation as – *mapping diverse practices of public engagement with energy, their emergence and interrelations within energy systems*. A key distinction is that our current project not only seeks to understand public views on energy system change through discrete ‘invited’ events, but also opens up to the dynamics of multiple public engagements within a wider and ongoing system or ‘ecology’ of energy participation. This move is important for at least three reasons.

1. Recent developments in interpretive social science stress that what publics think about complex issues like energy is powerfully shaped by the practices through which they engage with it, the settings in which engagements occur, and how they are framed (Chilvers & Longhurst, 2016; Marres 2012; Stirling 2008). This means that different practices of engagement – like opinion surveys, deliberative processes, community action, or public protest – mould publics in different ways and produce different ‘matters of concern’ about energy systems. In mapping across diverse forms of engagement, in addition to holding discrete invited events, our project contributes to producing more comprehensive and robust evidence about different public views on energy systems.

2. The multiple ways in which publics engage with energy systems involves much more than their views about, or ‘acceptance’ of, decisions, actions and technologies made by others. Publics do not only engage in talking about energy, but are themselves busy *doing* things that are already shaping energy systems and energy transitions in powerful ways (Seyfang et al. 2013; Shove & Walker, 2014). Mapping out the diverse practices through which publics engage with energy allows research to remain open to the multiple outcomes and products of participation – of knowings, meanings, actions, and modes of organising – rather than falling back on the traditional ‘technology acceptance’ versus ‘behaviour change’ split that has become engrained in energy research and policy.
3. The move to a ‘systems of participation’ approach is reflective of how the ‘state of the art’ in the theory and practice of participation has rapidly advanced in the last few years. For example, leading edge work on how to bring about effective public deliberation on crucial issues like our collective energy futures has shifted from trying to perfect discrete engagement processes that can claim to be representative and inclusive of ‘the public’, to approaches more interested in building an effective ‘deliberative system’ where multiple forms of public involvement interconnect and can flourish (Parkinson & Mansbridge, 2012; Burall, 2015). The same goes for energy-related practices where interest is moving from a focus on the dynamics of social practices in situ to understanding how they connect up to form wider ‘systems of practice’ (Watson 2012). Such systemic perspectives reveal broader landscapes of energy participation and how they relate to institutions, constitutions and political cultures (Jasanoff 2011) – insights which cannot be gained from discrete invited forms of public engagement.

In this project we apply such systemic thinking to the energy field for the first time. The research has three stages. In the first stage we conducted a literature review and developed a conceptual framework for understanding systems and ecologies of energy-related participation (Chilvers et al. 2015). This current report presents the results of the second stage where our conceptual framework has been applied in carrying out a systematic review using an experimental methodology to provide a robust mapping of public participation in UK energy transitions 2010–2015. As well as providing a significant evidence base in its own right, this mapping will inform the development of new experiments in energy participation to be conducted in the third stage of the project.

The objectives of this report are to:

- put forward a framework for the study of energy participation at a systemic

level, adopting a relational approach;

- describe our experimental methodology for a UKERC systematic review of qualitative evidence, with the key criteria of representing the diverse practices of participation;
- identify and illustrate the key patterns of UK energy-related participation which emerge from the top-level analysis of our systematic review corpus;
- explore the insights about energy-related participation and the energy system emerging from the in-depth analysis of a sample of 30 cases from our systematic review corpus;
- develop the concept of ‘ecologies of participation’ by exploring the connections between the cases of energy-related participation in our corpus, and their relationship with the broader energy system;
- reflect on what the findings of this systematic review mean for future studies of public engagement with energy, the design of participatory experiments, and energy system governance.

Section 2 contextualises and details our conceptual framework for understanding energy participation as relational rather than fixed, and at a ‘whole systems’ level. Here we introduce the key concepts which have shaped our systematic review and develop two diagrams distilling our framework which will be returned to in our analysis.

Section 3 describes the methodology for our systematic review, paying special attention to the more experimental elements of our approach necessitated by our interpretive analytical framework, our deliberately broad definition of energy participation, and the predominantly qualitative nature of the data collected.

Section 4 explores and analyses the results of our systematic review, describing the key features of participation in the UK energy system 2010–2015. It does this by describing and visualising our full corpus of 258 cases as well as exploring the insights emerging from a more detailed analysis of a sample of 30 cases from our full corpus. We consider where in the UK and in the energy system energy participation is occurring, and then explore the definitions of the energy problem and energy futures, the modes of participation and the kinds of citizens that are produced through these participatory practices. The final part of this section focuses on the broader drivers in patterns of UK energy participation and describes processes shaping energy participation at institutional, national and transnational scales.

Section 5 considers the implications of our conceptual framework and systematic

review for future research and practice related to energy participation. We underline the significance of our novel approach and suggest future pathways for energy research and policy.

The appendix contains a full list of the cases collected and analysed in this systematic review and mapping, as well as summaries of the sample of 30 case studies subject to more in-depth analysis.

2. Literature review and conceptual framework

In the first stage of research we reviewed diverse literatures relating to public engagement with energy and developed a conceptual framework to guide the project (Chilvers et al. 2015). This groundwork was important given recent advances in theories and practices of participation and the project's ambition to develop a new way of thinking about energy-related participation from a relational and systemic perspective.

In the past, highly centralized energy systems left little role for the public, other than as 'passive consumers' (Devine-Wright, 2007). Citizens remained largely distant and removed from the core domains energy production, supply and its governance. As noted in the introduction, this has changed dramatically over the past two decades. The neoliberalisation of energy markets, the dawn of a new post-carbon era, moves to more distributed forms of energy production, the rise of the internet and smart technologies, have all served to multiply the roles that publics take up in relation to energy (Walker & Cass, 2007; Chilvers & Longhurst, 2012, 2016). Amid the current clamour to better understand and enact societal engagement with energy transitions, our review identified three ways in which participation and publics are and can be conceived. At the end of this section we identify an approach which is consistent with the relational whole systems framing of this project, and which allows the symmetrical comparison of diverse forms of participation in and around the energy system.

2.1 Mainstream approaches to energy participation

The first perspective is associated with mainstream approaches to energy participation, most of which are well-established in energy research, policy and practice. This includes commonly adopted approaches for engaging societal actors with energy, such as behaviour change techniques (often grounded in the disciplines of psychology and economics), public attitude surveys, deliberative processes, transitions management, and sometimes forms of engagement enacted in social movements. While the intentions of these forms of engagement diverge considerably – ranging from encouraging the public to adopt more sustainable energy behaviours through to eliciting opinions about energy policy and facilitating wider public debate – in the review we found that they have similar ways of conceiving of participation and the public. This includes the dominant assumptions of:

- Publics engaging with energy as individuals or groups of individuals;
- Participation as being fixed or pre-given in terms of the form it takes (related to specific definitions like deliberation, behaviour change, etc.) and who is involved (approaches routinely ‘target’ interested publics, consumers, innocent citizens, etc.) and the object of participation (for example, the energy-related issue in question, as often defined by governing institutions);
- Participation as the technical application of methods which can be objectively evaluated against ‘best practice’ criteria (like inclusion, representativeness, attitudinal change, impact on decision-making);
- Participation as occurring in discrete events at particular sites, which can be replicated and thus ‘scaled up’.

We call this view and set of assumptions about participation and the public ‘residual realist’ (after Chilvers & Kearnes, 2016), because it assumes a definitive external public that can be more accurately known or moved by set public engagement approaches. This is where most ‘state of the art’ reviews of public participation with energy would end, with a review of cutting edge participatory methods and the means by which their effectiveness can be evaluated.

2.2 Relational approaches to energy participation

The second perspective identified in our initial review has become firmly established across the interpretive social sciences over the past decade but has not crossed over so much into the worlds of policy and engagement practice. It is a relational perspective underpinned by approaches which see publics and participation as continually emerging and constructed through the performance of collective practices. From this perspective publics do not engage with energy as (groups of) autonomous individuals but instead do so through collective practices. Even a single person never participates alone, but always through collective practices comprising networked relations with material elements, infrastructures, technologies, knowledges, meanings, other people, policy instruments and so on. Furthermore, practices of participation with energy never occur in isolation. They are always entangled with, shaped by, and shape other collective practices and the energy systems in which they are situated.

Our review includes relational approaches to participation developed in Science and Technology Studies (STS), which take practices of public participation with energy as their focus, in addition to Social Practice Theory (SPT) approaches that have mostly

focused on everyday social practices which use energy. Relational studies of participation focus on the emergent characteristics of a participatory collective, instead of viewing their properties as fixed and natural. These emergent characteristics include the definition of the energy issue produced, the kinds of citizens which are engaged and produced, and the vision of democratic participation which is constructed through a given collective. Relational approaches demonstrate the entanglement of participation and begin to explore the multiple relationships between participatory collectives and other bodies and processes. They provide the resources to open up to the diversities, complexities and multiple productions of participatory practices across energy systems. However, they tend to focus on individual collectives or instances of participation rather than offering a broader systemic view of patterns of participation.

2.3 Systemic perspectives on participation

Our initial review established a third perspective that sees participation and the public from a more systemic standpoint. This is a view that is only just emerging in academic social science, and has not yet been applied to energy policy and related engagement practice. The review therefore drew together, for the first time, the latest literature and theoretical resources from within and outside of the energy field to develop a systemic perspective on public participation with energy, in keeping with the UKERC ‘whole system’ remit. Such systemic perspectives move beyond a narrow imagination of participation as discrete ‘events’ at particular sites in the system. The emphasis moves to understanding multiple interrelating ‘ecologies of participation’ (Chilvers & Kearnes, 2016) that make up wider energy systems and their constitution.

Deliberative democratic theorists, for example, are increasingly seeing a focus on engaging mini-publics in individual participatory processes as insufficient, in that it fails to consider how multiple deliberative moments interact in broader ‘deliberative systems’ (Mansbridge et al. 2012). They argue that the quality of individual cases of deliberation can only be judged with reference to this broader system. Related to this are institution-focused approaches to systemic participation, which have emerged from a range of different disciplines (see Pallett and Chilvers, 2013; Dobson, 2014). These approaches shift the focus away from specific instances of participation and onto key governing institutions, asking how successfully they have been able to respond to diverse instances of participation in institutional processes

and decisions.

In the energy field, the use of transitions approaches to understanding and managing energy (e.g. Loorbach 2010) have been associated with taking a system-wide perspective on the social and material elements of energy systems. Furthermore, whilst transition management is generally characterized as a top-down project with an overriding focus on technical elements, more recent work has emphasized the need to take account of social and participatory democratic elements in this schema (e.g. Hendriks 2009; Laird, 2013). Other recent energy-related work in SPT has sought to move beyond a focus on single practices performed in mostly domestic settings and focus instead on the relationships between practices as they extend through space and time to make up particular systems (such as the energy system). Here, work has begun exploring the nature and density of connections between different practices. Shove et al (2012), for example, distinguish between co-located but loosely connected 'bundles' of practice and more densely integrated 'complexes' of practice, whilst Watson (2012) notes that practices are interconnected, and therefore influence one another, through shared elements, shared 'carriers' or performers, and through their arrangement and sequencing across space and time.

The field of STS offers a number of conceptual resources for understanding systems of participation. Our review identifies two main approaches. The first approach is object-oriented and pragmatist. It focuses on the objects which give rise to, mediate, or are produced through public involvement with energy - ranging from material technologies like smart homes or oil pipelines through to energy-related issues that co-emerge with publics (Barry, 2012; Marres, 2012). Such insights emphasize the multiple forms of public involvement that make up issue-spaces or controversies, for example around issues like fracking or fuel poverty. The second systemic STS approach focuses more on institutional factors and human agency, with an interest in how collectively acceptable forms of public reason solidify and change over time in particular settings (e.g. Jasanoff 2012). These approaches have tended to focus on a particular nation-state, or to compare between nation-states, developing an in-depth analysis based on the specificities of national culture and history. Such insights argue that understanding systems of energy participation depends on exploring how they are powerfully shaped by and shape the political cultures and constitutions in which they are situated.

2.4 A framework for understanding ecologies of participation

On the basis of the above reviews, we outlined a relational and co-productionist framework for understanding and intervening in energy-related participation (see Chilvers et al. 2015). This framework moves beyond the mainstream approaches, to bring together the second (relational) and third (systemic) perspectives on participation outlined above. More specifically it builds on the approach developed by Chilvers and Kearnes (2016) and Chilvers and Longhurst (2016) in setting out a practice-oriented and relational approach to participation grounded in co-productionist thinking from STS. This framework has the benefit of being open and flexible, so it can be used to analyse and symmetrically compare diverse forms of participation across (energy) systems, rather than being applicable to one particular kind of participation which is the case for most analytical frameworks. The framework is shown in Figure 4.

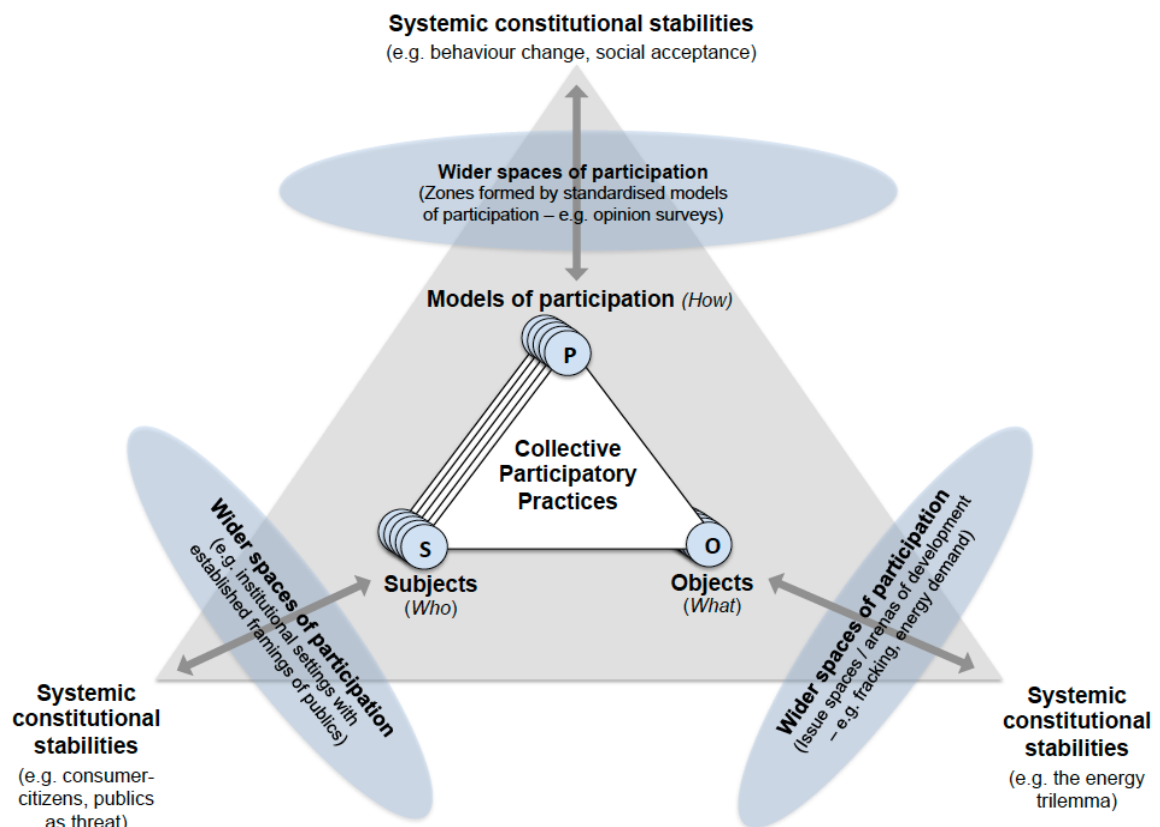


Figure 4. A framework for understanding ecologies of participation in socio-technical systems (Chilvers et al. 2015).

The triangle at the centre of the diagram represents the **collective participatory practices** through which publics engage with energy and the energy system. Our

approach emphasises the ways in which these participatory practices are not fixed or pre-defined, but rather are emergent and continually being made and performed. In this sense all practices of energy-related participation comprise, are shaped by and are productive (produce outcomes) in relation to three key dimensions (see also Chilvers and Longhurst, 2016):

- **(O) objects of participation** – i.e. what is participation for and what is the energy object being participated in (for example: energy technologies, energy consumption, energy-related issues, energy governance);
- **(S) subjects of participation** – i.e. the actors enrolled into participatory practices and their identities (for example: innocent citizens, consumers, activists, experts);
- **(P) models of participation** – i.e. how the elements of participatory practices are organised, formatted and configured (for example: through codified participatory techniques like surveys, or more organic bottom up or citizen-led processes)

These dimensions are co-produced through the assembling of particular material settings, knowledges, devices, meanings, and configurations of human and non-human actors that make up collective participatory practices. The multiple triangles at the centre of Figure 4 signify the sheer diversity of different ways in which people participate in and relate to energy systems. Instead of predefining the who, what and how of participation, analytically our approach opens up to the diversity of participatory practices through which publics engage in energy transitions. This leads us to form a more open **definition of *public participation as heterogeneous collective practices through which publics engage in addressing collective public problems (in this case 'energy-related' issues), whether deliberately or tacitly, which actively produces meanings, knowings, doings and/or forms of social organization.***

While this highlights the diversity and emergence of public engagements with energy, such collective participatory practices form part of wider spaces and systems depicted towards the outside of Figure 4. In our framework, two aspects are important in explaining the systemic patterning and dynamics of energy participation.

The first is **wider spaces of participation** – *i.e. spaces within which multiple participatory practices connect up and relate.* Wider spaces of participation can exist and form on any of the three dimensions of participatory practice (see Figure 4). For example, in relation to models of participation, zones of standardization can form around a particular method or technology of participation (e.g. opinion polls or citizens' juries) which connect similar participatory practices across space and

time, often internationally. Spaces of participation can also be spaces of difference where multiple participatory collectives cohere around a controversy (e.g. fracking, biofuels or fuel poverty), or otherwise an arena of development where they compete in shaping innovation pathways (e.g. the development of smart energy technologies). In terms of the subjects of participation, multiple participatory practices can be connected with a wider space of participation in reproducing particular public identities (e.g. consumer–citizens, innocent citizens). Specific institutional settings are a good example of such spaces. As shown in Figure 4, these wider spaces of participation thus form over space and time and serve to shape participatory practices in situ, but are in turn formed and shaped by them in a recursive relationship.

Second, these spaces of participation are situated within and beyond the wider energy system as represented by the grey triangle and the text on the outside of Figure 4. Drawing on co–productionist work in STS, this aspect of our framework introduces the notion of the **energy system as constitution**. *This goes beyond the conception of the energy system as being made up of purely technical elements, to highlight the importance of political, legal and social elements which also make up this system and help to make it stable.* This approach emphasizes the importance of the national political culture and constitutional relations between citizens, science and the state within which an energy system is situated, in shaping (and being shaped by) the forms of participation that occur within it. These systemic stabilities are tied up in energy policies, laws, regulations, infrastructures, established social practices, sociotechnical imaginaries, and collective forms of public reason that have become established within situated (national) political cultures over historical time. But energy constitutions are also subject to moments of transformative change, for example at times of crisis, following surprise events or as a result of changes in the energy policy landscape (such as the recent merger of DECC and BIS to create the new Department for Business, Energy and Industrial Strategy). Under these constitutional conditions certain forms of energy–related participation become more established, legitimate or prevalent than others. For example, in our review we identify literature that indicates the models, subjects and objects of participation that have become dominant within the UK energy system in the early 21st century (see Figure 4), under a hybrid governance regime characterized by a liberalized energy market with notable levels of state intervention:

- Dominant *framings of the energy object (O)* were shown to centre around the energy trilemma of climate change, energy security, and affordability in

instrumental terms;

- Dominant *models of energy participation (P)* were shown to centre on behaviour change approaches, legislatively required consultation processes, and increasingly deliberative democratic methods of engagement to gain citizen inputs onto energy policy;
- Dominant *imaginaries of energy publics (S)* were shown to focus on the imaginary of the ‘public as a threat’ to energy security and progress, as well as prevalent assumptions of publics as consumers or as innocent citizens enrolled into surveys and deliberative fora.

So, in contrast to a vision of energy-related participation as the engagement of individuals in discrete engagement processes, our framework opens up to the existence of diverse, emergent and interrelating participatory practices, that form part of and interact with of wider spaces of participation set within an energy system as constitution. Our framework therefore advances to focus on understanding **ecologies of participation** – *i.e. the relationships between diverse interrelating collectives and spaces of participation and how they interact with wider systems and political cultures*. In this sense: “An ecological conception of participation suggests that is not possible to properly understand any one collective of participation without understanding its relational interdependence with other collective participatory practices, technologies of participation, spaces of negotiation and the cultural political settings in which they become established” (Chilvers & Kearnes, 2016: 52).

This perspective moves from seeing systemic participation as simply about eliciting public views on energy systems in invited events to inform particular moments of decision or action. The challenge also becomes one of also mapping the diversities, relations and productions of already existing practices and spaces participation within energy systems. In order to map relations between practices, spaces and systems of energy-related participation Figure 5 sets out a mapping space which differentiates between:

- *dominant participatory practices* that are well established, prevalent and more ‘central’ to the energy system as constitution;
- *diverse participatory practices*, which form part of wider spaces of participation and tend to be more marginal, endangered and ‘decentred’ in relation to the energy system;
- *participatory practices* which are either *emerging* in relation to the energy system as constitution or are deemed to ‘*overflow*’ (lie outside of) it under certain frames of reference.

Dominant participatory practices would tend to be those most commonly associated with public engagement with energy in particular settings. Diverse participatory practices will often challenge dominant institutional assumptions and framings about energy participation and throw up alternative ways of meaning, knowing, doing and organizing in relation to energy. Participatory practices that are emergent or overflow the energy system continually challenge the unitary definitions of ‘the system’ and speak to the inherent uncertainties and indeterminacy of energy participation and the publics. Not only do new participatory collectives emerge which challenge accepted definitions of ‘the energy system’, forms of participation deemed to be outside of – or ‘overflowing’ – the system can become part of it under alternative system frames (for example, under certain system frames public engagements in addressing transport, water, health or social justice related–issues may be defined as within or outside the energy system – raising the possibility of ‘non–energy energy participation’).

The framework presented in Figure 5 emphasises the need for continued and ongoing institutional responsiveness to diverse and emergent forms of energy participation as well as possible overflows. This inverts the challenge of participation in governing energy system transitions from one of a **problem of extension** – *i.e. including all relevant actors within discrete participatory process* – under the mainstream view of energy participation, to one of a **problem of relevance** – *i.e. the need to be continually responsive to the relevance of diverse, emergent and overflowing practices of energy participation*. Such a move depends on being able to map ecologies of participation across wider systems. It is this novel challenge that is taken forward in the systematic review that follows.

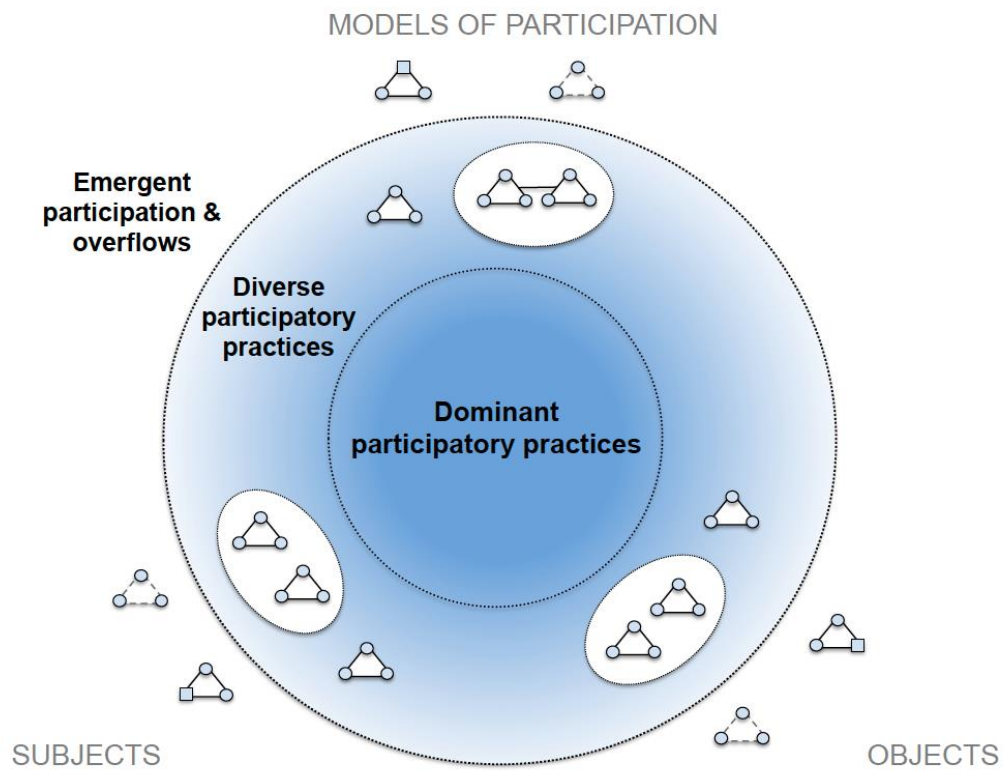


Figure 5. A framework for mapping relational ecologies of participation (in terms of dominant, diverse, emergent and overflowing participatory practices).

3. Systematic review methodology

Our approach to the systematic review was guided by the methodology developed by the UKERC Technology and Policy Assessment (TPA) programme, which has been widely used in systematic reviews of evidence around different energy policy topics (e.g. Blyth et al. 2014; Gross et al. 2013). Though we included the key features and stages of a UKERC TPA systematic review, several aspects of our project required a different approach to the systematic review methodology, namely:

- the use of an interpretive analytical framework to allow comparison across different areas of the literature which use different approaches and terminologies;
- the deliberately broad and reflexive definition of ‘participation’ – our object of study – which was adopted, and our aim to attend to the diversity of participatory collectives relating to the UK energy system; and
- the predominance of qualitative and case study–based data in our systematic review corpus.

Figure 6 illustrates the key stages of our systematic review process.

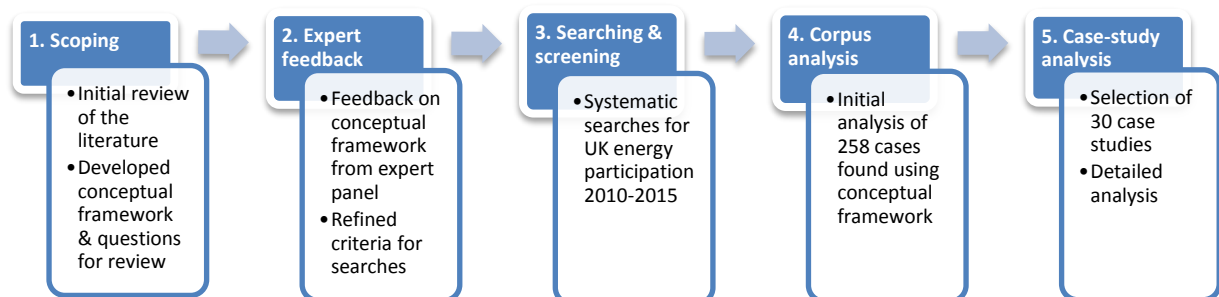


Figure 6. Systematic review methodology key stages

3.1 Scoping

As summarised in the previous section, we wrote a scoping note as the basis for our review (Chilvers et al. 2015) in order to develop and refine of our analytical framework. Therefore in contrast to other UKERC TPA systematic reviews, this scoping stage was not only about identifying potential problems and issues relevant

to the review topic, but it was also about defining our object of interest and developing the conceptual framework through which our systematic review findings would be analysed and explored. The framework was informed by a review of the literature but also emerged from conceptual developments in the fields of science and technology studies (e.g. Chilvers & Kearnes 2016; Jasanoff 2011; Marres 2012), democratic theory (e.g. Parkinson & Mansbirdge 2012), political science (e.g. Brown 2009) and beyond (see Chilvers et al. 2015). The most important elements which emerged from this stage were our broad practice-based definition of participation which challenged its narrow framing in much of the existing literature, and our decision to adopt a relational co-productionist approach to understanding public participation at the level of the UK energy system, as described in section 2.

The question of what counts as part of the energy system and what constitutes legitimate participation in the energy system is a contested one, with different system actors perceiving these boundaries and priorities differently. The question of who and what might be excluded from participating in this system, therefore also depends on the definition of system boundaries and of what is valued. Our intention in this systematic review is to create a mapping which is of potential use to all system actors, rather than prioritising some over others. This necessitated the use of a symmetrical and flexible framework, like the co-productionist framework we chose, which accommodates different definitions of the energy system itself as well as different kinds of participants and forms of engagement.

3.2 Expert feedback

The initial scoping note was sent to our expert panel for feedback on our proposed approach and conceptual framework. We also sought suggestions of potential cases to be included in our systematic review corpus. The feedback from our expert panel confirmed that a range of people with very different perspectives on and relations with energy participation saw this as a relevant and worthwhile project in terms of participation practice and theory, and understandings of the energy system. Panel members were broadly supportive of the move towards a perspective that explores

Expert panel members

Dr Noortje Marres, University of Warwick
Professor Nick Pidgeon & Dr Christina Demski, Cardiff University
Diane Warburton, Shared Practice
Dr Matt Watson & Dr Rachel Macrorie, University of Sheffield
Professor Brian Wynne, Lancaster University
Dr Nick Eyre, University of Oxford

diverse and interrelating ‘ecologies of participation’ across energy systems.

The comments from our expert panel helped us to sharpen our explanations of the value, justification and rationale of the approach we have taken in this process, highlighting the broader analytical contributions it could make and making clearer our normative stance. Several panel members pointed out that our deliberately broad definition of ‘participation’ might make it difficult for us to limit and bound the ‘system’ under study and manage the ‘slippery’ uses of the term. This was something we put a lot of care and attention into in the searching and screening stage (see section 3.3), and it also prompted us to reflect more in our analysis on the purposes of different forms of participation. As discussed in section 2, however, retaining a ‘reflexive’ definition of participation is essential to our approach, in order to attend to the pre-given assumptions of existing definitions of participation and open up to the diversity of ways in which citizens are engaging with and shaping UK energy transitions. The panel’s comments also indicated that our understanding of the relationships between individual instances of energy participation and the broader energy system needed to be more clearly developed and articulated. We attended to some of these comments in section 2, but this question of the relationship between energy participation and the broader system was also part of the corpus and case study analysis stages, and is reported in detail in sections 4.6 and 4.7.

As we had hoped, the expert panel’s comments drew our attention to an even greater diversity of modes and examples of energy participation than were reflected in the scoping note. These comments shaped our approach to the searching and screening stage by pointing to additional search terms, and highlighting the importance of moving beyond peer reviewed sources to also gather examples of energy participation from the grey literature.

3.3 Searching and screening

Drawing from the conceptual framework developed in our scoping note, and our specific concern with reflecting a diversity of energy collectives in our review, our approach to searching for cases was necessarily more experimental than other UKERC TPA systematic reviews. Our searches aimed to identify examples of **UK public participation** concerning **energy**, but we also adopted a very high number of synonyms for each of these terms to account for the diversity of terminologies for participation, the public and energy issues (i.e. the models (P), subjects (S) and

objects (O) of participation defined in Figure 4, above) which we found through our initial review of the literature and expert feedback. Table 1 shows the full list of search terms used. We did all of our searches through both academic and non-academic search engines (Web of Knowledge, Scopus, Google Scholar and Google) to identify cases from the academic literature, grey literature and media. The main researcher for the systematic review task (HP) went through all of the results found through Web of Knowledge and Scopus. Due to the much higher number of results produced by Google Scholar and Google, the researcher adopted the protocol of going through the first four pages of results, and only proceeding further if highly relevant cases were found after four pages.

UK	Public	Participation	Energy
Britain	Citizen*	Involvement	Electricity
England	Consumer*	Engagement	Gas
Scotland	Activist*	Survey	Transport
Northern Ireland	Protester*	Attitudes	Heat*
Wales	User*	Opinion*	Fuel
	Stakeholder*	Dialogue	“fossil fuels”
	Practitioner*	Deliberation	Coal
	Communit*	“behaviour change”	Oil
	Participant*	Nudge	Nuclear
	Collective*	Co-operative	Renewable
	Homeowner*	Media	Hydropower
	Audience*	“social media”	“solar power”
	Individual*	“transition management”	Photovoltaics
	Societ*	Protest	Biomass
	“civil society”	“social movement*”	Biofuels
	Civic	Experiment*	Bioenergy
	Population	“collective experiment”	“nano energy”
	Carrier	“social practice*”	Nanoenergy
		“deliberative mapping”	“geothermal energy”
		“speculative design”	“carbon capture”
		Assemblage*	“radioactive waste”
		“issue space”	Shale
		“open innovation”	Fracking
		Inclusion	“hydraulic fracturing”
		Empowerment	“low carbon”
		Consultation	Pylon
		Bottom-up	Microgeneration
		Co-design	Grid
		Co-production	Voltage

		Partnership	Smart
		Discursive	“Green Deal”
		Demonstration	Ofgem
		Grassroots	“sustainable lifestyles”
		Communication	“zero carbon”
		“sentiment mapping”	“feed-in-tariff”
		Crowdsourcing	“fuel poverty”
		Makerspaces	Eco-home
		Hackerspaces	Insulation
		Visioning	Efficiency
		“participatory modelling”	“demand reduction”
		“citizen science”	“demand side response”
		“multi-criteria mapping”	“demand side management”
		Heating	Feedback
		Cooling	Meter
		Cooking	“in-home display”
		Showering	“sustainable consumption”
		Bathing	“Direct Load control”
		Laundry	“Critical peak pricing”
			“Time-of-use tariff”
			DECC
			“big six”
			“British Gas”
			EDF
			Npower
			E.ON
			“Scottish Power”
			SSE

Table 1. Synonyms used for case study searches

The key criteria which guided our searches and screening were that:

1. Each case involved some kind of citizen engagement with energy transitions (within this we included some forms of stakeholder engagement, but not processes which only involved expert elicitation)
2. Each case took place somewhere in the UK
3. Each case took place between 2010–2015 (we included some cases which started before this time period, where a significant amount of engagement occurred in 2010 or later)
4. The corpus as a whole attended to diversity in terms of: locations in the UK;

different visions of the public; different forms of participation; and different understandings of energy issues/the energy system.

The use of multiple synonyms in our searches and the multiple meanings of key terms like 'energy' also meant that our searches contained a high proportion of irrelevant material. For example, the results frequently included literature from physics, medicine and the nutritional sciences which could not be fully excluded by using a subject filter. This required the main researcher (HP) to go through the results manually to identify relevant cases. We also carried out targeted searches for cases with characteristics we expected to find based on our scoping study (for example, open innovation processes or sentiment analysis projects), but which did not appear in the initial search corpus, in order to test whether our search terms and criteria were working effectively. In the cases of open innovation and sentiment analysis projects, even focussed searches did not yield many additional cases which fitted our criteria, suggesting that these were techniques talked about generally but did not appear specifically in the broader literature. We infer from this that their use for energy participation had either been over-stated or the results of these collectives had been under-reported, for example for reasons of commercial confidentiality.

The time frame was also a very important element of our review, as we were not attempting to collate all recorded instances of public participation in UK energy transitions, but rather to provide a detailed picture of energy participation in the UK 2010–2015. There were several reasons for adopting this time period including:

- it was a contemporary recent period containing collectives which members of the research team had prior knowledge of, and it went up until the time the searches were carried out to ensure that the results would be relevant to current conversations about energy participation;
- the time period was manageable within resource constraints, but was a long enough time period to map diverse forms of participation and explore interactions between them linked to system-wide developments; and finally,
- the period coincided with the term of Conservative–Liberal Democrat Coalition Government which was characterised by changes in energy policy as well as broader constitutional conditions.

We defined a case of participation as comprising some form of collective practice through which publics and/or civil society engage with a particular part of the energy system or an energy-related issue. Where multiple academic papers or reports referred to the same collective, this counted as one case. Some academic papers focussed on several different collectives, so these were counted as separate

cases where there was enough information about each collective to allow for full analysis, and counted as part of the same case where they had been aggregated together through the research process, for example through a survey of similar collectives. The focus of our searches was on when the instances of participation had taken place, meaning that not all relevant papers found within the 2010–2015 time frame were included in the corpus. Cases referring to historical events were also excluded. Due to the lag times associated with academic publishing, it is also therefore possible that some cases have been left out of the corpus, simply because their outputs have not been published yet. However, we did endeavour to include project websites for current projects and media or blog coverage of recent collectives in the corpus, as identified through Google searches.

The value of this approach in part comes from our specific interest in exploring the diversity of participatory collectives in and around the energy system which was key to the conceptual justification of this project and review (see section 2). Through this we have identified and mapped many cases of energy participation which have not until now been publicised in the academic literature or in official documents, or have not even been considered as examples of citizen engagement in energy transitions. Our corpus inevitably provides a partial account of participatory collectives engaging in energy transitions in the UK 2010–2015, due to the limitations of the literature itself and the challenges of searching within an area characterised by diverse academic approaches. However, the picture we provide is significantly more varied – and therefore provides a richer and more diverse account of citizen engagement ‘on the ground’ – than if we had relied purely on an academic search engine and not searched the wider grey literature or carried out targeted searches.

3.4 Corpus analysis

Our final corpus of 258 cases was analysed using our analytical framework (see appendix A for the full list cases). The main objectives of this stage were to map the diversities and patterns of the different understandings of participation, the public and energy issues reflected in the different cases, as well as mapping relations across the wider energy system. This coding structure was jointly created and tested on a sample of cases by the research team to ensure inter-coder reliability, and the coding of the whole corpus by the researcher (HP) was checked by the project lead (JC). Our analysis of these collectives, guided by our interpretive

framework, offers a mapping of energy participation in the UK, demonstrating the spread of different issues (objects), participants (subjects) and forms (models) of participation which are produced in these collectives, as well as the wider spaces of participation (such as different institutional settings) or parts of the energy system these collectives relate to. Through this we illustrate both the diversity of current energy participation in the UK, but also draw out the ways in which this participation is shaped and constrained by broader factors (i.e. the systemic constitutional stabilities noted in Figure 4, section 2). The full spreadsheet of our corpus, can be viewed open access [here](#). The spreadsheet includes key readings or links for more information about each collective, information about the locations, funding, and institutional settings of each collective, details about the ways in which some of the collectives have been studied by academics, and our top-level analysis of the who, how, what and where of each collective.

3.5 Case study analysis

To explore the richness of the data collected we conducted more detailed analysis on a subset of our full corpus of cases to gain deeper insights into the construction and effects of different participatory collectives, how they interact, and relate to the wider energy system. This full case study analysis enables us to get a more detailed understanding of the key characteristics of the participatory collectives identified in our first stage of the analysis, and how they shifted and evolved over time. Through this we are able to explore how the key features of the participatory collectives identified, including framings of the energy issue, forms of participation, and visions of the participating citizens, are produced, and how they interact with one another. This helps to demonstrate that key features of the participatory collectives, which may look relatively straight-forward in our infographics and statistics, are not fixed or natural characteristics but rather they emerge from and are produced through the performance of participation itself. The second contribution of this full case study analysis is to help us to get beyond a focus on individual cases of participation to start to identify significant relationships between different participatory collectives and to explore the ways in which these participatory collectives relate to the broader energy system. This analysis helps us to move beyond merely describing patterns of energy participation towards starting to explain some of the reasons for and drivers of the patterns we have found.

This sample of 30 cases is not statistically representative of the whole corpus,

rather it was selected with a number of other criteria in mind.

1. Cases were selected to capture as far as possible the **diversity of features** identified in the first round of analysis, as well as to ensure geographical coverage across the four nations of the United Kingdom. So for example, particular practices of participation which accounted for a high proportion of the cases in the whole corpus such as surveys or community action, are under-represented in this sample; whereas some of the less common issue areas such as energy-from-waste or energy transmission infrastructure have been included in the sample to allow us to explore a large range of different characteristics.
2. To aid understanding of the broader UK energy system and prominent institutional drivers influencing energy participation, the sample included participatory collectives which were judged to have received a high level of **publicity**, such as 'Reclaim the power', or which appeared to have been important in **shaping** energy policy, such as the DECC 2050 pathways public dialogue.
3. Some of the cases in the sample also reflected what appeared to be **emerging trends** in the whole corpus, such as growing interest in fracking or smart technologies, or the adoption of new methods of participation such as 'living labs' or 'sentiment mapping'.

The thirty full case studies are represented in the pictures on the next two pages, and summarised in appendix B.



UKERC Transforming the Energy System National citizen engagement process

DECC's public attitudes tracking



REENERGY Living Labs academic project



DECC's My2050 calculator and public dialogue

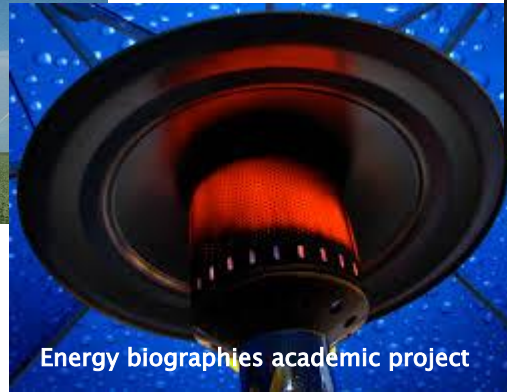
Experiences of fuel poverty academic study



Wind farm protests in Nant y Moch, Wales



Tilting at windmills dance installation



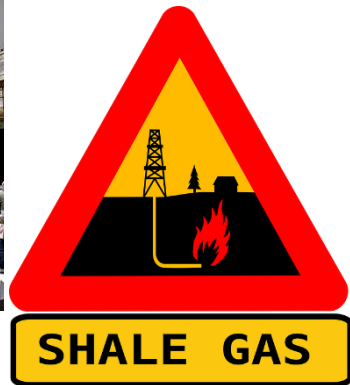
Energy biographies academic project



Energy Babble academic co-design project



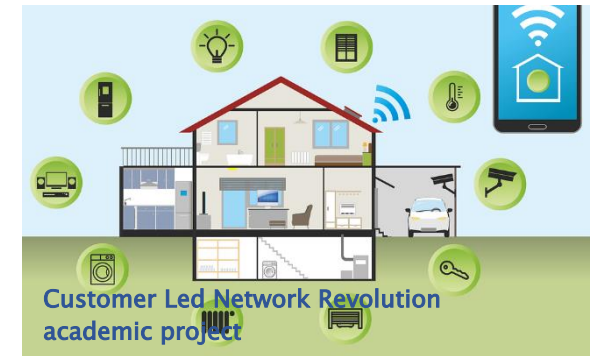
Low carbon communities challenge



UK Government public engagement with shale gas and oil



The BBSRC's Bioenergy Distributed Dialogue



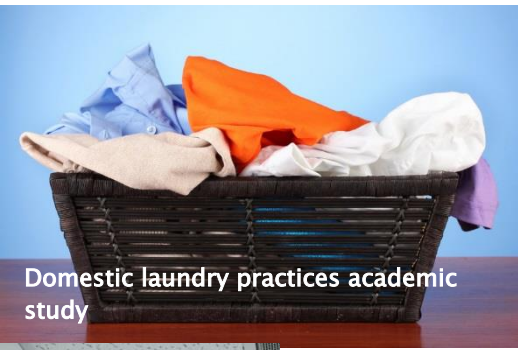
Customer Led Network Revolution academic project



Reclaim the power activist group



Northern Ireland's first community energy collective



Domestic laundry practices academic study



Understanding Homeowners' Renovation Decisions UKERC project



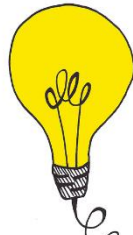
The Brighton Energy Co-op



Connect academic study into commuting behaviours



Thermal comfort behaviours in UK office buildings academic study



Drawing energy project at the Victoria & Albert Museum



Demand Energy Equality campaign group



Reporting of fracking in the UK press academic study

Sentiment analysis of perceptions of the Big Six energy companies by Talkwalker



BRITAIN'S FIRST 'FRACKING VILLAGE' WANTS TO QUIT FOSSIL FUELS
LET'S HELP THEM OUT!

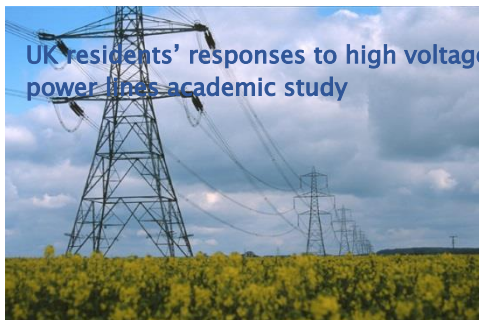
Back Balcombe campaign



Smart meters, smart people field study in Northern Ireland



Imaginaries of low carbon rural futures in English villages academic study



UK residents' responses to high voltage power lines academic study



Community food-waste energy production projects in Sheffield and Devon academic study



Londoners on bikes campaign

4. Findings: Mapping UK energy-related participation 2010–2015

This section presents the findings of our distinctive approach to mapping participation in and around the UK energy system 2010–2015. Using our novel conceptual framework we have been able to identify and map diverse forms of participation in energy transitions. Additionally, this framework allows us to directly compare instances of participation which have not have been considered together in other studies – ranging from behaviour change initiatives and policy consultations through to activism and citizen-led innovation – thus generating new insights. A further original element to our systematic review is the whole systems approach, which leads to an exploration of connections between different cases and broader ecologies and even constitutions of energy participation towards the end of this section.

As this is a mapping project the most appropriate place to start this section is with a discussion of the ‘where’ of UK energy participation in sub-section 4.1. This sub-section gives an immediate sense of the shape of our corpus, describing the geographical, institutional and funding patterns we found across our cases. To further situate our analysis and cases we then move on in sub-section 4.2 to consider the ‘what’ (or object) of UK energy participation, exploring the range of framings of energy and the energy system which emerged from our cases. In this sub-section and subsequent sub-sections our analysis moves from relatively straight-forward descriptions of the patterns across our corpus as a whole, towards more nuanced and detailed insights from the smaller set of 30 more in-depth cases studies. These insights demonstrate the emergence and dynamic nature of the key features of energy participation which form the focus of our analysis, and also start to hint at broader patterns or ecologies of energy participation which we return to at the end of the section. Sub-sections 4.3 and 4.4 consider the ‘how’ (i.e. models) and ‘who’ (i.e. subjects) of UK energy participation respectively, exploring the range of models of participation and democracy represented in our corpus, and the range of different roles for or imaginaries of citizens in different forms of energy participation. Throughout these sub-sections we demonstrate the close connection between models of participation, roles of citizens and framings of energy issues.

Sub-sections 4.5 and 4.6 describe some of the broader patterns in our data concerning the relationships we found between different cases of energy

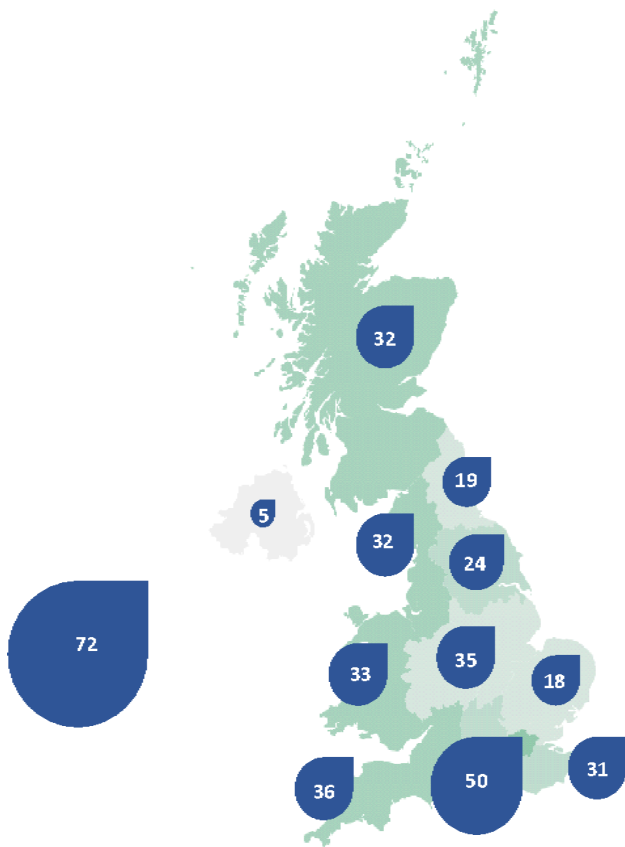
participation, relationships between the different productive dimensions of the cases, and relationships between cases of participation and the energy system as constitution. This enables us to identify prominent ecologies of participation which shape and affect the reception of individual instances of energy participation, as well as contributing to the broader energy constitution. We also describe the main features of the UK energy system as constitution 2010–2015 as identified through our analysis.

In line with our **interpretive and reflexive approach**, there are several caveats to the insights which follow which we briefly outline here. First, due to the nature of systematic reviews and searches, the **cases identified here are those which have been publicised in some way**, though we have made stringent efforts to make our corpus as diverse as possible. There will therefore, be a number of ‘de-publicised’ collectives which do not appear in this analysis (or indeed other analyses), so **there are uncertainties thus attached to our findings** which could be addressed to a certain extent through further empirical research. Secondly, the cases which we collected were accessed through academic databases and Google searches, both of which introduce their own further framing effects. Thirdly, there is a limit on the number of recent cases included in our corpus, where they have been studied through academic projects due to the long lead times in academic publishing. However, we tried to pick up relevant projects through other searches (for example, identifying project websites) where possible.

4.1 Where does energy-related participation happen?

Our systematic review reveals clear patterns concerning where participation related to energy transitions is occurring, in terms of the geographical distribution of participatory collectives across the UK, the institutional settings and funding of these collectives, and the parts of the energy system itself which the collectives relate to.

Geographical location



While 27% of the participatory collectives in our whole corpus (n=258) enrolled citizens from each of the four nations of the UK, almost half of the collectives (47%) were based solely in England. The other nations were significantly less well represented in the corpus with 14% of collectives being based solely or partially in Scotland, 14% in Wales, and only 5% of collectives included citizens in Northern Ireland. Figure 7 adds more detail to this picture, showing a further concentration of energy participation around London (accounting for 50 cases alone) and the Southwest of England, which has consequences for the systemic picture of energy participation which

Figure 7. Map of collectives' locations in the UK emerges, including questions of who participates, precisely which issues they are participating in and how they participate, as will be discussed in the sections below. In addition to this, 72 of the participatory collectives in our corpus claimed to engage participants from all the different regions of the UK.

Institutional settings

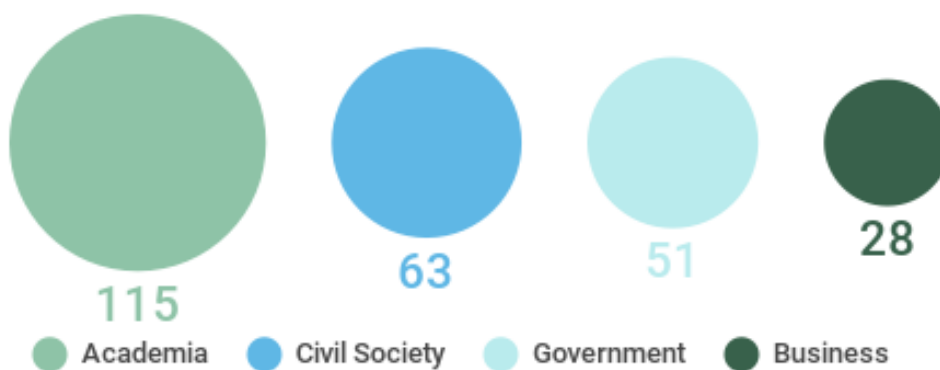


Figure 8. Institutional settings of energy participation

However, there are not only important geographical patterns in our whole corpus, but also institutional ones, that also have important implications for other aspects of energy-related participation. While many participatory collectives connect and blur between different institutional settings, Figure 8 shows our analysis of the primary institutional settings of each of the cases in our systematic review. This demonstrates that **by far the most participatory collectives are associated with the institutional setting of academia, accounting for 45% of the whole corpus, while civil society and Government settings account for 24% and 20% of the corpus respectively.** The dominance of academia as an institutional setting is in part a reflection of our systematic review methodology, which was framed using academic concepts and carried out mostly using search engines for academic papers. However, this also shows the very significant role played by academics in orchestrating energy participation in the UK, and therefore being able to represent and in some cases speak for different participatory collectives and the publics they enrol. The pattern demonstrated in Figure 8 also hints at other factors relating to how different participatory collectives are publicised. Academia is a setting where very diverse forms of participation, including everyday forms of engagement with energy, are regularly publicised through academic papers and reports.

In contrast, **in business, a setting which accounted for only 11% of our corpus, emergent participatory collectives tend to be much less publicised through public documentation, meaning that there are potentially many 'invisible' collectives missing from our corpus.** For example, parts of the grey literature suggest that techniques such as sentiment mapping and other ways of exploiting data from web forums and social media platforms are becoming increasingly widespread, and tend to be carried out by specialist private companies. Our systematic review searches found many companies claiming to have expertise in this area in the UK, and some even emphasising the importance of this kind of work around energy issues. However, in most cases there were no published reports available or even lists of the collectives created around these processes. This is perhaps because of concerns related to commercial confidentiality and wanting to safeguard newly developed participatory methods of sentiment mapping, or perhaps there is also a propensity for companies like this to exaggerate their range of experience and expertise. We also found similar patterns around open innovation processes, where there were very few documented examples publicly available, meaning that open innovation and sentiment mapping as modes of participation are likely to be under-represented in our corpus. This illustrates how recent trends towards the professionalization and commercialisation of public engagement expertise in the

UK and other western democracies (Chilvers, 2010; Lee, 2015) can at times serve to close down the transparency and publicity of participation in wider society. Much more everyday forms of ‘economic’ participation, such as switching energy suppliers and other engagements with energy markets, also appear to be underrepresented in our corpus. This points to a lack of academic study of these engagements in terms of citizen or consumer engagement, as well as lack of broader documentation of these forms of energy participation.

Patterns of resourcing

Related to questions of institutional settings, but more strongly highlighting themes around resources and the orchestration of energy participation, are the funding patterns of different participatory collectives. Given the predominance of participatory collectives with primarily academic institutional settings it is unsurprising that **universities and research councils funded the highest number of participatory collectives, with 94 collectives being funded in some way by UK research councils.** The Engineering and Physical Sciences Research Council (EPSRC) was the biggest funder, supporting 48 collectives. Amongst businesses, energy providers funded 24 collectives – with E.ON and EDF being particularly significant funders here – and other businesses concerned with the supply of energy funded a further 15 collectives. Most government funding came directly from the UK Government, accounting for 33 collectives, whilst devolved administrations and local government were also significant funders of energy participation. 19 collectives were funded by civil society, and a further 12 had no listed funding sources. Charities too were a significant funder of energy participation, including energy or environment focussed charities such as the Energy Saving Trust and Forum for the Future, as well as health–focussed charities like the British Heart Foundation, and arts–based charities, including the Design Museum and the Arts Council.

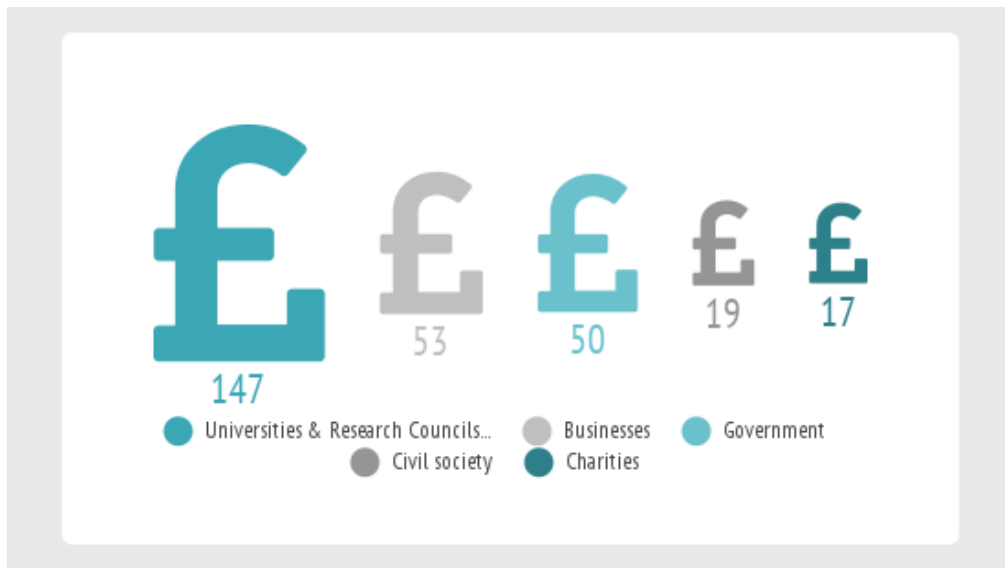


Figure 9. Funding of energy participation cases by sector (colour of £ corresponds to label)

Where in the energy system

An important consideration for a study interested in ‘whole-systems’ energy participation are the patterns of participation that our systematic review revealed across the energy system itself. The locations of many of the cases can be described in terms of the conventional (technical) parts of the energy system which often structure whole-systems accounts. For example, **many collectives are located primarily around energy supply**. Drawing examples from the smaller set of in-depth case studies, we observe for instance that in **case 2** (Reclaim the Power) participants were concerned with protesting against the continued prominence of fossil fuels in the UK’s energy supply, while **case 5** (Government public engagement with shale gas and oil), **case 22** (reporting of fracking in the UK press) and **case 25** (Back Balcombe) were all concerned in different ways with the potential for fracking to become part of the UK’s energy mix. There are also many examples of cases concerned with sources of renewable energy supply, such as **case 4’s** (The Bioenergy Distributed Dialogue) focus on bioenergy, **case 7** (wind farm protests in Nant y Moch) and **case 9’s** (Tilting at Windmills) focus on wind energy, **case 18** (Brighton Energy Co-op) and **case 25’s** (Back Balcombe) focus on solar energy, and **case 29’s** (community food waste energy production projects) focus on energy-from-waste. **Case 21** (Demand Energy Justice) also has a more general focus on aspects of energy supply, relating it to broader themes of energy justice.

Another part of the energy system which serves as a location for many of the

Figure 10. Locating participation in the energy system

Figure 10 is a word cloud of all the locations in the energy system we identified relating to our coding of the full corpus of cases, the size of the word indicating its frequency in the corpus. As discussed above, this figure illustrates **the technical aspects of the energy system where collectives of participation are most predominant – namely energy supply, demand, housing and transport** – as well as indicating prominent geographical locations where energy participation occurs such as England, Scotland, Cumbria and Bristol.

Wider spaces of participation

A further aspect which emerged from our analysis was the existence of wider spaces of participation around the energy system, towards which many participatory collectives were oriented. In Figure 4 (section 2) we define these as wider spaces of participation, which around the object of participation can form as issue spaces (Marres, 2012) characterised by debate and controversy around a prominent energy-related topic, or arenas of development characterised by concerted attempts to develop a particular new technology (Jørgensen, 2012). Prominent examples of **issue spaces** represented in Figure 10 are **climate change, fracking and fuel poverty**, all of which were topics of broader public debate as well as much academic research over the time period under study. Prominent **arenas of development** around emerging technologies which many participatory collectives in our corpus were directed towards, include **household technologies** such as retrofitting and smart technologies, **new technologies for energy supply** such as renewable energy, bioenergy, wind energy and solar energy. However, there are also some **social innovations or practices** which could be considered as arenas of development, such as the increasingly prominent community energy approach, or practices like cycling, which challenge technologically-centred notions of innovation in the energy system.

Analysis of our in-depth case studies suggests a yet more complicated and nuanced picture of the various locations around the energy system where participation occurs, showing the slippage between different parts of the energy system which can sometimes be found in participatory collectives. **This shows that what participation is for or where it occurs is often ambiguous, contested and multivalent, in that any one collective of participation can simultaneously relate to more than one wider space of participation or part of the energy system.** For instance, community energy collectives such as **case 3** (the Low Carbon

Communities Challenge) and **case 13** (Renergy living labs) can often shift between the locations of energy supply and demand. While community energy is usually focussed on creating community-controlled forms of renewable energy supply, they can often be viewed by government, businesses and third sector bodies supporting them as behaviour change programmes aiming to reduce energy demand through education and awareness raising. Furthermore, many community energy projects also adopt demand side measures such as assisting with the roll out of smart meters or encouraging participants to retrofit their houses. Energy demand and supply can also become blurred in collectives organised around energy practices in the home. For example, both **case 10** (the Customer Led Network Revolution) and **case 16** (domestic laundry practices) illustrate the link between the increased adoption of renewable forms of energy supply, and expected changes in practices—that-use-energy (or energy demand) in the home in order to make the most of times when renewables are in more abundant supply. Landscape-based protests such as **case 7** (wind farm protests in Nant y Moch) and **case 9** (Tilting at Windmills) illustrate the relationship between forms of energy supply (particularly wind turbines) and energy transmission (particularly pylons) in stimulating controversy and opposition.

Energy system frames

The smaller set of in-depth case studies reveal a multitude of different ways of understanding and framing the energy system itself. For example, **case 6** (the DECC 2050 public dialogue) adopted a centralised and technical understanding of the energy system as consisting of technical and some behavioural levers, which participants quite literally grappled with through the 2050 pathways calculator which was used in the dialogue. **Case 19** (iconnect study of commuting behaviours) adopted a similarly technical understanding of the energy system, but focussed specifically on transport infrastructures, which are often left out of conventional definitions of the energy system. Challenging conventional understandings of the energy system more strongly, **case 10** (the Customer Led Network Revolution) presents the energy system as a system of social practices, emphasising the role of social and institutional dimensions. **Case 7** (wind farm protests in Nant Y Moch) and **case 9** (Tilting at Windmills) broaden definitions of the energy system still further, to encompass the landscapes in which they are embedded. Another interesting feature of **case 7** is that the energy system was understood at very different scales by different actors, with some focussed on a global energy and climate system, whilst others considered local, regional and national scales (Mason and Milbourne

2014). More creatively challenging established understandings of the energy system **case 20** (Drawing Energy) explores multiple ways of visualising energy in response to the invisible nature of energy itself. **So, while there is often a tendency for the energy system to be framed in technical terms a number of participatory collectives go beyond this to encompass social, practice-based and institutional dimensions.**

Non-energy energy participation

A final element to the question of where energy participation occurs, which emerges from our more in-depth analysis, is the **connectedness of participatory collectives around the energy system to multiple 'non-energy' systems**. Many of the collectives we found aimed to influence broader environmental processes, as well as the energy system. For example, in **case 29** (community food waste energy production projects) protesters around the Holsworthy energy-from-waste plant in Devon, were also concerned with the implications of the development for road networks and agricultural systems. Other collectives saw connections between addressing energy issues and public health concerns. For example, **case 19** (iconnect study of commuting behaviours) hoped to ascertain whether improvements in infrastructures for walking and cycling were likely to have dual environmental and public health benefits. There were other collectives still which illustrated the importance of non-energy systems in determining participation and outcomes in the energy system itself. For example, **case 17** (understanding homeowners' renovation decisions) demonstrated that homeowners were more likely to consider undertaking energy efficiency renovations if they were also planning amenity renovations to their houses, and that these decisions were linked to a variety of factors including people's lifestyles, satisfaction with their houses and stage of life. At the other end of the spectrum, **case 14** (experiences of fuel poverty) explores the multiple non-energy systems, including the UK benefits system, the healthcare system, and tenancy relations, which affect people's experiences of fuel poverty and can limit their ability to change their situation or participate in other aspects of the energy system. **This illustrates the value of an ecologies of participation perspective for understanding interconnections at the nexus of energy with other issues – such as food, waste, health, and social justice – as well as attending to 'overflows' of participation that can be deemed to lie outside of, but powerfully shape, the energy system.**

4.2 What are citizens participating about?

Objects of participation

A key dimension of our analytical framework presented in section 2 concerns the objects of participation, raising questions about what citizens are participating in and how objects of participation are framed through collective participatory practices. In keeping with this, our systematic review opens up to a broader range of issues than are usually considered relevant to understanding public participation in energy transitions. **Our analysis shows that as well as participating in discussions directly about energy policy, the energy system and the UK energy mix, citizens are participating in collectives centred on many other energy-related issues**, which are just as important in influencing the broader energy system, and prominent ecologies of energy participation. Figure 11 shows the eleven main issues which formed the objects of the participatory collectives in our full corpus of cases. Renewable energy was the subject of the highest number of cases, with 25 collectives being concerned with renewable energy in general, 13 collectives concerned with wind energy, and further collectives concerned with solar, bioenergy, hydropower, and energy-from-waste. Other forms of energy supply were prominent objects of our participatory collectives, including 10 collectives concerned with fracking, 10 concerned with nuclear power, 8 concerned with CCS, and even one collective around coal mining.

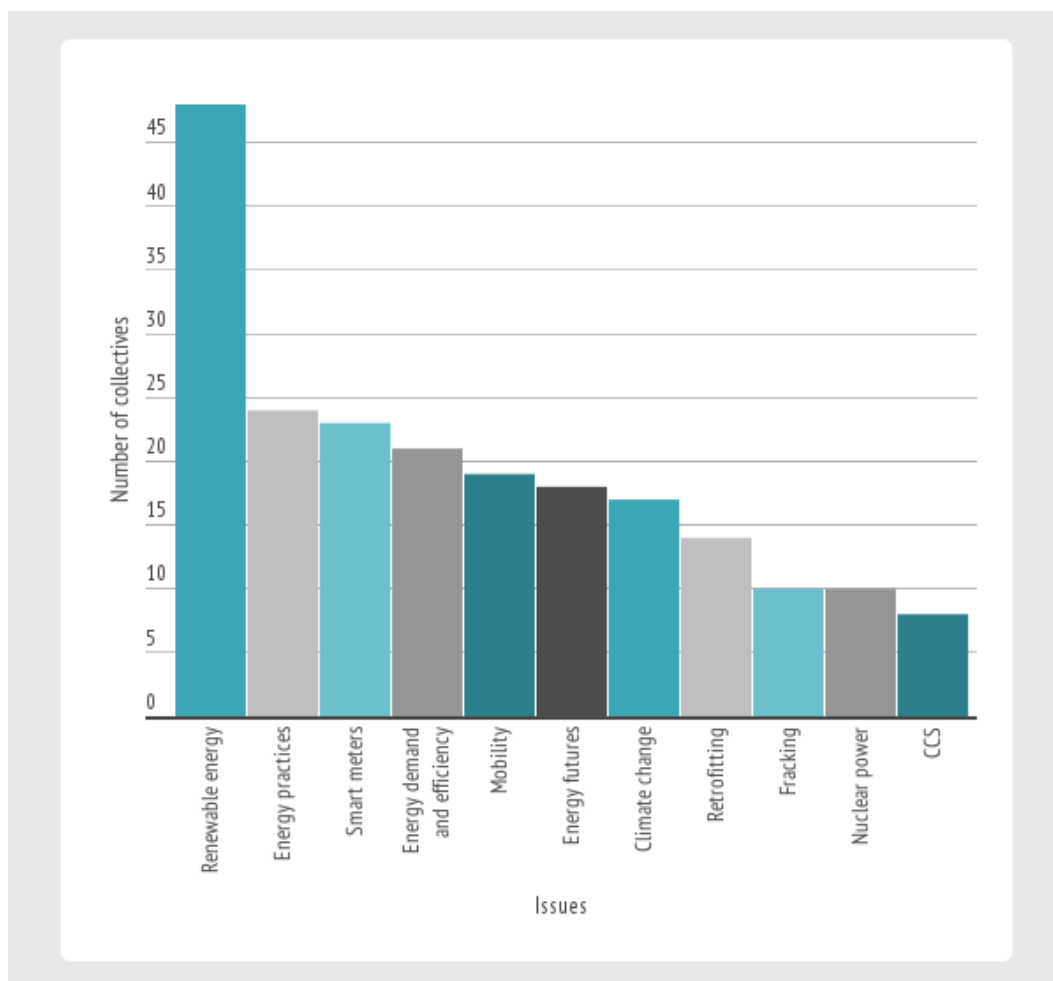


Figure 11. Key issues that form the object of energy-related participation.

Energy-related practices were the subject of 24 of our collectives, including 14 collectives concerned specifically with heating and cooling, and 4 collectives concerned with practices-that-use-energy and/or water such as showering or laundry. Smart meters and in-home displays were the object of 23 cases in the corpus, while related issues of energy efficiency and demand emerged from 21 of the cases. Also related to practices-that-use-energy and demand, 14 cases were specifically concerned with retrofitting. A very small number of cases were concerned with issues related to the pricing of energy, including carbon charges and personal carbon allowances.

Some of the more nebulous issues that formed the object of participatory collectives were climate change and energy futures, accounting for 17 and 18 cases respectively, whilst other cases explored issues like resource sustainability, degrowth, flooding, biodiversity and geoengineering. The final main group of issues emerging from our corpus are those related to mobility, which accounted for 19

cases. These included cases concerned with electric vehicles, walking, cycling, public transport and HS2.

Figure 11 does not show which issues (such as renewable energy or energy practices) are the most objects for energy participation in the UK, rather it indicates more the current size of the 'issue areas' at play around these objects. Objects around which a great number of collectives have formed, also tend to be objects to which there is a greater range of different forms of participation attached (as is discussed in 4.3). We can see from this a general trend emerging of energy objects which citizens are more likely to encounter through their everyday lives being the objects of a greater number of collectives, whereas apparently distant objects such as CCS, fracking and nuclear power are related to a smaller number of collectives. This is not to say that these latter objects are unimportant – fracking and nuclear in particular have been the focus of some of the most high-profile cases of public engagement during the period of study – however, it does challenge the conventional focus of formal invited public engagement processes on controversial new technologies, over the more mundane objects which people are more accustomed to participating around.

Beyond opinions: public doings

Our smaller set of 30 in-depth case studies were concerned with, amongst other topics, community energy, landscapes, laundry practices, biofuels, cycling, thermal comfort in office buildings, the Big Six energy companies, new pylon designs, low carbon housing, and energy-from-waste schemes. However, **it is not just the articulation of public views on issues which formed the focus of these collectives. In many of the cases studied citizens are engaging in more material ways with the energy system and making material commitments.** For example, in **case 2** (Reclaim the Power) **case 25** (Back Balcombe) and **case 29** (Central Sheffield energy-from-waste scheme), citizens were involved in direct actions to shut down existing infrastructures or to prevent the development of new infrastructures around energy. In the case of community energy projects, such as the later stages of **case 25** (back Balcombe), and **case 3** (the Low Carbon Communities Challenge), **case 8** (Northern Ireland Community Energy) and **case 18** (the Brighton Energy Co-op), citizens are making material commitments in the shape of installing energy technologies, in many cases solar panels, but also other sources of energy supply like hydropower, or energy saving technologies like smart meters. Academic studies of social practices in the home, such as **case 10** (the Customer Led Network Revolution) and

case 16 (study of domestic laundry practices), demonstrate the complex ways in which people participate in energy transitions through mundane technologies in the home such as in home energy displays, washing machines or micro-renewables. In other cases, such as **case 12** (Energy Babble) and **case 21** (Demand Energy Equality), citizens have been involved in creating new technologies which aim to disrupt and shift ideas about and practices around energy, like the co-designed Energy Babble radio which transmits and receives messages about energy issues with synthesised voices, or the Bristol Energy Tree which is a piece of community art including solar panels which also offers free Wi-Fi to passers-by. **The evidence in our systematic review clearly shows that publics are already busy getting on with energy transitions and committing to new trajectories of change in diverse and distributed ways. In governing energy transitions a top down emphasis on extracting public voices and opinions about the energy systems in order to inform centralised decisions needs to give ground to other ‘ways of seeing’ and sensing potentially impactful public doings across energy systems.**

Resisting dominant framings

In many of the cases studied there were concerted attempts by participants to open out or challenge dominant framings of energy issues. Such resistance can be seen in cases of Government-sponsored public dialogue which tend to be strongly framed by Government priorities – and therefore dominant framings of energy issues – in order to feed directly into policy-making processes. For example, in **case 6** (the DECC 2050 public dialogue) where participants used a ‘pathways calculator’ to create their own pathways for achieving the 2050 greenhouse gas reduction targets, some participants resisted this framing by objecting to some of the inbuilt assumptions of the pathways calculator, rejecting the Government’s set target, or arguing that setting targets was not a useful course of action (Ipsos Mori 2011). Similarly, **case 5** (Government public engagement with shale gas and oil) was framed narrowly in order to foreclose broader discussion about the acceptability of fracking; however, it is evident from the evaluation report that participants in the dialogue were actively opening out this framing to discuss broader issues of directionality in energy transitions and the overall UK energy mix (TNS BMRB 2014).

Unsurprisingly, **it was often activist collectives which most explicitly sought to open out and challenge framings of energy issues.** In both **case 2** (Reclaim the Power) and **case 25** (back Balcombe) protesters were often presented as reflecting narrow concerns relating to the human health and safety implications of fracking, but they

were actually articulating concerns about the direction of current energy transitions and setting out alternative energy futures, which in **case 25** the community tried to realise through its proposal to develop community solar energy. **Academic orchestrated collectives also provide examples of explicit reframing of energy problems**, often resulting from careful reflection. For example, **case 17** (Understanding homeowners' renovation decisions) deliberately looked at non energy related household renovations in order to better understand people's reasons for adopting energy related retrofits, and to highlight the narrow focus of other studies in this area, as well as the assumptions made in Government policy. In **case 20** (Drawing energy) the research team started with an interest in the use of energy in the home, but through their people-centred interviews they realised that participants' understandings of energy went well beyond electricity and heat in the home, they tried to open up the framing of the study to reflect this. As a result of this the invisibility of energy, which emerged as a prominent characteristic in their interviews, became the focus of artistic workshops where they invited participants to visualise energy. **An important lesson here is to see resistance to dominant framings – whether it occurs within a participatory collective or through the articulations of other collectives – as a source of learning and wisdom rather than something to be closed down and denied.**

Overflowing issues and societal concerns

In many of our 30 in-depth case studies, **participatory collectives framed energy issues in ways that seem quite narrow at face value but which can be interpreted as speaking to a much broader set issues and societal concerns. The object of participation is not always what it seems.** For example, **case 1** (national citizen engagement process around the transformation of the energy system) demonstrates the strong link between apparently technical issues related to energy efficiency expressed by the participants, and concerns about social justice and autonomy in the organisation of the energy system. Mason and Milbourne's (2014) account of **case 7** (wind farm protests in Nant Y Moch) demonstrates that collectives which seemed to express fairly-straight forward disagreements over whether wind farms should be built in an area of Wales were linked to more fundamental contrasting understandings of the place of humans in the environment. Some groups articulated an understanding of local people inhabiting a specific landscape, which involved multiple and complex relationships to the environment, whilst others focussed on a global environmental system governed by universal, scientific reasoning, where relationships to specific places were seen as less significant.

Similarly, **case 9** (Tilting at Windmills) illustrates how quickly discussions and disputes over a particular issue (in this case it was also wind energy) can overflow into other topics, such as the history of coal mining, climate change and energy efficiency (Allen and Jones 2012).

Academic studies focussed on understanding social practices or behaviour demonstrate similar overflows of energy-related issues and systems. For example, **case 14** (experiences of fuel poverty) shows the multi-dimensional nature of fuel poverty, which includes factors such as the quality of housing, relationships between tenants and landlords, energy costs and the conditions of its supply, social relationships in and around the household, and people's health: though Government policies on fuel poverty address a much narrower range of issues (Middlemiss and Gillard 2015). **Case 16** (domestic laundry practices) and **case 19** (iconnect study into commuting behaviours) both illustrate that everyday energy-using practices such as doing the laundry or commuting, are linked to multiple other energy issues, such as how people heat their homes, shifts in the timings of abundant energy supply as the National Grid moves towards more renewable sources of energy, or the development of infrastructures for walking, cycling or public transport use. **We take from this that it is important to not take the framing and outcomes of participatory collectives for granted. In line with a more ecological reading of participation the challenge is to be open to how forms of energy participation are relationally connected to other (often seemingly 'non-energy') issues, practices and raise concerns about societal dimensions of energy transitions (like issues of equity and the desired direction of change).**

Institutional closures and framing effects

There are also broader tensions at play here between the framing of different collectives around the energy system and how they are orchestrated, with implications for their ability to influence other collectives and the energy system as a whole. In general, **participatory collectives which have been organised by central Government or by businesses tend to be the most tightly framed, meaning that attempts by participants to open out or even challenge these framings are not always understood or acted upon.** For example, **case 11** (DECC's public attitudes tracking) has a relatively narrow focus on the acceptability of different energy technologies to the participants, and its format provides few opportunities for participants to offer alternative framings of the issue. Similarly in **case 6** (the DECC 2050 public dialogue) the pathways calculator which was used by the participants

strongly determined the possible outcomes for example, meaning that it was impossible for a participant to create a pathway that used no nuclear power or fossil fuels. These more rigid framings can be seen in part as a pragmatic response to the pressures of policy-making processes, where there is often a clear decision that participatory collectives feed into, limiting the relevance of discussions which go beyond the initial framing and are thus deemed ‘out of scope’. The drawbacks of this are evident in **case 4** (the Bioenergy Distributed Dialogue) where the slightly looser format of the workshops allowed participants to explore multiple dimensions of the biofuels issue, but the elements of these outputs which did not fit with the direction of bioenergy research within BBSRC at the time of the dialogue were rendered irrelevant.

There are also less tangible reasons for these patterns of institutional closure. Previous research has shown that **framings of environmental problems can be very enduring and difficult to shift, even in response to new evidence and ideas. There is evidence that these framings can become institutionalised through organisational routines, ways of thinking and dominant imaginaries, such as narratives about the centrality of science and technology in achieving progress** (Stirling 2008). For example, in **case 1** (national citizen engagement process around the transformation of the energy system) the researchers were limited to an extent in the way they could frame energy policy issues within their public workshops, due to the need for the dialogue process to speak directly to the concerns and problem definitions of policy and decision-makers in these dominant institutions. In the domain of business, **case 24** (sentiment mapping of perceptions of the Big Six energy companies) was framed narrowly as it was dictated by the process commissioners’ (the Big Six energy companies) concerns about how to manage their image and deal quickly with public relations crises, rather than considering other aspects of citizens’ experiences with their energy suppliers. However, **narrowly-framed collectives are not just restricted to the domains of government and business**; for example, **case 30** (Londoners on Bikes) was an activist collective and popular campaign which was targeted very specifically at getting London mayoral candidates to lay out their policies for supporting cyclists, so did not explore alternative framings or understandings of the issue. In Aldred’s (2013) account of the campaign she reflects that this narrow focus helped the collective to achieve relatively quick and clear influence, like in the case of more Government-led collectives.

Distributed openings

At the other end of the spectrum, **relatively freed from institutional framings and constraints, but also tending to be much more distanced from important decisions about the energy system, collectives orchestrated by civil society or academia often have broader and more flexible framings of energy issues.** For example, **case 2** (Reclaim the Power) is a collective of activists loosely united by their opposition to fossil fuels, but also concerned with a number of other energy justice issues including fuel poverty, social inequality, and the promotion of renewable energy. The first direct action of the collective was to oppose the development of fracking in Balcombe in Sussex in 2013, alongside other activist groups, but the framing of the collective has shifted throughout its life to reflect broader issues related to energy supply. **Several academic orchestrated cases had deliberately open framings of energy issues from the outset.** Sometimes this was combined with arts and design based approaches, for example in **case 9** (Tilting at Windmills) the researcher and performance artist reflected that her intention was that her encounters with participants on her walk would be *'entirely open with no set script or questions, I would not go out of my way to facilitate meetings, necessarily talk to everyone I met, or record everyone I talked to. I would be directed by the rhythms that emerged in process'* (Allen & Jones, 2012: 214). Similarly in the artistic and academic study **case 20** (Drawing Energy) participants produced pictures covering a wide range of different framings of energy, including end products related to energy like light bulbs, impressions of nature and the elements, images embodying power, everyday commodities and experiences, colour or movement, mathematical symbols, and ideas of emotional or human energy. In **case 15** (Energy Biographies) researchers faced challenges in adopting a framing of energy practices which would be open to the alternative understanding of participants, as they found that participants often framed their response in terms of dominant framings and ways of talking about energy, for example efficiency or high energy technologies, in some cases narrowing the possible focus of the study (Henwood et al. 2015). **The evidence from the past two subsections indicates that the propensity for participatory collectives to open up and be reflexive about the objects of energy-related participation is greater in more distributed or decentred sites and lessens with closer proximity to centres of power and decision-making. While there are important exceptions in our overall corpus, it is important to acknowledge this patterning when attempting to think systemically about energy participation and the objects, visions, pathways and trajectories of energy system change.**

What energy futures are being imagined?

Related to the different energy issues explored in the collectives identified and studied as part of our systematic review, there were also different visions of energy futures expressed. For example, the analysis of **case 1** (national citizen engagement process around the transformation of the energy system) shows that apparently everyday concerns about issues such as the affordability of energy are wrapped up with broader concerns about energy futures and how we reach them (Parkhill et al. 2013). In **case 25** (Back Balcombe) the contrasts drawn by activists, NGOs and members of the community between the proposed fracking development in the village and the community solar farm which the group tried to develop, highlight the very different futures and forms of social organisation which would be enabled by these different technologies: with fracking implying to participants in this collective the centralised autocratic governance of the energy supply, whereas the solar farm was seen as enabling a more distributed energy supply which gives communities more autonomy as well as social and financial benefits.

Some of the cases specifically explored energy futures, with 18 cases from our whole corpus being primarily concerned with energy futures. For example, **case 1** (national citizen engagement process around the transformation of the energy system) used a variety of future scenarios to provide a basis for discussion in workshops. Similarly, **case 28** (imaginations of low carbon futures in English villages) used future scenario methods to identify participant narratives of the energy futures of English rural areas; however the majority of participants actually expressed narratives of stasis or non-transition. **Case 6** (the DECC 2050 public dialogue) was about exploring different pathways for reaching a clear vision of the UK's energy future – one where the Government targets to reduce greenhouse gas emissions by 80% by 2050 are met.

In some cases visions of energy futures were more implicit or emergent. For example, the activists in **case 2** (Reclaim the Power) implicitly set out an alternative low carbon vision of UK energy futures, relating both to the technical organisation of the energy system, but also connected to particular forms of social organisation, such as citizen power over energy supply. **Case 5** (Government public engagement with shale gas and oil) reveals a very different implicit vision of the UK energy future, where fracking is viewed as a significant part of the future energy mix, and citizens are expected to accept the Government's decision to pursue the development of this source of energy supply. During the course of **case 10** (the Customer Led Network Revolution) which investigated the relationship between new micro-generation technologies, such as solar panels, and smart meters it became clear that future practices-that-use-energy would need to be reconfigured in

response to the different temporal and spatial patterns of renewable energy supply. **What is clear across our corpus of cases is that, whether deliberately intended or more tacit, participatory collectives continually produce visions of future energy system change. It is important to note that these visions are not only technological or material in character but often have a sophisticated reading of the future social worlds that stand to be brought into being by energy transition pathways. This is an important feature of public relations with energy transitions and their reactions to proposed energy system changes that needs to be acknowledged.**

4.3 How are citizens participating?

A further dimension of our analytical framework presented in section 2 attends to models of participation, raising questions about how citizens are participating and the ways in which collective participatory practices become organised, formatted and configured. An overview of our systematic review reveals a wide range of different models and modes of participation in the energy system, which go far beyond the public opinion surveys and consultations often imagined in discussions of public participation. Figure 12 shows the **most commonly produced forms of participation which emerge from our whole corpus**. Perhaps unsurprisingly, modes of elicitation such as **surveys (41 cases), deliberative workshops (27 cases) and consultations (23 cases)** which are the most prevalent models of participation in **Government as well as elsewhere, together account for more than a third of the whole corpus**. However, the **prominence of community action** as a form of participation, accounting for 38 cases, also shows the significance of more grassroots forms of participation, especially community energy, during the period under study. **Everyday behaviour (23 cases) and everyday practices (14 cases)** were also significant modes of participation in our corpus, mostly emerging from academic studies. The **domestication of technology** was also a significant mode of participation, emerging particularly around new or emergent technologies like smart meters, retrofitting and cycling.

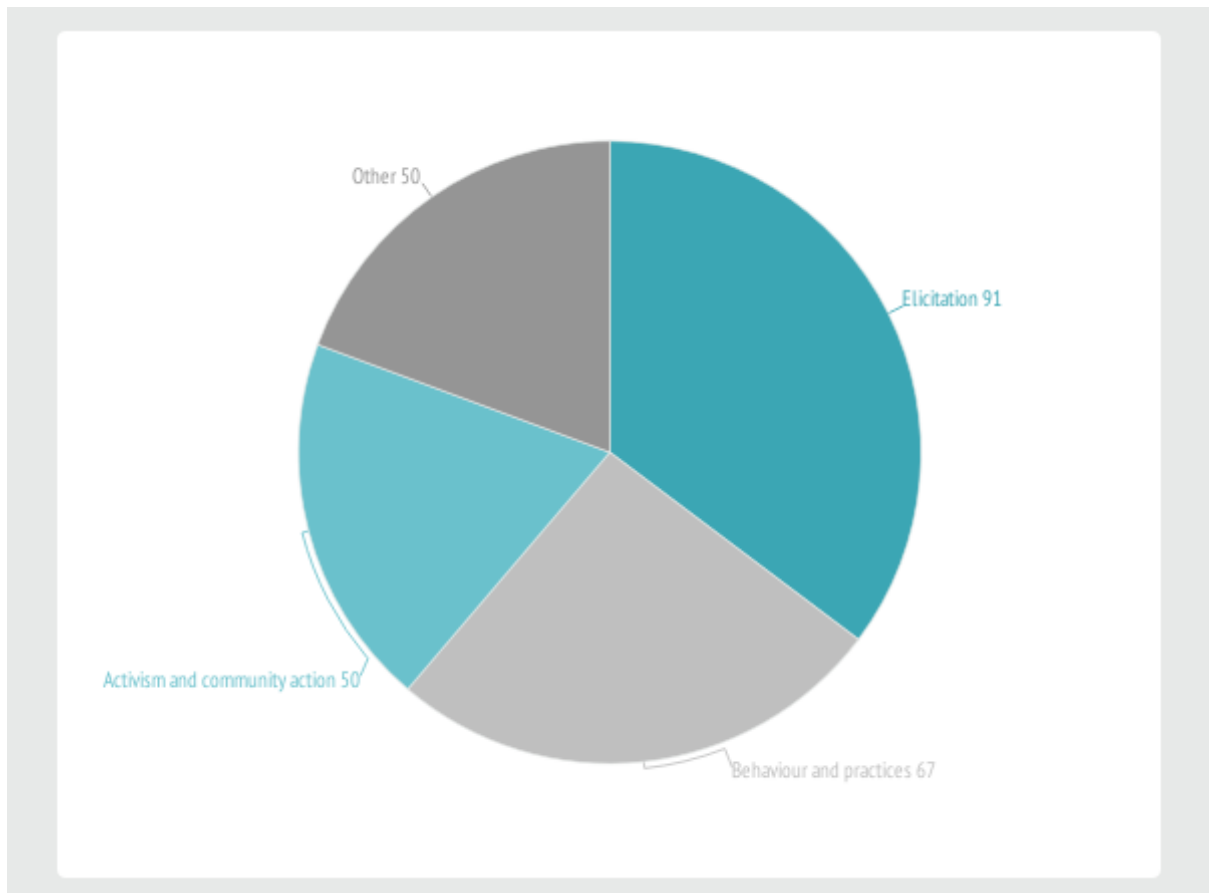


Figure 12. Forms of participation in energy transitions.

While surveys, consultations and deliberative workshops are all widely adopted forms of participation, our corpus also contains **numerous examples of diverse and emergent modes of participation in the energy system**, including activism, co-design, communication, hackerspaces, open innovation, participatory or performance art, controversies and formal political processes. Our full case-study analysis also illustrates blurrings between these different modes of participation, for example with surveys being used by academics to understand everyday behaviours or forms of community action. Moreover, this analysis also suggests that often there is more than one model of participation enacted in any given collective, for example with activist groups also engaging in more conventional communication methods in order to get their arguments across. **The overriding picture in the whole corpus is of the sheer diversity of models of participatory practice being performed across the UK energy system, set against the prevalence of dominant participatory practices of opinion surveys, consultation, deliberative processes, behaviour change and everyday practice.**

Dominant models of participation

Our systematic review shows that there are **particular formats of participatory practice in the energy system which are much more strongly represented than others, often linked to dominant institutions and assumptions about how people should participate. Public opinion surveys** are strongly favoured by Government departments and agencies, as well as businesses and media outlets, like **case 11** (DECC's public attitudes tracking). Surveys are presented as gaining a representative sample of the public, as well as being cheap to run and easy to repeat and alter to reflect new developments. More recently, especially since the creation of the Government's public dialogue programme Sciencewise in 2004, governing bodies have also begun to adopt **deliberative workshops as a prominent mode of participation** around energy and other issues. For example, **cases 4** (the BBSRC's Bioenergy Distributed Dialogue), **5** (UK Government public engagement with shale gas and oil) and **6** (DECC's 2050 public dialogue) all reproduced a deliberative workshop model orchestrated by Government or Government agencies, bringing together a small group of citizens with experts and expert information, to deliberate key policy issues over one or two days. This model of participatory practice, influenced by approaches from market research, is seen as giving decision-makers a more in-depth understanding of public responses to energy issues, as well as giving participants more time and opportunity to develop their views on the given issue. Deliberative workshops are also commonly used in academic studies for the same reason, especially where the orchestrators hope to directly influence policy processes, such as in **case 1** (national citizen engagement process around the transformation of the energy system).

Everyday behaviours and behaviour change are modes of participation which together account for 35 of the cases in our whole corpus. Furthermore, these are prominent ways of thinking about public participation in Government and beyond which have clear implications for other collectives, for example overflowing into community energy, communication or education projects. **The focus on behaviour can sometimes narrow accounts of participation as it encourages an emphasis on the levers and attitudes driving behaviour without necessarily considering broader social practices and material elements underlying the behaviour.** For example, **case 19** (iconnect study of commuting behaviours) conducted longitudinal research with a cohort of participants to ascertain whether improved walking and cycling infrastructures had affected their commuting behaviours. However, the study did not consider what other changes might have occurred in participants lives or in the cities they lived and worked in which might also have contributed to shifting

practices, or locking certain behaviours in place. **These dominant models of participation are associated with established methods and technologies of participation, each of which circulate in wider spaces of standardisation to be applied beyond energy issues and energy systems, a point we develop further in section 4.5, below.**

There are however also strong patterns of participation falling outside of formal governing institutions. For example, **activist collectives** in **case 2** (Reclaim the Power), **case 29** (the Central Sheffield energy-from-waste scheme) and **case 30** (Londoners on Bikes) adopted a set of closely associated methods and practices including **direct action** focussed on significant pieces of material energy infrastructure, such as power stations or roads, as well as how they organise their meetings around deliberation and consensus decision-making, and use social media to co-ordinate their campaigns and actions. **Community action emerges as a very commonly adopted mode of energy participation from our corpus, and one which straddles the domains of government, academia, civil society and business,** particularly related to community energy projects which often include actors from all of these domains. Community energy groups in the UK are well-networked with one another, providing advice and support (Hargreaves et al 2013), so it is of little surprise that they take a range of recognisable forms, such as charitable incorporated organisations, charitable social enterprises or limited companies with social purposes (Seyfang et al 2013). In our in-depth cases, for example **case 8** (Northern Ireland's first community energy collective) and **case 18** (the Brighton Energy Co-op), both adopted a common energy co-operative structure and also related to their broader communities in similar ways, through crowd-funding or community shares.

Emerging participatory practices

Our systematic review analysis also points to new and emerging modes of participation around energy. **In some cases, these new forms build on existing modes of participation,** for example **case 4** (the Bioenergy Distributed Dialogue) tried to develop new ways of carrying out public dialogues, which would allow them to continue for a longer period of time and to iteratively shape and respond to developments in the relevant policy area – in this case the development of bioenergy research within the BBSRC. **Other modes of participation have been emerging for some time,** such as the arena of **community energy** described above, or the increasing focus in academic research on **practices-that-use-energy, often in**

the home, such as **case 10** (the Customer Led Network Revolution), **case 14** (experiences of fuel poverty), **case 15** (Energy Biographies), **case 16** (laundry practices) and **case 27** (Smart meters, smart people). This focus on social practices aims to go beyond dominant behaviour change understandings and models of participation, to recognise the complexity and situated nature of energy demand.

New modes of participation are also emerging from developments in technology, such as the emerging possibilities for conducting co–design and speculative design processes, particularly coming out of arts and design schools like Goldsmiths University of London and the Royal College of Art, such as **case 12** (Energy Babble) and **case 20** (Drawing energy). Academics and businesses are also starting to exploit the possibilities of engaging citizens through social media, for example with the development of the approach of **sentiment mapping which scans interactions on social media platforms and web forums** for emotional responses to particular energy issues, such as **case 24** (sentiment analysis of perceptions of the Big Six energy companies). There are still further cases which claim to be creating new modes of participation, but where there are strong similarities with widely used modes of participation. One example of this is the **‘living labs’** approach adopted in **case 13** (Renergy Living Labs), a specific methodology to engage ‘users’ around innovation processes, which has much in common with deliberative workshops. **As highlighted in Figure 5 (section 2), it is important to remain attentive to such emergent participatory collectives across wider socio–technical systems because they introduce alternative models, and thus objects and subjects, of energy–related participation as well as providing foresight into models of participation that could become more central in future energy democracies.**

Hybrid collectives

Our more in–depth case study analysis complicates this picture of dominant and emerging participatory practices by revealing the existence of multiple forms of participation within any given collective. On a very simple level, surveys – a mode of participation in itself – have also been used by academics in a number of cases to gain insights into other modes of participation, particularly behaviours and practices, including in **case 23** (thermal comfort behaviours in UK office buildings), **case 28** (imaginations of low carbon rural futures in English villages), **case 19** (iconnect study into commuting behaviours) and **case 17** (understanding homeowners’ renovation decisions). There are also collectives where their modes of participation are understood differently by different actors, so for example, whilst

case 3 (DECC's Low Carbon Communities Challenge) was understood by most of its participants and by many of the facilitators involved as a process organised around community action, it was treated within DECC primarily as a behaviour change project. **Case 10** (the Customer Led Network Revolution) was also understood as a behaviour change project by many of the companies funding the study, and by the engineers and economists involved in carrying out the study; however, a small but significant subset of this work was carried out by qualitative researchers emphasising the role of everyday social practices.

There are also many cases we analysed which actively adopted multiple modes of participation. For example **case 6** (DECC's 2050 public dialogue) primarily used deliberative workshops but it also employed an interactive game which was used within the workshops but also open to other participants, and there was also a further part of the collective where the organisers tried to empower young activists through involving them in a DECC youth panel focussed on the 2050 targets. Many activist collectives also included other modes of participation, for example **case 21** (Demand Energy Equality) uses activist and campaigning methods, but also aimed to communicate its message to a broader public, and also to educate participants through reskilling workshops. **Case 25** (Back Balcombe) began as a protest, but over time evolved into a process of community action involving further modes of participation such as crowd-funding and a co-operative structure. **Case 7** (wind farm protests in Nant Y Moch) also illustrates how forms of activism themselves often emerge around more formal structures of participation, like the planning system, especially where particular groups feel that they or their arguments are being excluded and ignored.

One insight that we take from this is that, **rather than participation simply being about the more effective application of participatory methods and techniques (as suggested by the mainstream perspectives on participation), it is often the case that multiple models and philosophies of participation co-exist and affect each other at particular sites. Importantly, multiple theories of participation co-exist 'in the field'** – for example, a more mainstream realist approach to behaviour change and more relational practice theory perspective both could be informing interventions at the same site of public engagement, which will in turn be interpreted differently depending on these theoretical perspectives.

Orchestration and exclusion

Being excluded from participation or a lack of participation are also themes which

run through several of our in-depth cases. For example, in **case 9** (Tilting at Windmills) the researcher met many people on her walk who felt they had been excluded from conversations about climate change: *'Nobody talks to us about it [climate change]. Perhaps we talk less about things anyway, I don't know'* (Allen and Jones 2012: 215). In both **case 14** (experiences of fuel poverty) and **case 27** (smart meters, smart people) the researchers uncovered multiple ways in which people living in fuel poverty are marginalised and how their engagements with the energy system are limited in certain ways by a variety of institutional and material factors.

The final contribution of our full case study analysis to understandings of how people participate in UK energy transitions is to **problematize the distinction which is often drawn in accounts of public participation, between invited and uninvited forms of participation. Whilst the adoption of these two terms has been useful to an extent in reflecting the often very different characters of instances of public participation formally orchestrated by governing institutions and participation occurring outside of or even in opposition to these institutions, they do not do justice to the full range of modes of participation identified in our systematic review and make normative assumptions about the ways in which these different forms of participation are orchestrated and shaped.** Whilst it is often easiest to identify the actors, interests and ideas orchestrating participation in the government domain, such as **case 5** (public engagement with shale gas and oil) or **case 6** (DECC's 2050 public dialogue), it is also possible to trace the orchestration of other forms of participation (cf. Chilvers & Longhurst, 2016).

For example, at first glance **case 2** (Reclaim the Power) could be interpreted as an organically emerging activist group, however researchers have identified strong links to earlier collectives such as 'Climate Camp' through particular prominent individuals, practices and ideas (Bergman 2015). Furthermore, the collective's public actions are clearly very carefully planned and orchestrated, to make particular arguments, garner media attention, and target important points of energy infrastructure. Aldred's (2013) account of **case 30** (Londoners on Bikes) also reflects that the social movement was not an entirely organic and issue-focussed collective, but it also adopted more formal modes of organisation and had clear pre-defined goals. Other cases demonstrate that apparently banal everyday practices of engagement with energy should also not be considered to be organic. For example **case 10** (the Customer Led Network Revolution) illustrates the subtle ways in which every day social practices around energy can be reconfigured through the introduction of new technologies, in this case solar panels used for micro-generation, which had implications for how people monitored their energy use, and

when they chose to schedule energy intensive practices (Bulkeley et al. 2016).

Case 29 (Community energy-from-waste) brings out issues around orchestration strongly, by comparing two apparently similar controversies and local protests around energy-from-waste plants, with one in central Sheffield and the other in Holsworthy Devon. The researchers reflect that these two different cases have been documented very differently, and have very different places in the national consciousness due to the different historical and local contexts in which they were situated, but also how they were orchestrated and publicised (Alexander and Reno 2014). The controversy around the central Sheffield energy-from-waste plant was well publicised at a national level because of the way local protesters drew on earlier negative experiences of energy-from-waste schemes linked to social housing, and also because of the high-profile involvement of the international NGO Greenpeace in orchestrating a direct action focussed on the plant's chimney, which was strongly reported in the national press. In contrast, the opposition to the energy-from-waste plant in Holsworthy was mainly focussed at a local level, appearing on local forums and websites, many of which are no longer accessible. In this rural location, the controversy was more focussed around the potential risks of processing agricultural waste in the plant, linked to memories of the devastating effect that BSE and Foot and Mouth disease had on the area. Thus the collective did not feed into broader national debates about energy. What is clear from our systematic review is that **all forms of energy participation – whether invited or uninvited, insider or outsider – are always orchestrated and framed in powerful and highly partial ways, and are thus subject to exclusions. Ways of acknowledging such partialities and contingencies should become part all forms of energy participation, how they are communicated and valued.**

4.4 Who is participating?

As introduced in section 2, a third dimension that gets co-produced through the performance of collective participatory practices relates to the subjects of participation – or in other words who participates. **Across our whole corpus a wide variety of different versions of the public were produced through the participatory collectives.** Figure 13 illustrates key categories of the different visions of citizens in relation to energy produced in the whole corpus. The most prominent visions of publics were as a mass to be consulted (i.e consultative publics), accounting for 119 cases, including communities affected by particular problems or new developments

such as the risk of flooding or a proposed power plant (33 cases), and collectives which brought into being a vision of an aggregate population being represented through the process of participation, often through surveys and academic studies (30 cases). The vision of publics as consumer citizens was also strong (82 cases), including householders engaging with energy in the home (32 cases), users of technologies or infrastructures like smart meters or cycle-ways (35 cases), and visions of the public as consumers of energy or energy-related products (15 cases). Publics were also assigned a more active role in a significant minority of the cases, for example as active communities working together for example to create a community energy scheme (32 cases), and as active citizens aiming to address energy problems (17 cases). Explicitly activist publics accounted for 8 of the cases.

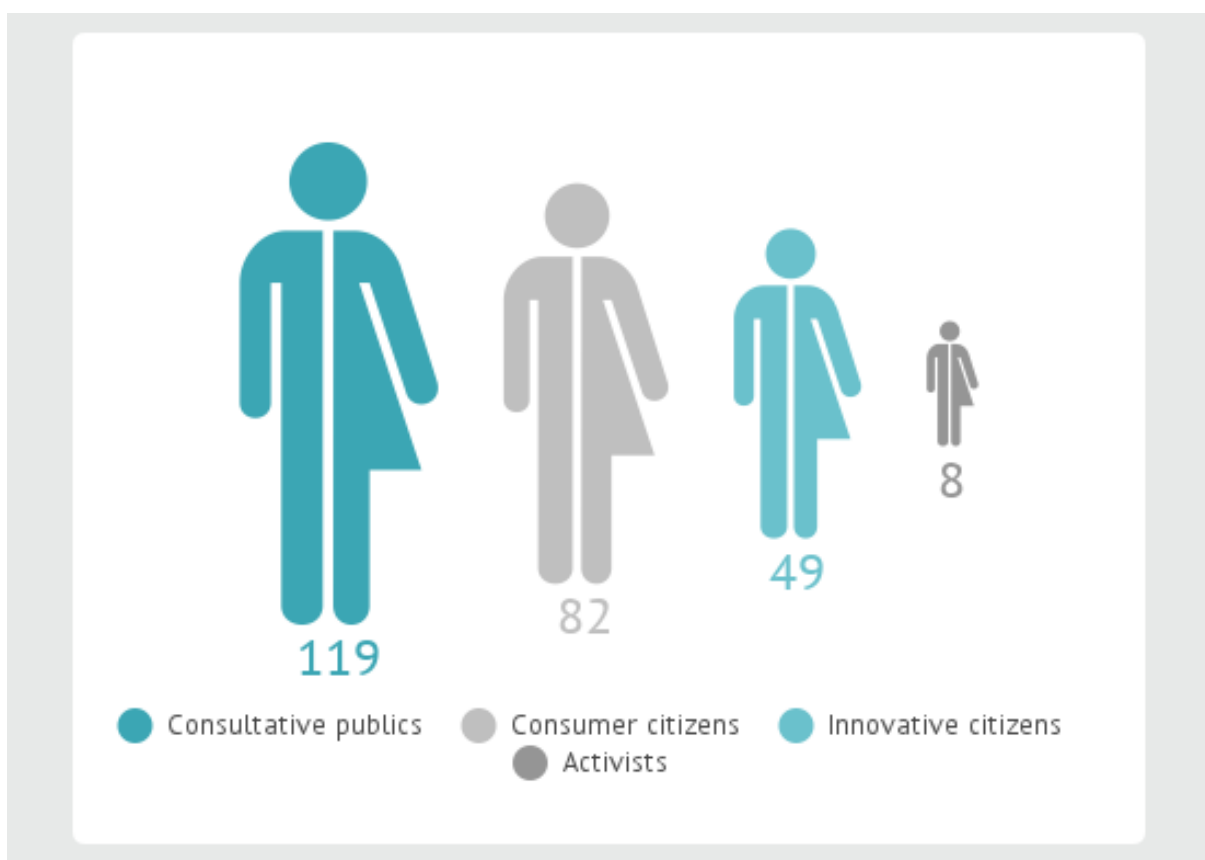


Figure 13. Who participates in energy transitions?

Enduring publics

Whilst our systematic review corpus illustrates the diversity of kinds of citizens participating in the UK energy system, as with modes of participation, **there are visions of citizens which are particularly enduring and influential in shaping accounts of participation in the energy system.** As shown in figure 13, the attempt

to represent an aggregate population by selecting a subset of participants which are statistically representative of a larger population according to a set of demographic characteristics, was common to many of the cases in our whole corpus. In our full case studies **case 1** (national citizen engagement process around the energy system), **case 11** (DECC's public attitudes tracking), and **case 17** (understanding homeowners renovation decisions) all produce this vision of an aggregate population. Furthermore, the strength of this vision is evident in criticisms of **case 4** (the Bioenergy Distributed Dialogue) for example, where the official BBSRC response report dismissed some of the findings of the dialogue on the basis that the participants were not a representative cross-section of the population (BBSRC 2014). The strength of this vision of the public as an aggregate population is also evident in other public dialogues such as **case 5** (UK Government public engagement with shale gas and oil), where attempts were made by the facilitators of the process to ensure that the participants involved represented the demographic characteristics of the UK population, even though statistical representativeness could not be achieved with such a small group. Thus **the vision of an aggregate population has become an important way to legitimate a particular participatory collectives, and to delegitimize others, potentially foreclosing and excluding other visions of citizens in the energy system.**

There are further visions of publics in our corpus which have the potential to exclude or overshadow alternatives. For example, the **vision of publics as consumers of energy**, produced in **case 24** (sentiment analysis of perceptions of the Big Six energy companies) of the small corpus. **The vision of a citizen as consumer potentially limits the range of ways a person can legitimately participate around the energy system, giving primacy to direct engagements with the market over broader social practices or more political forms of engagement with energy.** Similarly, the vision of citizens as householders, which is particularly reflected in academic work aiming to understand social practices related to energy – such as **case 10** (the Customer Led Network Revolution), **case 14** (experiences of fuel poverty), **case 15** (Energy Biographies), **case 16** (domestic laundry practices) and **case 27** (smart metres, smart people) – potentially overlooks people's engagements with energy in other parts of their lives as well as more overtly political engagements with the energy system. Finally, the **construction of participants in several of the collectives as affected or unaffected publics and communities is linked to a vision of energy issues as being primarily about public acceptability of new technologies and infrastructures.** This vision was produced in **case 5** (UK Government public engagement with shale gas and oil), **case 26** (UK residents' responses to high

voltage power lines), and **case 29** (community food waste energy production schemes), often resulting in more complex participant responses and sentiments such as concerns with the directionality of the UK's energy transition or different underlying relationships to local landscapes being ignored or deemed as irrelevant.

Active citizens

The strength of visions of participants as active citizens or active communities amongst the cases in our corpus seems to challenge some of these more conventionally dominant visions of energy publics however, emphasising the political activism of citizens – for example in **case 2** (Reclaim the Power) and **case 25** (Back Balcombe) – and the ability for communities to take elements of energy transitions into their own hands through community energy projects – such as **case 3** (DECC's Low Carbon Communities Challenge), **case 8** (Northern Ireland Community Energy), **case 12** (Energy Babble), **case 13** (Renergy living labs), **case 18** (the Brighton Energy Co-op), and **case 25** (Back Balcombe). **This emphasis on the agency of participants appears to be a particular feature of public participation around energy, which contrasts with accounts of participation in other domains, such as biosciences or emerging technologies** where dominant visions of participants have been characterised as 'innocent citizens' with little active knowledge or interest in the issues under discussion (Irwin 2001). However, visions of active citizens and communities still hold the potential to obscure and exclude. For example, the evaluation report of **case 3** (Dialogue by Design 2011) reflects that in many of the 'communities' involved in the programme it was a relatively small set of individuals who came to represent and act on behalf of the community sometimes leading to disputes with the broader community later on. **Accounts of active citizens and communities have also been shaped by a broader imaginary of the public as a threat**, which has been described by Welsh and Wynne (2013) in terms of broader trends in visions of the public within and around the UK Government. For example, protesters in **case 2's** direct actions on power stations in 2012 and 2013 were presented in some parts of the media and by the energy company EDF as a threat to property. This resulted in harsh treatment of the participants by the police as well as them being formally charged with criminal damage, though the charge was later reduced to aggravated trespass (Finchett-Maddock, 2013). Similar patterns have been observed around the treatment and reporting of protesters in **case 25** (e.g. BBC Sussex 2014).

Publics producing publics

Our in-depth analysis of the full case studies also shows that **within many of the collectives visions of other publics and collectives emerged and were produced.** For example, activists in **case 21** (Demand Energy Equality) sought to educate a broader population through their work, largely envisaging these people as ignorant or innocent citizens. **Case 22** (reporting of fracking in the UK press) demonstrates that it was not only negative visions of fracking protesters which were produced, but also visions of the general public as a potential barrier to the quick development of fracking, which were produced in some parts of the media coverage around the issue. In **case 30** (Londoners on bikes) the orchestrators of the campaign put a lot of thought into defining the identity of the collective and the kinds of members it sought, in recognition of stigma and apparent exclusivity of cycling identities. For example, though the collective appealed directly to cyclists, the decision was made to avoid using the term 'cyclist' instead appealing to the broader identity of people on bikes. This avoided stereotypes of lycra-clad cyclists who skipped red lights, or people who only cycled for leisure.

Importantly, **our analysis does not only demonstrate the many ways in which visions of the public in the energy system have been projected and imposed. It also reveals many examples where participants have actively challenged and in some cases shifted visions of themselves.** For example, there is evidence that participants in **case 5** (UK Government public engagement with shale gas and oil) tried to challenge the portrayal of them as ignorant of the issues through the way information about fracking was presented to them in the workshops. The participants opened up this discussion to broader energy issues and questioned the information presented to them, though were ultimately constrained by the procedural format of the collective. The evaluation report on the dialogue notes that 'there was less focus on empowering participants and giving them the time and space to set their own agenda' (Icaro 2014: 31). Activists in **case 7** (wind farm protests in Nant y Moch) similarly challenged the official portrayal of them as irrational and ignorant, whilst also rejecting the model of community participation assumed in the idea of 'community benefits'. In their analysis of the controversy Mason and Milbourne (2014: 10) note that 'the notion of community benefits is not only suspect because it is limited to financial valuation of landscape and is often considered as compensation or even a bribe'. While **case 10** (the Customer Led Network Revolution) could be considered as promoting a vision of the public as only customers or consumers, the small group of social scientists involved in the study, as well as the inputs of the participants helped to demonstrate their broader role in

engaging with the energy system through multiple social practices.

Legitimate publics

Our in-depth analysis of the smaller set of cases also reveals several examples of the ways in which participatory collectives have challenged or contested assumptions of what or who counts as a legitimate participant in the energy system. This can be seen most straight-forwardly in the deliberate attempts made by the orchestrators or collectives such as **case 28** (imaginings of low carbon rural futures in English villages), **case 27** (smart meters, smart people), and **case 14** (experiences of fuel poverty) to engage with marginalised communities such as the fuel poor or rural dwellers who are often excluded from participating in the energy system in other ways. Participants and orchestrators in **case 5** (UK Government public engagement with shale gas and oil) and **case 22** (reporting of fracking in the UK press), especially policy actors and parts of the media, contested the legitimacy and right of activists to meaningfully participate in the fracking issue space. For example, anti-fracking protesters were presented as ‘professional activists’ often not resident of the area immediately affected by developments, who, it was claimed, therefore had no right to comment on these ‘local’ issues.

Material publics

Some of the collectives orchestrated by academics and designers also pushed the identities of participants much further, by considering the active role played material objects in the collectives. For example, **case 12** (energy babble) explored the impacts of the generative machines the designers created – namely energy babble, which was a hybrid smart meter and radio which broadcast and carried sentiments about energy and environmental issues, and several ‘twitterbots’ which playfully interacted with other twitter users around energy issues – on other participants. **Case 9** (Tilting at Windmills) explored the way participants and the researcher actively engaged with the landscape and with other material objects such as wind turbines, and the technologies used to record participants’ voices and incorporate them into a film installation.

4.5 Interrelating ecologies of energy participation

The analysis of our systematic review corpus has yielded not only significant insights into individual processes of energy participation and the patterns which are evident across these cases, but also **revealed significant relationships and interconnections between different participatory collectives. These relationships form part of a broader ecology of energy-related participation, including relationships with and between wider spaces of participation and dominant institutions.** Exploring these dynamics can help explain the patterns of energy participation our systematic review has revealed.

Historical trajectories

Our case study analysis identified several recurrent kinds of relationships between different participatory collectives in the energy system. **The first kind of relationship between collective participatory practices concerns the histories or historical trajectories of the collectives.** In many cases it is difficult to identify exactly when a collective emerged because they are **often strongly connected to earlier collectives through their form, purpose and key individuals involved.** For example, this was the case with many activist and community groups. The emergence of **case 2** (Reclaim the Power) can be traced directly from the influential collective around the Camp for Climate Action which was active between 2006 and 2010, through an interim working group called the Climate Justice Collective (Bergman 2015). Similarly **case 30** (Londoners on Bikes) emerged from earlier feminist and environmentalist activist collectives, as well as drawing on collectives which were specifically organised around cycling, including people involved in ‘critical mass’ cycles and the bike blogging community (Aldred 2013). Community energy groups such as those involved in **case 8** (Northern Ireland Community Energy) and **case 12** (Energy Babble) almost all had very long histories of collective action around energy topics, for example through transition towns initiatives or community co-operatives.

It is also possible to identify **long histories of collectives located more in the policy sphere.** For example, **case 3** (DECC’s Low Carbon Communities Challenge) involved community energy groups such as Transition Town Totnes and the Lamas eco village, all of whom had longer histories of energy action. Furthermore, the Low Carbon Communities Challenge concept emerged from an earlier public dialogue processes orchestrated by DECC with support from Sciencewise, which was called the Big Energy Shift, which concluded that efforts towards behaviour change were best focussed at a community level (Pallett and Chilvers 2013). Another DECC public dialogue **case 6** (DECC’s 2050 public dialogue) emerged directly from the 2008

Climate Change Act which set the 2050 greenhouse gas reduction targets, at least partly in response to the actions of earlier collectives such as Climate Camp and Transition Towns.

Circulating models of participation

A second significant kind of relationship between participatory collectives which emerged from our case studies is the sharing of tools and models for participation. This can be seen for example in collectives orchestrated by academics and designers. In **case 9** (Tilting at Windmills) the academic, artist and dancer Jess Allen developed an approach which she calls 'tractivism', inspired by land artists such as Richard Long as well as by **techniques from activism and dance**, which she has then developed in further projects (Allen and Jones 2012). These projects include the 'All in a day's walk' performance on the topic of the slow food movement, as well as 'Trans-Missions' which she completed in June 2015 exploring infrastructures of energy transmission in the West Midlands. Similarly, particular approaches to **speculative design and co-design** have been developed at Goldsmiths University of London and the Royal College of Art (RCA) and adopted in a number of different energy collectives. **Case 12** (Energy Babble) in particular, was very significant in developing a distinctive Goldsmiths speculative design methodology which is now being employed in other projects, such as the current Citizen Sense project which is developing new monitoring technologies and approaches for measuring air pollution and the effects of fracking. There are also similar connections to be made between RCA projects like **case 20** (Drawing Energy) and other exhibitions orchestrated by the RCA such as the Nuclear Dialogues project or the Micro Kingdoms exhibition at the Design Museum. Another significant academic tool for energy participation in our case studies was **trials of smart meters and feedback devices**, which has been used in a range of examples including **case 10** (the Customer Led Network Revolution) and **case 27** (smart meters, smart people).

There are several examples of how **tools for participation have been shared between different collectives in the policy domain** in our case studies. For example, **case 4** (The Bioenergy Distributed Dialogue) used the concept of a card game as a basis for public dialogue, drawing on an earlier climate change related card game called Democs for a public dialogue carried out by the New Economics Foundation in 2005. Similarly, **case 1** (national citizen engagement process around the energy system) which was an academic but policy-oriented project, used the My2050 scenario tool which was originally developed for **case 6** (DECC's 2050 public dialogue) to engage participants in discussion about energy futures. There is also evidence of **tool sharing between different community energy groups**, driven by the

strong mutual support networks and government or third sector structures in place to help these collectives (Hargreaves et al 2013). For example, **case 8** (Northern Ireland Community Energy) and **case 18** (the Brighton Energy Co-op) both received advice from organisations like Co-operative Energy on how similar projects were run, and they also looked at the business models used by other community energy groups. This helps to explain certain patterns around community energy, such as the relatively limited range of organisational forms they often take (Seyfang et al 2013). Here we see **collectives of community energy becoming connected in wider spaces of participation, within which particular models of participation in terms of community organising become more stabilised across space and time. This process applies to the way in which all the models of participation (such as those identified in section 4.3) expand and become more established within the wider UK energy system as constitution.**

Collective solidarities

A third kind of connection between different energy collectives – particularly activist groups – is through particular issues, or what some authors have labelled as **discourse coalitions, where several collectives, organisations and even individuals are together promoting a similar agenda.** For example, **case 2** (Reclaim the Power) has been identified by a number of analysts as part of a broader anti-fracking discourse coalition with other activist groups and collectives such as **case 25** (Back Balcombe), as well as individuals like the Green Party MP Caroline Lucas (Bomberg 2015; Cotton et al 2014). Similarly, **case 7** (wind farm protests in Nant y Moch) formed part of a larger anti-wind turbine and anti-electricity pylon discourse coalition in rural Wales (Mason and Milbourne 2014). **Case 21** (Demand Energy Equality) does much of its work in collaboration with other groups with similar aims related to the energy system, including 10:10, Greenpeace and the African Solar Cooperative, as well as collaborating with organisations with stronger social aims such as volunteering matters and local groups supporting people on low incomes or with addiction problems. In **case 29** (community food waste energy production projects) the controversy around the Sheffield plant in particular was publicised and bolstered by actions by Greenpeace which shared the local groups' scepticism about energy-from-waste schemes. Though it had less identifiable commitments to a particular cause, **case 9's** (Tilting at Windmills) walk symbolically began at the Centre for Alternative Technology, suggesting shared aims.

Intermingling collectives

A fourth kind of relation between different cases of energy participation which emerges is the complex nesting and overlapping of different collectives. This is common in academic studies, for example **case 3** (the Low Carbon Communities Challenge) contained lots of existing community energy projects which were energy collectives in their own right. Similarly, **case 7** (wind farm protests in Nant y Moch) was studied as part of a larger academic project on public perceptions of wind energy in Wales, **case 10** (the Customer Led Network Revolution) describes one qualitative academic study which was part of a much larger academic and industry-led project into the effects of new smart technologies in the North East of England, **case 15** (Energy Biographies) drew on three existing case studies of active community groups, and **case 28** (Imaginations of low carbon rural futures in English villages) also formed part of a broader RELU-funded project on rural communities responses to climate change. There were other examples of nested collectives, such as **case 19** (iconnect study of commuter behaviours) which looked at the effects of three of Sustrans' Connect 2 schemes for promoting cycling, out of a total of 84 schemes across the country. Community energy projects, such as **case 8** (Northern Ireland Community Energy) often engaged with and primarily benefitted existing community groups, particularly those engaged with energy issues.

Overflowing collectives

On top of the nesting and overlapping of collectives, a further kind of connection between the collectives in our case studies emerged from various overflows from the collectives. **Case 25** (Back Balcombe) is a significant example of the overflowing nature of many energy collectives, morphing from an initial anti-fracking protest into community energy group, which was then forced instead to enlist the help of a commercial energy company in response to cuts in feed-in tariffs. **Case 7** (wind farm protests in Nant y Moch) illustrates the importance of geographical overflows, as the progress of the protests in Nant y Moch was influenced by other protests and public inquiries around wind farms and power stations happening in the same local area. **Case 16** (domestic laundry practices) shows overflows between different social practices and parts of the energy system, for example illustrating how established working practices have implications for the temporality and frequency of practices (Higginson et al. 2014). Even where orchestrators of a given energy collective have attempted to keep it tightly focussed and bounded there are still overflows. For example, **case 24** (sentiment mapping around the Big Six energy companies) picked

up on many wider discussions around energy issues such as clean energy or fuel poverty which were taking place online, as these were very difficult to separate out from collectives specifically talking about their experiences with the Big Six energy companies. In another example, the progress of **case 17** (homeowners renovation decisions) was affected by the introduction by the Government of the Green Deal, as well as subsequent changes to the Green Deal, altering the terms under which the collective was participating in the energy system.

Boundary work and insulation

Our case studies also reveal several **important disconnections between different energy collectives which are equally significant to understanding the broader ecology of energy participation. A strong theme here is collectives which deliberately deny the existence, validity or relevance of other collectives operating in the same issue space.** For example, the reporting of **case 5** (UK Government public engagement with shale gas and oil) tends not to draw connections to protests, media coverage and public opinion surveys in the fracking issue space which were going on in the same time period. Where these collectives are mentioned in the documents concerning the process their relevance is downplayed, and there was no attention paid to direct conjunctions between these collectives such as the appearance of anti-fracking protesters outside of one of the deliberative workshops which formed part of the dialogue. Similarly, **case 11** (DECC public attitudes tracking) does not acknowledge protests and other forms of participation occurring around the energy issues and technologies it seeks public perceptions around. In another example of this kind of disconnection, **case 13** (Renergy living labs) presents its methodology as completely different and novel, denying connections to other deliberative events attempting to engage communities around energy issues, even when they have occurred in the same areas.

Other disconnections are formed where collectives actively try to reject and propose alternatives to more dominant energy collectives. For example, **case 14** (experiences of fuel poverty) explicitly rejected the picture of fuel poverty created by other collectives studied through statistical and survey methods and imagined in Government policy-making. Similarly, **case 28** (imaginings of low carbon rural futures in English Villages) set out to challenge the assumptions made in policy about rural communities and the kinds of energy transitions they are engaged in. Other disconnections emerged from issues around publicising energy collectives. For example, **case 4** (the Bioenergy Distributed Dialogue) was drawn upon or

explicitly connected with many other collectives in the energy area due to its institutional setting within a research council, and the emphasis in reports on the process on issues around emerging technologies rather than energy. In another example of this, the protests around Holsworthy energy-from-waste plant in **case 29** (community food waste energy production schemes) failed to connect up with other similar collectives or with national protests and organisation, due to its framing around concerns agricultural waste and local issues such as road access, as well as the lack of connections of the individuals involved with broader movements.

Institutional settings

The ecology of energy participation described here can be linked to a number of **institutional and other drivers of participation which form a link between individual instances of participation and the broader energy constitution**. Firstly, there appear to be **several significant institutions orchestrating and driving patterns of energy participation**. For example the partnership between DECC and Sciencewise accounts for a number of significant energy collectives during the period of study, all of which were public dialogues, including **case 3** (Low Carbon Communities Challenge), **case 5** (UK Government public engagement with shale gas and oil) and **case 6** (2050 public dialogue). Additionally, DECC was the institutional setting for yet further influential energy collectives. It is also possible to identify significant activist or third sector organisations such as Greenpeace, Co-operative Energy and 10:10 which have significantly influenced many energy collectives. Also important in this ecology of participation is a **number of academic centres of power, which have been particularly influential in shaping energy research which engages with the public**, this list includes: Cardiff University – **case 1** (national citizen engagement process around the energy system), **case 15** (Energy Biographies) as well as many collectives involving public opinion surveys; our own institution UEA often in partnership with Sussex University – particularly the CISE project which engaged many community energy groups (Seyfang et al 2013); Exeter University – **case 26** (UK residents' responses to high voltage power lines) and a wide range of other work; and Goldsmiths University London and the Royal College of Art which have together been influential in promoting speculative design projects around energy – **case 12** (Energy Babble) and **case 20**.

Technologies of participation

There are also several different models of participation – what have sometimes been referred to as technologies of participation – which have become dominant. The

analysis of our full corpus shows that public opinion surveys are still a widely favoured and legitimate method of engaging with the public around energy issues. Public dialogue is a good example of a more recent approach which is now widely used in UK Government public engagement around energy – including **case 3** (Low Carbon Communities Challenge), **case 4** (Bioenergy Distributed Dialogue), **case 5** (UK Government public engagement around shale gas and oil) and **case 6** (2050 public dialogue). This approach has also been used in more academic settings, for example in **case 1** (national citizen engagement process around the energy system). As discussed above speculative design and community energy are also models which are beginning to become stabilised and standardised elements of the ecology of participation, being adopted in many different contexts, places and institutional settings.

Issue spaces

The above analysis also suggests the importance of particular issue spaces in driving energy participation. For example, renewable energy emerges as a consistent theme for many energy collectives during the period of study. Fracking was also a very significant issue space during the period of our review, and was one that became a symbolic battle field for broader contestations over the organisation of the energy system. **Case 22** (reporting of fracking in the UK press) captures some of the multiple and overlapping collectives operating in this space, including protesters from groups like ‘Frack Off’, and residents in Blackpool experiencing seismic activity due to fracking also referenced. Since the time periods covered in that academic study there has been a multiplication of fracking collectives including public attitudes surveys, public dialogues – **case 5** (UK Government public engagement with shale gas) and further protests – **case 2** (reclaim the power) and **case 25** (Back Balcombe).

Imaginaries of publics

A final organising feature of the ecology of energy participation has been the **strength of particular visions or imaginaries of the public, which have shaped the design, orchestration and reception of different energy collectives.** Our mapping and analysis shows the continuing strength of visions which paint the public as (passive) consumers, whose behaviours can be shaped through behaviour change initiatives and whose opinions on and levels of acceptance of new developments

can be tested through public opinion surveys. However, the emergence of alternative models of public engagement such as public dialogue and community energy, which allow for a more active role for participants suggest a further dominant imaginary of the public as active, and perhaps even resourceful and resilient with regards to the energy system. A final imaginary of the public which is reflected strongly in responses to and reporting of some of the activist collectives in our study is the vision of the public as a threat to property and potentially to reason (cf. Welsh and Wynne 2013). This imaginary helps to explain some of the disconnections we found between different energy collectives, as well as illustrating some of the difficulties for activist collectives around how their actions are publicised or not and their ability to shape the broader energy system.

4.6 What are the key features of the UK energy system as constitution?

Our mapping and analysis of UK energy participation sheds light on the key features of the UK energy system as constitution 2010–2015. In describing the energy system as constitution, we are not only interested in the technical elements of the energy system as it is usually defined, but also in the forms of social organisation associated with the system and the predominant ways of defining the energy problem, of viewing the public and of understanding participation. In section 2 (and illustrated in Figure 4) we suggested that an *energy system as constitution emphasizes the importance of the national political culture and constitutional relations between citizens, science and the state within which an energy system is situated, in shaping (and being shaped by) the forms of participation that occur within it*. We went on to identify from relevant literature suggested constitutional stabilities relating to the models, subjects and objects of participation that have become dominant within the UK energy system in the early 21st century.

The picture that emerges from sections 4.1–4.5 above largely support this **view is of an increasingly distributed energy system undergoing a primarily technical transition, defined by the dimensions of the energy trilemma – climate change, energy security and affordable energy – though there are many other emergent issues. In this system as constitution publics are primarily viewed as consumers or as a threat, though there are other legitimate roles for them to play in some contexts. The terms of participation are largely defined by Government and academia, focussing primarily on elicitive forms of engagement. Our analysis also identifies more emergent features of this constitution, including the community**

energy movement which in some ways reframes modes of participation and visions of publics, growing interests in smart technologies and their implications for behaviour and practices, as well as prominent controversies symbolised by the fracking issue space.

Influencing the energy constitution

Our case studies show the many different ways in which energy collectives contribute to and shape the energy system as constitution. For example, some collectives feed directly into energy policy-making processes, such as the DECC-run public dialogues and surveys **case 3** (Low Carbon Communities Challenge), **case 4** (the Bioenergy Distributed Dialogue), **case 5** (UK Government public engagement with shale gas and oil), **case 6** (2050 public dialogue), and **case 11** (public attitudes tracking). Other collectives have fed into policy processes via influencing think tanks and policy actors, for example **case 1** (national citizen engagement process around the energy system) influenced the environmental think tank the Green Alliance and was cited by policy actors such as the UK Government's Chief Scientific Advisor and the European Commission. Other collectives attempted to influence policy through campaigning and direct action, such as **case 2** (Reclaim the Power), **case 29** (community food waste energy production projects) and **case 30** (Londoners on Bikes). Some cases actually had material impacts on the energy system, for example in **case 19** (iconnect study of commuting behaviours) Sustrans' Connect 2 projects made material changes to walking and cycling infrastructures across the UK. Similarly, **case 21** (Demand Energy Equality) was engaged in trying to create alternative energy infrastructures and technologies, such as the solar tree in Bristol city centre and DIY solar panels. **Case 7** (wind farm protests in Nant y Moch) had material impacts in a different way, by halting the development of several wind farms in the area. Some cases aimed to have a much more diffuse influence on the energy system through engaging in more open-ended engagements or encouraging participants to question parts of the system, such as **case 9** (Tilting at Windmills) and **case 14** (experiences of fuel poverty).

Working with and against 'the system'

The cases we analysed can be crudely categorised into those which accepted or attempted to work with the current form of the energy system as constitution, and those which attempted to challenge and transform it. Unsurprisingly, Government-orchestrated and business-orchestrated collectives tended to reinforce the energy constitution, even to the point of foreclosing or failing to adequately to report

exchanges which started to consider broader elements of the energy constitution such as directionality and the energy mix. However, there were some ways in which these collectives were used to challenge the energy system. For example, the New Economics Foundation used data from **case 11** (DECC's public attitudes tracking) to challenge current Government policy around fracking and renewables. Cases which looked at everyday social practices related to energy such as **case 10** (the Customer Led Network Revolution), **case 15** (Energy Biographies) and **case 16** (Domestic laundry practices), also highlighted the way in which the energy constitution itself dictated the terms and scope of collectives.

Academic studies often had a more ambiguous relationship to the energy constitution, sometimes because they were attempting to describe energy collectives, or because they hoped to be able to influence policy by speaking the accepted language around the energy system. So for example, in **case 1** (national citizen engagement process around the energy system) and **case 26** (UK residents' responses to high voltage power lines) the academics largely framed and communicated their collectives in the context of the current energy constitution, and accepted ways of talking about energy, participation and the public, in order to enhance their potential to influence policy-makers. Other academically-orchestrated collectives, such as **case 9** (Tilting at Windmills), **case 10** (the Customer Led Network revolution) and **case 20** (Drawing Energy) tried to open up aspects of the energy system as constitution to discussion but did not try to directly engage with or challenge the system.

Some academically-orchestrated collectives did pose a more direct challenge to the energy system as constitution. For example, **case 12** (Energy Babble) created new objects which subverted or even made fun of aspects of the energy constitution, like the smart meter roll out, and **case 14** (experiences of fuel poverty) directly challenged dominant understandings of fuel poverty and the fuel poor. **Activist collectives also tended to directly challenge aspects of the energy system as constitution, disputing particular decisions which had been made as well as trying to reveal and contest the underlying power relations and inequalities in the energy system** (Cotton et al. 2014) – for example **case 2** (Reclaim the Power), **case 21** (Demand Energy Equality) and **case 25** (Back Balcombe). **Other academic and activist collectives tried to draw attention towards neglected or excluded aspects of the energy constitution.** For example, both **case 8** (Northern Ireland Community Energy) and **case 27** (smart meters, smart people) responded to a perceived lack of activity and resources for energy participation in Northern Ireland, as well as trying to engage with poorer households. **Case 28** (imaginations of low carbon rural energy

futures in English villages) tried to give voice to rural dwellers who tended to be ignored in discussions of the energy transition. **Case 30** (Londoners on Bikes) tried to put the issue of cycling onto the agenda, challenging the received wisdom that cycling was not an activity which required direct government planning and intervention in current systems.

Community energy projects had a highly ambiguous relationship with the energy system as constitution, appearing to challenge it by developing new technical and social structures which side-stepped the formal energy system on the one hand, but also playing into behaviour change narratives around energy (e.g. Smith et al 2015). The cuts to feed-in tariffs at the end of 2015 will also have a huge impact on the community energy movement, threatening the viability of current and planned projects, meaning that the future of community energy in the energy system as constitution is not guaranteed.

Beyond the energy constitution

The final insight our analysis offers into the UK energy system as constitution, is the relevance of multiple processes operating at different spatial scales which transcend the boundaries of the energy constitution. For example, some of the collectives we studied resulted from broader international collaborations, particularly European projects, such as **case 13** (Renergy Living Labs) and **case 26** (UK residents' responses to high voltage power lines). There were also more locally situated collectives which appeared to be operating outside the rules of the energy constitution, such as **case 7** (Wind farm protests in Nant y Moch), or even studies which focussed on practices at the household level such as **case 14** (experiences of fuel poverty). More significantly, **many of the patterns observed around energy participation in the UK in this review relate to processes which are occurring at a transnational rather than merely national level**, such as the emergence of particular technologies of energy participation including community energy, public dialogue, transition towns and living labs, and the existence of significant issue spaces like fracking and nuclear power, which go far beyond national boundaries.

5. Conclusions

In this systematic review and mapping of public participation in UK energy transitions we have taken forward a new approach to public engagement with energy. This has been an experiment in mapping broader ecologies of participation, emphasizing the relations between different instances of public participation in and around the energy system, and identifying significant patterns of engagement across the system. Most importantly, the report highlights the diverse and distributed ways through which civil society and wider publics are involved shaping and governing energy transitions. Our approach has produced new insights about existing participatory collectives around the energy system from the academic literature, as well as bringing other significant cases of engagement practice to light. Furthermore, it has demonstrated the existence of more or less stabilized visions of the public, framings of energy issues or material commitments, and modes of democratic engagement which characterize the energy system as constitution.

What emerges is a picture of the UK energy system on the cusp of the low carbon era. While the energy system remains market-led, with some elements of Government steering and intervention, it is also in the process of becoming a more distributed system. This emerging low carbon distributed energy system is also characterised by an increasing diversity of ways in which the public engages in and around it. It is clearly challenging for Government and other organisations to recognise and understand this diversity and to deal with the interconnectedness of participatory collectives, but these emerging characteristics also offer some notable opportunities which can be harnessed. For example, there are many instances where citizen actions are supporting the transition to a low carbon energy system, or even suggesting alternatives for the energy system which are yet to be explored by Government and industry. Even seemingly hostile or irrelevant forms of engagement with the energy system can be connected to more constructive forms of engagement in interesting ways. The community energy movement and the continued existence and innovation of off-grid communities both provide good examples of citizen actions which need to be supported by Government and could also be seen as sites of learning. There are also novel techniques for public engagement emerging, such as sentiment analysis and speculative design, which need to be carefully interrogated but also provide opportunities for doing engagement differently in future.

We now present nine key concluding messages that emerge from this report.

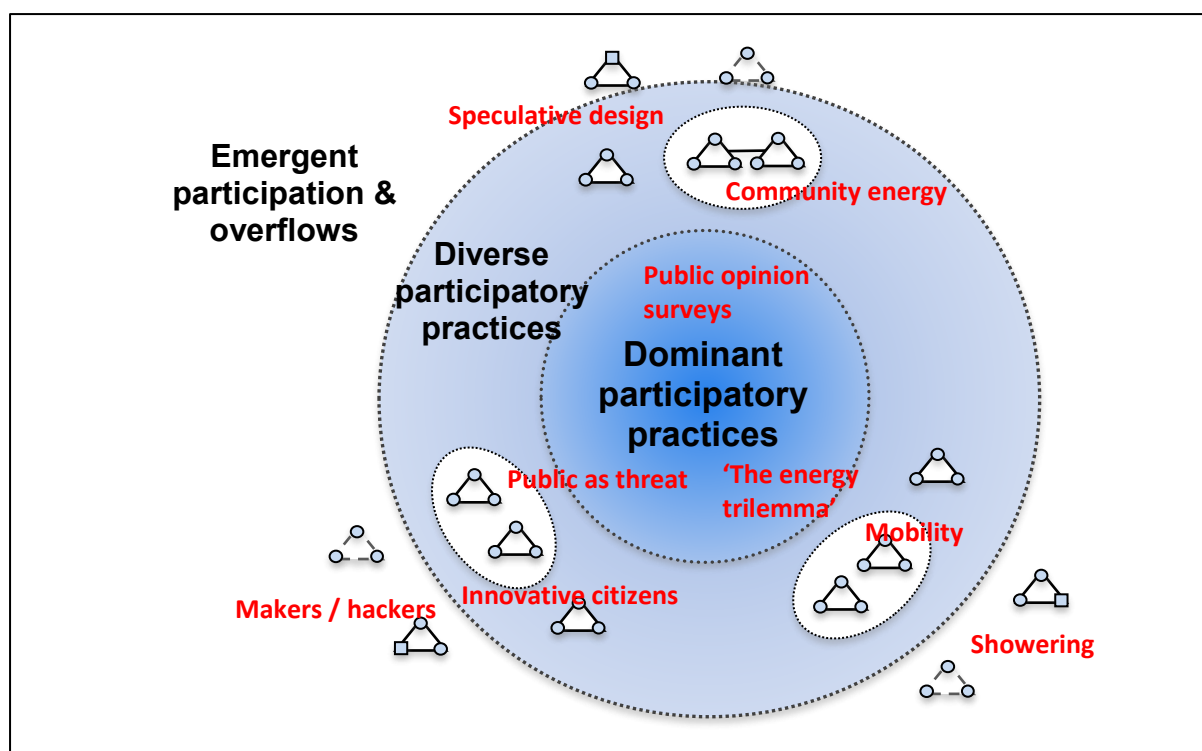


Figure 14. Experimental mapping of the UK energy system as constitution.

5.1 There are clear systemic patterns and inequalities of energy participation

Our systematic review shows clear patterns of participation across the UK energy system, not only exposing the sheer diversity of collective practices through which publics engage with energy, but also revealing critical ‘systemic inequalities’. The evidence shows some forms of participation – such as opinion surveys, deliberative processes, consultations, behaviour change, and community energy – to be more prevalent than others. This in turn raises questions over the political economic dimensions and inequalities in resource distribution, which open up and close down forms of and opportunities for participation in energy transitions. The mapping in turn generates evidence-based insights into the forms of participation that are excluded or endangered in the UK energy system – such as co-design, activism and protest, and arts-based forms of engagement. Our analysis thus raises questions about what drives systemic omissions and inequalities in energy-related participation and how they might be addressed.

For example, a number of our cases were concerned with the issue of fracking, but they were viewed very differently by governing institutions and influential media outlets, with implications for their ability to influence debates on or material commitments around the energy system. The Government's formal public engagement on shale gas and oil process (**case 5**) was focussed specifically on how the Government should engage with communities affected by fracking. Separate cases of public participation around fracking as an energy supply technology in the UK were initiated through surveys carried out by YouGov (YouGov 2015), researchers at the University of Nottingham (O'Hara et al. 2013), and the DECC public attitudes tracker (DECC 2015), amongst others. At the same time large NGOs (Friends of the Earth 2016), smaller social movements and campaign groups (**case 2**), and local protesters (**case 25**) were also participating around the issue of fracking. The public dialogue process was treated by DECC as the most full and legitimate example of public engagement around fracking in the UK, though the public opinion surveys also had a high level of legitimacy and were sometimes used in the media and by activist groups to challenge government policy. Protests were generally presented as being organised around specific concerns for public health and safety, with many accounts also focusing on the supposed violence and irrationality of the protesters, eroding their legitimacy further. The review showed similar situations in play around issues such as smart meters or some forms of renewable energy.

5.2 Alternative framings and meanings of energy system transitions are available

The evidence from the systematic review clearly shows that all forms of energy participation in the corpus are framed in powerful and highly partial ways. No one form or process of participation can capture multiple perspectives and visions of UK energy system change once and for all. Reports of individual participation processes should come with a warning label that other framings and meanings are available. The mapping thus provides a more robust (but still in itself partial) evidence base by revealing multiple contending visions across diverse sites and spaces of participation.

Some of the cases in our systematic review are narrowly framed (e.g. **case 5**, **case 23** and **case 26**) while some were more openly framed or aimed to stimulate discussions about whole systems (e.g. **case 1**, **case 2** and **case 6**), but all say things about energy transitions and futures. Furthermore, the cases represented a wide

diversity of visions and understandings of the energy system itself, from a mainly technical system (e.g. **case 11** and **case 19**) to one embedded in particular landscapes and social contexts (e.g. **case 7**, **case 28** and **case 29**), or one consisting of multiple interconnected social practices (e.g. **case 10**). Particular dominant views of the energy system and energy system change are reflected in **Government-led cases as well as some of the other cases from business and academia**. These tend to emphasise technological and behaviour change as the primary mechanisms of energy system change, often down-playing alternative models of progress or drivers of change, such as ideas about de-growth or energy justice, as reflected in some of the less publicized cases.

Our cases also provide ample evidence of the overflowing of particular situations or framings of energy issues. **What appear to be collectives of public engagement in fracking, carbon capture and storage, nuclear or other issues, are often also broader debates about energy futures and ‘upstream concerns’ such as directionality, control, purposes, inclusion and equity** (cf. Macnaghten & Chilvers, 2014; Wynne, 2016). While often expressed and enacted through the performance of participatory collectives – whether institutionally sanctioned (e.g. **case 5**) or activist (e.g. **case 25**) – such concerns are routinely closed out of the public reporting and wider public debate. This has implications for the systemic inequalities of energy participation as described in 6.1 above, as well as the broader energy system as constitution.

5.3 Energy publics are actively and systemically constructed

The systematic review evidence powerfully demonstrates that there is not a single UK energy public out there waiting to be discovered and more accurately represented or shifted on to more sustainable paths. It also shows the challenge of knowing and moving energy publics is more difficult than identifying or forming groups of individuals (as we see in market segmentation, survey and deliberative work). This is because ‘the public’ and subjects of participation are an outcome – not merely an input to – practices of public engagement with energy.

Our mapping reveals diverse identities of the public as users of energy technologies, consumers, householders, an aggregate population, and unaffected or neutral publics, but also as affected, active or marginalized communities, active citizens and activists. However, our cases also show that particular public identities are continually co-produced with the energy system. This means that certain

persistent assumptions about the public, for example that it can be best represented as an aggregate demographically representative population or that activists are dangerously irrational and mainly focused on local ‘NIMBY’ issues, become self-reinforcing in the way that participatory collectives are received, interpreted and reported on. **This creates broader systemic ‘public closures’ around who gets to speak about energy transitions, and how their visions will be interpreted and publicized. These systemic driving forces need to be exposed and challenged, as we highlight below.**

5.4 Systems and ecologies of participation matter

The systematic review evidence shows that understanding citizen engagements with energy in terms of discrete isolates cases limits comprehension of both the dynamics of energy participation and the societal dimensions of energy transitions. Our analysis has revealed multiple connections and interrelations between collective participatory practices and wider spaces of participation, which are shaping and being shaped by socio-technical change in energy systems. These interrelations matter in terms of revealing the multiple ways in which a particular energy issue such as fracking is being debated across the energy system – or even identifying cases where alternative collectives and framings of an issue are being denied. They help to demonstrate the dominance of particular imaginaries of the public which are shaping energy participation and the energy system more broadly. They also show the impacts of transnational flows of issue framings or widely adopted models of public engagement which have implications for how and when people participate in energy transitions.

This message complements wider moves in energy research towards ‘joined-up’ systems thinking approaches, but highlights the importance of also attending to the social systems or ecologies which are at play in shaping participation in energy transitions – and therefore energy transitions themselves. For example, some of our cases which have emerged from social practice driven studies (e.g. **case 10, case 14 and case 16**) show how changes in technologies and social practices in one part of the system – for example home microgeneration, or changing modes of paying for electricity supply – have implications for other social practices and forms of engagement in energy transitions, such as energy use in the home. A further example shows how participatory collectives of political protest can connect with the formation of new social innovations and modes of participation in the case of

community energy (e.g. **case 25**). A further aspect of this more ‘joined-up’ approach is that it encourages us to see all instances of public engagement with energy in broader context, and therefore to have a broader awareness of the change processes they might be responding to or influencing, or how they relate to other participatory collectives.

5.5 The UK energy constitution and political culture shape societal engagement

The forms and ecologies of participation that become established as credible and legitimate are powerfully shaped by (and in turn shape) the UK energy constitution and political culture. For example, public opinion surveys (e.g. **case 11**) and increasingly public dialogue processes (e.g. **case 1**, **case 4**, **case 5** and **case 6**) are a widely adopted mode of public engagement around the energy system, often used by government actors and academics. These are generally trusted as a legitimate and authoritative means of engaging and representing the public and so are often used to justify policy decisions or positions. However, these approaches form part of wider ecologies of participation in the energy system, which make broader assumptions about the role of the public and the appropriate framing of energy issues. This can often result in more active or unruly publics like activists or alternative framings of energy issues being unintentionally excluded from broader national debates.

The community energy movement is a clear ecology of participation which emerges from our analysis, characterized by models of active community organizing around renewable energy generation and behaviour change. This creates a strong vision of the public as active citizens or communities who can take action to accelerate energy transitions, appearing to challenge some aspects of the energy system as constitution which often focuses more on issues of public acceptance of new arrangements and technologies. However, community energy projects have also formed part of flagship Government policies and public engagement processes (e.g. **case 3**) often being framed and interpreted in ways shaped by the broader energy constitution. For example, official accounts of the community energy movement often present it as a behaviour change tool, rather than a mode of engagement with more radical decentralized potential.

5.6 A systems of participation view opens up new methodological innovations

Once the move is made beyond a mainstream view of participation as public engagement with energy in discrete events, new approaches and methods are needed to map across diversities of societal engagement in energy transitions. Our systematic review in itself represents one such mapping approach, using documentary evidence and secondary data. We have taken an experimental approach to conducting the systematic review, which could be applied in other energy contexts or in relation to other socio-technical systems.

A number of other methods for mapping diversities of public and civil society involvement in socio-technical systems and controversies – such as issue mapping, controversy mapping, and social network analysis – are emerging and should be taken forward through further research and experimentation in the energy domain. Such maps produce public documents (evidence for all, not only for policy) that reveal hidden diversities of participation and thus offer a means of enhancing public accountability and transparency of decision institutions. The act of mapping diversities can reveal and make public otherwise denied or marginalized perspectives, concerns and actions, and serve as a basis for harnessing citizen innovations and passions.

5.7 Reflexive and experimental participatory practices are needed

The above lessons on framing effects and the active construction of the subjects (publics) and objects (energy futures) of energy transitions through the practices of participation demand that future public engagements with energy should strive to be open and reflective about these aspects. This calls for more experimental and reflexive practices of public engagement with energy involving: attention to connections with other instances or ecologies of public engagement with energy; anticipation of the potential effects of the engagement not only on the issue or commitment under discussion but for broader ecologies or constitutions; and awareness of alternative ways of framing energy, engaging citizens and imagining the public.

Social scientists and engagement practitioners should also do more to open up and communicate uncertainties about energy participation and publics – pertaining to the way they have been constructed, possible alternatives, and exclusions.

Uncertainty is not only a concern for energy modellers, but for those modelling energy publics too. The evaluation frameworks which are used for judging the effectiveness of behaviour change programmes or deliberative consultations, for example, also need to open up these uncertainties. They should not only be concerned with inclusion and linear impacts on decision processes, but rather they need to also consider significant exclusions and wider effects.

5.8 We need more responsive and responsible ways of governing energy transitions

The new way of thinking about energy participation put forward in this systematic review prompts new forms of governing energy transitions. There is a need for a shift away from eliciting and ‘fixing’ public views to shape a vision of ‘the transition’ which is then centrally managed, towards a much more distributed and responsive mode of governing energy transitions. Publics and participation in the energy system are continually emerging – imagining, knowing and doing in different ways. The challenge is to develop systems that can know, respond and work with these diverse, continual and ongoing forms of energy participation not see them as something to be controlled or denied. Such responsiveness to continually emergent public values is key to building more sustainable and responsible energy futures.

These insights effectively turn participation around. The burden is no longer only on publics to participate around energy transitions, but also on institutions to account for the relevance of diverse publics and participation which are already underway. This calls for new forms of institutional listening (cf. Dobson 2014) to the diversity of existing participation in energy transitions, as well as new ways of seeing public doings that may be excluded or under-publicized. This more open and outward looking approach to governing should attend to the emergence and overflows of energy participation and promote institutional learning and responsiveness to new framings, publics, and forms of engagement. This allows for the harnessing of distributed actions toward sustainability and energy transitions, as well as identifying potential barriers to societal engagement with transitions, such as cuts to subsidies for community energy projects or the dismissal of activist collectives.

5.9 New avenues for energy participation research and practice are opened up

Finally, the systematic review and the above points come together to lay out some **important future avenues for energy-related participation research and practice.**

- There is a need for more in-depth, ethnographic and interpretive analyses of participation across the full range of different cases, settings and spaces revealed in our systematic review.
- These insights could be further enhanced and deepened through **comparative and cross-national studies** which compare the UK energy constitution to other political cultures, and also study transnational circulations and flows of models of engagement and energy issues.
- **A programme of active interventions producing experiments in energy-related participation** is also needed in order to take forward some of our above recommendations (in 5.6, 5.7 and 5.8) and generate further empirical insights around the emergence of different forms of energy participation and their relationships with the energy constitution.
- Finally, our findings suggest a **need to reconfigure the infrastructures of ‘social intelligence’ that systems of governing energy currently depend on,** necessitating for example the need for an observatory to continually monitor ongoing and emergent societal engagement with energy. Such a project would move beyond the opinion poll and the simplistic acceptance versus behaviour change dichotomy to develop a more nuanced, dynamic and systemic way of representing and engaging publics in energy transitions.

Bibliography

- Aldred, Rachel. 2013. "Who Are Londoners on Bikes and What Do They Want? Negotiating Identity and Issue Definition in a 'Pop-up' Cycle Campaign." *Journal of Transport Geography* 30: 194–201.
- Alexander, Catherine, and Joshua O. Reno. 2014. "From Biopower to Energopolitics in England's Modern Waste Technology." *Anthropological Quarterly* 87(2): 335–58.
- Allen, Jess, and Sara Penrhyn Jones. 2012. "Tilting at Windmills in a Changing Climate: A Performative Walking Practice and Dance–Documentary Film as an Embodied Mode of Engagement and Persuasion." *Research in Drama Education: The Journal of Applied Theatre and Performance* 17(June): 209–27.
- BBC Sussex. 2014. "How Summer Fracking Protest Unfolded in Sussex Village." *BBC News*. <http://www.bbc.co.uk/news/uk-england-sussex-26765926>.
- BBSRC. 2014. *BBSRC Response to the Bioenergy Dialogue*.
- Bergman, Noam. 2015. "Climate Camp and Public Discourse of Climate Change in the UK." *Carbon Management* (February): 1–10.
- Blyth, Will, Rob Gross, Jamie Speirs, Steve Sorrell, Jack Nicholls, A Dorgan, and Nick Hughes. 2014. *Low Carbon Jobs: The Evidence for Net Job Creation from Policy Support for Energy Efficiency and Renewable Energy*. London.
- Bomberg, Elizabeth. 2015. "Shale We Drill? Discourse Dynamics in UK Fracking Debates." *Journal of Environmental Policy & Planning* 7200(December): 1–17.
- Brown, Mark B. 2009. *Science in Democracy: Expertise, Institutions and Representation*. First. Cambridge, Massachusetts: MIT Press.
- Bulkeley, H., G. Powells, and S. Bell. 2016. "Smart Grids and the Constitution of Solar Electricity Conduct." *Environment and Planning A* 48(1): 7–23.
- Burall, Simon. 2015. *Room for a View: Democracy as a Deliberative System*. Involve. <http://www.involve.org.uk/blog/2015/10/20/room-for-a-view/> (last accessed: 6/5/2016)
- Cabinet Office Behavioural Insights Team and Department for Energy and Climate Change. 2011. *Behaviour Change and Energy Use*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60536/behaviour-change-and-energy-use.pdf (last accessed: 6/5/2016)
- Chilvers, Jason, and Matthew Kearnes. (eds.) 2016. *Remaking Participation: Science, Environment and Emergent Publics*. Abingdon: Routledge.
- Chilvers, Jason, and Noel Longhurst. 2012. *Participation, Politics and Actor Dynamics in Low Carbon Energy Transitions – Report of a Transition Pathways*

Project Workshop. Norwich.

Chilvers, Jason and Longhurst, Noel. 2015. A Relational Co-productionist Approach to Sociotechnical Transitions. 3S Working Paper 2015-27, Norwich: Science, Society and Sustainability Research Group, UEA.

Chilvers, Jason and Noel Longhurst. 2016. "Participation in Transition(s): Reconceiving Public Engagements in Energy Transitions as Co-Produced, Emergent and Diverse." *Journal of Environmental Policy & Planning*, DOI: 10.1080/1523908X.2015.1110483

Chilvers, Jason, Helen Pallett, and Tom Hargreaves. 2015. *Rethinking Energy Participation as Relational and Systemic*. London.

Chilvers, J., 2010. *Sustainable Participation? Mapping out and reflecting on the field of public dialogue in science and technology*. Sciencewise.
<http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Strategic-Research-documents/Sustainable-Participation-report-03-10.pdf> (last accessed: 6/5/2016)

Cotton, Matthew, Imogen Rattle, and James Van Alstine. 2014. "Shale Gas Policy in the United Kingdom: An Argumentative Discourse Analysis." *Energy Policy* 73: 427-38. <http://dx.doi.org/10.1016/j.enpol.2014.05.031>.

DECC. 2015. *DECC Public Attitudes Tracker - Wave 12*.

Demski, Christina, Catherine Butler, Karen Parkhill, Alexa Spence, and Nick Pidgeon. 2015. Public values for energy system change. *Global Environmental Change*, 34: 59-69.

Devine-Wright, P. 2007. "Energy citizenship: psychological aspects of evolution in sustainable energy technologies." In Murphy, J. (Ed) *Governing Technology for Sustainability*, London: Earthscan, pp.63-86.

Dialogue by Design. 2011. *The Low Carbon Communities Challenge: Findings from the Engagement Support by Dialogue by Design*.

Gross, Rob, Philip Greenacre, Chiara Candelise, Felicity Jones, and Arturo Castillo Castillo. 2013. *Presenting the Future: An Assessment of Future Costs Estimation Methodologies in the Electricity Generation Sector*. London.

Hargreaves, T, Hielscher, S, Seyfang, G, & Smith, A. (2013). Grassroots innovations in community energy: the role of intermediaries in niche development. *Global Environmental Change*, 23(5), 868-880.

Hendriks, Carolyn M. 2009. "Policy Design without Democracy? Making Democratic Sense of Transition Management." *Policy Sciences* 42(4): 341-68.
<http://link.springer.com/10.1007/s11077-009-9095-1> (March 6, 2015).

- Henwood, Karen, Nick Pidgeon, Christopher Groves, Fiona Shirani, Catherine Butler, and Karen Parkhill. 2015. *Energy Biographies Research Report*. Cardiff.
- Hielscher, Sabine. 2012. *Brighton Energy Co-Op: An Innovation History*. <https://grassrootsinnovations.files.wordpress.com/2012/09/brighton-energy-coop-innovation-history1.pdf> (last accessed: 6/5/2016)
- Higginson, Sarah, Murray Thomson, and Tracy Bhamra. 2014. "For the Times They Are a-Changin': The Impact of Shifting Energy-Use Practices in Time and Space." *Local Environment* 19(February 2015): 520-38.
- Hopkins, Rob. 2008. *The Transition Handbook: from oil dependency to local resilience*. Cambridge: Green Books.
- Icaro. 2014. *Evaluating the Public Dialogue Process on Shale Gas and Oil Developments*.
- IEA/OECD. 2016. *Track the energy transition. Where we are, how we got here, and where we need to be*. International Energy Agency http://www.iea.org/publications/freepublications/publication/COP21EnergyTransition_DataBrief_08December.pdf (last accessed: 6/5/2016)
- Ipsos Mori. 2011. *Findings from the DECC 2050 Deliberative Dialogues*.
- Irwin, A. 2001. "Constructing the Scientific Citizen: Science and Democracy in the Biosciences." *Public Understanding of Science* 10(1): 1-18.
- Jasanoff, Sheila. 2011. "Constitutional Moments in Governing Science and Technology." *Science and engineering ethics* 17(4): 621-38. <http://www.ncbi.nlm.nih.gov/pubmed/21879357> (July 26, 2012).
- . 2012. "Reason in Practice." In *Science and Public Reason*, ed. Sheila Jasanoff. Abingdon, Oxon: Routledge, 1-22.
- Jørgensen, Ulrich. 2012. "Mapping and navigating transitions - The multi-level perspective compared with arenas of development." *Research Policy* 41(6): 996-1010.
- Lee, Caroline W. 2015. *Do-it-Yourself Democracy: The Rise of the Public Engagement Industry*. Oxford: Oxford University Press.
- Loorbach, D. 2010. "Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework." *Governance—an International Journal of Policy Administration and Institutions* 23(1): 161-83.
- Macnaghten, Phil and Chilvers, Jason. 2014. "The future of science governance: Publics, policies, practices." *Environment and Planning C* 32(3): 530-548.
- Mansbridge, Jane, James Bohman, Simone Chambers, Thomas Christiano, Archon Fung, John Parkinson, Dennis F. Thompson, and Mark E. Warren. 2012. "A Systemic Approach to Deliberative Democracy." In *Deliberative Systems*, eds.

- John Parkinson and Jane Mansbridge. Cambridge: Cambridge University Press, 1–26.
- Marres, N. 2012. *Material Participation: Technology, the Environment and Everyday Publics*. Basingstoke: Palgrave Macmillan.
- Mason, Kelvin, and Paul Milbourne. 2014. “Constructing a ‘Landscape Justice’ for Windfarm Development: The Case of Nant Y Moch, Wales.” *Geoforum* 53: 104–15.
- Middlemiss, Lucie, and Ross Gillard. 2015. “Fuel Poverty from the Bottom-up: Characterising Household Energy Vulnerability through the Lived Experience of the Fuel Poor.” *Energy Research and Social Science* 6: 146–54.
<http://dx.doi.org/10.1016/j.erss.2015.02.001>.
- Miller, Clark, Jennifer Richter, and Jason O’Leary. 2015. “Socio-Energy Systems Design: A Policy Framework for Energy Transitions.” *Energy Research & Social Science* 6: 29–40.
- Mission Innovation. 2015. *Mission Innovation: Accelerating the Clean Energy Revolution – Joint Launch Statement*. <http://www.mission-innovation.net/wp-content/uploads/2015/11/Mission-Innovation-Joint-Launch-Statement.pdf> (last accessed: 6/5/2016)
- Pallett, Helen, and Jason Chilvers. 2013. “A Decade of Learning about Publics, Participation and Climate Change: Institutionalising Reflexivity?” *Environment and Planning A* 45(5): 1162–83.
- Parkhill, Karen, Christina Demski, Catherine Butler, Alexa Spence, and Nick Pidgeon. 2013. *Transforming the UK Energy System: Public Values, Attitudes and Acceptability – Synthesis Report*. London. www.understanding-risk.org
www.ukerc.ac.uk/support/tiki-index.php?page=Transforming+the+UK+Energy+System.
- Parkinson, John, and Jane Mansbridge. 2012. *Deliberative Systems: Deliberative Democracy at the Large Scale*. Cambridge: Cambridge University Press.
- Pidgeon, Nick, Christina Demski, Catherine Butler, Karen Parkhill, and Alexa Spence. 2014. “Creating a National Citizen Engagement Process for Energy Policy.” *Proceedings of the National Academy of Sciences of the United States of America* 111 Suppl : 13606–13.
- Pye, Steve, Nagore Sabio, and Neil Strachan. 2015. *An integrated systematic analysis of uncertainties in UK energy transition pathways*. *Energy Policy* 87: 673–684.
- Seyfang, Gill, Jung Jin Park, and Adrian Smith. 2013. “A Thousand Flowers Blooming? An Examination of Community Energy in the UK.” *Energy Policy* 61: 977–89.

- Shove, Elizabeth and Gordon Walker. 2014. What is Energy For? Social Practice and Energy Demand. *Theory, Culture & Society* 31(5): 41–58.
- Shove, Elizabeth, Mika Pantzar, and Matt Watson. 2012. *The Dynamics of Social Practice: Everyday Life and How It Changes*. London: SAGE Publications.
- Skea, J, P Ekins, and M Winskel. 2011. *Energy 2050*. London: Routledge.
- Smith, A., Hargreaves, T., Hielscher, S., Martiskainen, M., & Seyfang, G. 2016. Making the most of community energies: Three perspectives on grassroots innovation. *Environment and Planning A*, 48(2), pp407–432.
- Sovacool, Benjamin K. 2014. “What Are We Doing Here? Analyzing Fifteen Years of Energy Scholarship and Proposing a Social Science Research Agenda.” *Energy Research & Social Science* 1: 1–29.
- Stirling, Andy. 2008. “‘Opening up’ and ‘Closing down’: Power, Participation and Pluralism in the Social Appraisal of Technology.” *Science Technology & Human Values* 33(2): 262–94.
- . 2014. 24 *Towards Innovation Democracy? Participation, Responsibility and Precaution in Innovation Governance*.
- TNS BMRB. 2014. *Public Engagement with Shale Gas and Oil*. London. <http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Publicengagementwithshalegasandoil.pdf>.
- UNFCCC (United Nations Framework Convention on Climate Change) 2015. *Adoption of the Paris Agreement*. FCCC/CP/2015/L.9/Rev.1 <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf> (Last accessed: 6/5/2016)
- Walker, Gordon, and Noel Cass. 2007. “Carbon Reduction, ‘the Public’ and Renewable Energy: Engaging with Socio–Technical Configurations.” *Area* 39(4): 458–69.
- Watson, Matt. 2012. “How Theories of Practice Can Inform Transition to a Decarbonised Transport System.” *Journal of Transport Geography* 24: 488–96.
- Welsh, Ian, and Brian Wynne. 2013. “Science, Scientism and Imaginaries of Publics in the UK: Passive Objects, Incipient Threats.” *Science as Culture* 22(4): 540–66.
- Wynne, Brian. 2016. “Ghosts of the machine: publics, meanings and social science in a time of expert dogma and denial.” In J. Chilvers and M. Kearnes. (eds.) *Remaking Participation: Science, Environment and Emergent Publics*. Abingdon: Routledge, pp.99–120.

Appendix

A List of cases in full corpus

UCL citizen views on CCS focus groups	2012
Deliberative process involving backcasting of energy scenarios in Manchester	2010
EPSRC retrofit 2050 project, inc participatory back-casting with user groups	2011–2015
SPICE project	2010–2011
Experiment in using visualisation/GIS tools in wind farm planning in South Wales	2010
Community participation around transmission line upgrades to Hinkley Point	2009–2010
Public beliefs about high-voltage powerlines survey	2012
Wind farm protests in Nant Y Moch, Wales	2012–2013
Q method study on effects of different imagery for climate change engagement	2011
Abundance crowd-funding project for UK renewable energy projects	ongoing
UK consent processes for wind energy and CCS	2012
Bristol energy champions	2014–present
Bristol Smart Energy City Collaboration	2015–
USmart Consumer survey on smart meters	2014–
OUGO – TNS-BMRB public engagement with shale gas and oil	2014
UKERC national citizen engagement process for energy policy	2010– 2013
UK survey on perceptions of climate change and willingness to save energy related to flooding experience + other behavioural factors	2010
Study of the acceptability of renewable energy in an area with a weak grid and low socio-economic development Clydesdale, Scotland	2011
Survey of Scottish fishers' attitudes towards renewable energy	2010
Northern Ireland Community Energy – supposedly the first community energy projects in N. Ireland	2014–
UCL Energy institute Smart Meter Trial on time of use tariffs	2014
Consumer Futures workshops on Customer attitudes to communicating rights and choices on energy data privacy and access through smart meters	2013
Divestment movement	2013–
Community action research producing Bristol Community Strategy for energy	2012–2013
Academic involvement with Durham City Energy Descent Plan	2012–2013
Climate Camp	ended 2011
Lammas Eco-village	long running
Tilting at Windmills Jess Allen art/activism project in Wales	2010

Trans-missions project by Jess Allen, walking along powerlines	2015
Transition towns	ongoing
No Dash for Gas/ Reclaim the power – could focus on their 1st June "Eighteen actions against the fossil fuel industry", or camps at Balcombe 2014, Blackpool 2013	ongoing
Protest outside 2012 UK Energy summit, with protesters from many different groups – inc kettling and disproportionate police response	2012
Cardiff and Leeds study of UK public perceptions of shale gas, CCS & other energy sources	2013– 2014
Protest network around an energy-from-waste plant in Cymlyn Burrows, South Wales	ongoing up until 2012
English housing survey	2012–2014
The Green Deal	Up to 2014
Q-method study of stakeholder discourses on sustainability in Northern Ireland linked to Ecological and Carbon footprinting	2011
Study into local drivers, enablers, barriers and solutions to community-based renewable energy in the Lake District	2010
UCL project on housing, energy and well-being incorporating stakeholders through participatory methods	2011–2016
Smart communities demand-side community action project	2011–2013
Facilitation, Learning and Sharing (FLASH) project run by UCL , inc. development and trial for new methodologies for post occupancy evaluation in retrofit households	2011–2012
Cross comparison of different kinds of households' adoption and continued use of energy monitors	2010–2013
Consumer Led Network Revolution project with industry and academic partners (Durham & Newcastle) involved in roll out of smart technologies for the home	2010–2014
Study of energy practices in the home of self-identified environmentalists	2008–2011
Study into social impacts of renewable tidal energy in Swansea Bay	2013–2017
Lilac' UK affordable post-carbon housing initiative	2013
Study of attitudes towards community renewable energy projects in Cumbria	2012
Review of 21 energy-related community projects in Scotland	2011
Social network study/ survey of community renewable energy projects in Oxfordshire	2011
Qualitative study of 6 renewable energy communities in Scotland	all ongoing
The Co-operative's community energy challenge	2012–2014
(Youth) community energy catalyst scheme	2014–2015
DECC low carbon communities challenge	2011
Commons Select Committee inquiry/ consultation into DECC's priorities	current
Survey of public perceptions of design options for new nuclear power plants	2010
EPSRC public engagement project promoting low-carbon home adaptation	2009– 2010

and behaviour change amongst older people	
Action research developing low carbon neighbourhoods in Newcastle	2009–2010
Eurobarometer survey on public awareness and acceptance of CCS – Scottish section of work included in–depth interviews with 'informed publics' and stakeholders and a series of workshops	2011
DECC my 2050 simulator and public dialogue	2011
Public engagement around an offshore wind energy project in the Firth of Forth	2010
Survey of public climate change scepticism	2010
Survey on public acceptance of hypothetical windfarm off Exmouth	2013
Focus groups on public acceptance of fracking	2013
Survey UK resident's responses to high voltage power lines carried out at national and local scales	2012
Survey informing a decision–making model into UK environmental coaction (inc. electricity and transport use)	2013
Survey into public perceptions of energy futures before and after Fukushima	2005–2011
Survey into acceptability of a powerline in Nailsea, Somerset	2010
Survey of domestic energy use and energy behaviour amongst householders in Northern Ireland	2010
Public attitudes towards nuclear power and energy security	2010
A comparative analysis of people's willingness to change energy consumption under 3 different policy framings	2010
Survey into university related student travel behaviours	2012–2013
Survey into impact of retrofit schemes on householder behaviour in a UK housing scheme	2013
Survey into impact of walking and cycling infrastructures on people's travel behaviours and energy consumption – iconnect study of travel behaviours	2010–2011
Drivers perceptions and experiences of electric vehicles	2011
DECC public attitudes tracking	quarterly
Focus groups on public attitudes towards CCS in context	2010
Study into imaginations of low carbon rural futures in 4 English villages	2011–2012
Survey into what people in deprived communities in Yorkshire think about household energy efficiency interventions	2011–2012
focus groups with children & parents on energy demand reduction with IHDs	2012
CBI survey of public attitudes to UK energy priorities	2014
Ipsos MORI public attitudes to science 2014 report – has section on emerging energy technologies	2013–2014
UK Onshore Oil and Gas– commissioned research on public attitudes to natural gas from shale	2014
Durham energy institute surveys into public attitudes towards wind power on the isle of Man	ongoing
Cambridge public opinion survey on smart metering and energy	2013

consumption	
Ipsos MORI poll of public awareness, attitudes and experience of smart meters	2013
Ipsos MORI DECC research (survey and workshops) into homeowners' willingness to take up more efficient heating systems	2012
Survey of public opinions on alternative low carbon wall insulation techniques in the UK	2010–2011
Research into what water users think of tidal energy experiments in the Cornwall Wave Hub (surveys & interviews)	after 2010
Yougov poll for Renewable UK Cymru on public support for renewables	2013
Bioenergy distributed dialogue (BBSRC & Sciencewise)	2013
CCC and Sciencewise public dialogue on UK response to climate change	2013
ECCI 'Shaping our energy future' public dialogue event	2012
Public dialogue on UK National Ecosystem Assessment (DEFRA, NERC, Sciencewise & Exeter Uni)	2015
National dialogue on behaviour change in climate policy (carried out by RESOLVE)	2008–2010
Deliberative public workshops in London and Cardiff on the future development of the smart homes market	2012
The National Energy Foundation's Community Generation fund – categorised as behaviour change intervention	ongoing
Stop Climate Chaos Scotland's low carbon behavioural change initiative, including a book of short stories, supporting other bodies/initiatives and public lectures	2013
Carbon Smart field experiment into energy efficiency & behaviour change in office use	2013
Survey, household intervention and interviews with householders for experiment in behaviour change strategies for energy efficiency in the home	2010–2011
Cross-EU study of examples of community ownership of renewable energy promoting de-growth, with case study of CAT in Wales highlighted	2013
Anthropological comparative study of community food-waste energy production projects in Sheffield and Devon	long running
Focus groups on public acceptability of solar radiation management	2011
Deliberative mapping of options for tackling climate change	2012
Energy Babble – produced through the Energy and Co-designing communities speculative design project at Goldsmiths	2011–2014
Qualitative study into perceptions of domestic energy information in the Midlands	2012
UK Government consultation into display energy certificates	2014
UK Government consultation into community energy	2013
Scottish Government consultation into climate change act	2015
Londoners on Bikes campaign	2012
Carbon, Comfort and Control	2010–2011

Conditioning Demand	2011–2012
Experiment into effects of different forms of communication about CCS	2010
Experiment into willingness-to-pay for efficient washing machines in the UK	2011
Heat pump field trial user evaluation funded by Energy Saving Trust	2008–2011
Study into cyclists perceptions of satisfaction and comfort on cycling infrastructure	2013
Survey evaluating public acceptance of the 'Green Town' concept in Southampton	2011
Experiment into inducing subconscious energy behaviours through visually displayed energy information in student halls at the University of Bath	2012
Study into improving retail energy efficiency behaviours	2011–2013
Survey into park and ride behaviours in Bath	2011
Energy living labs in Durham and Sheffield	2012
Mixed method study into owner occupied superhomes	2013
Study into stakeholder perspectives on barriers and enablers to climate change mitigation options in rural land use in North East Scotland	2013
Study into perceived control of homeowners over their domestic energy use	2014
Twitter mining to understand transport use around football matches	2012–2013
Walking, cycling and driving to work patterns in the English and Welsh 2011 census	2011
Longitudinal study of effectiveness of town-wide cycling initiatives in England	2008–2011
Study of mainstream consumers' responses to driving electric cars	2010
Mixed methods study of people walking or cycling to work despite unsupportive environments	2009–2010
Study of community-led retrofitting initiatives	2009–2011
Study identifying different personas and their approaches to domestic energy retrofits	2012
Study into attempts to scale up low carbon action	2010–2014
Survey of public attitudes to and perceptions of HS2	2013
study into changes in patterning of walking, cycling and bus travel on the new Cambridgeshire guided busway	2011
National travel survey diaries of mode use	2010
Mixed methods study into people's reasons for adopting low carbon lifestyles	2011
Workshops mapping stakeholder values in order to identify potential sites for tidal energy around the Mull of Kintyre	2012
Study into reporting of fracking in the UK press	2011–2012
Survey into how homes are heated in Leicester	2009–2010
Study into heat protection behaviours and attitudes during 2013 heat wave	2013
Study using geo-located tweets to map patterns of transport use	2012–2013
Study into the environmental performance of a low carbon homes project in Wales, funded by the Technology Strategy Board	2013–2014

Field study of thermal comfort behaviours in UK office buildings	2010–2011
Qualitative study of experiences of fuel poverty	2010–2013
Experiment with stakeholders in communicating uncertainty in estimated greenhouse gas emissions from agriculture	2014
Equity effects of a carbon charge on car commuters around Manchester Airport	2008–2010
Field trial into individual energy use and feedback in an office setting	2012
Study into the development of community wind energy schemes	2010–2012
Study of climate change conversations on twitter around the 2013 IPCC working group 1 report	2013
2– year support programme for local action on climate change in Leicester	2010–2012
Study identifying people's mental models in home heat control	2012
Participatory GIS study exploring links between post–industrial landscape history and ecology in an old mining site	2011
Mixed methods study of motivations and attitudes of business travellers	2011
Conflicts between offshore wind farms and tourism in Argyll Scotland	2010–2011
Survey investigating potential contribution of demand responsive transport to a sustainable local transport system in Manchester and Leicestershire	2012
Survey of community energy in the UK	2011
Questionnaires into effects and risk perceptions of fuel poverty	2012–2014
Creative energy homes project, examining an attempt to switch behaviour patterns through a smart meter platform	2012
Analysing cycling as a social practice	2010–2011
Scottish Government's Climate Challenge Fund	2014
Questionnaire investigating behavioural predictors of electricity consumption in office buildings	2013
Mixed method study into people's mental models of sea–level change in the Severn Estuary	2011
Focus groups and questionnaires into public opinion on the issue of waste process heat for district heating	2010
Disputes around the proposal for an open cast coal mine in West Yorkshire	long running
Energy4all renewable energy cooperative in Cumbria	2010
Studies of Manchester, Birmingham and Glasgow smart city systems	2012
Assessments, modelling and workshops to determine the potential to retrofit England's suburbs to adapt to climate change	2011–2012
Study into the relationship between contact with environmental organisations and public attitudes and behaviour	2010–2012
Energy biographies	ongoing
Teddinet study of how consumers respond to energy monitors	2012–2013
Teddinet study of teen attitudes towards energy consumption	2011
Teddinet study of personalised energy feedback in offices	2012
Keeping cool exhibition by Walker, Shove et al	2011
VERD project: Understanding Homeowners' Renovation Decisions related to the Green Deal	2012

Study of how people manage heat flow through their homes using web forums data	2010
Community outreach project in Exeter with local community initiatives interested in energy sustainability	2010–2011
UK household longitudinal survey in pro–environmental behaviours across household members	2013–2014
Community outreach work on district heating Glasgow and Edinburgh	2010–2014
In–depth study into domestic laundry practices in Loughborough	2010–2011
Ipsos MORI pilot sentiment mapping of nuclear power tweets following Fukushima disaster	2011–2012
Talkwalker sentiment analysis of perceptions of the big 6	2015
Royal College of Art sentiment mapping for the future of commuting project – part of TSB's transport systems catapult	2014 –
Transport buzz open source sentiment mapping tool	current
Reflect smart phone app aiming to encourage drivers to reflect on the impacts of their practices on subjective wellbeing, and the wellbeing of others who choose to commute by cycling or walking	2015
Nuclear dialogues, Royal College of Art project	2009–2010
United Micro Kingdoms exhibition at the Design Museum in 2013 exploring 4 possible visions of the future of the UK, including some exploration of energy futures	2013
Energy Factory installation at Green Man festival	2012
Indoor weather spaces	2012
Drawing energy participatory research at the V & A – linked to Suslab living labs European project	2014
Design council workshop with DECC on how to help people make their homes more energy efficient	2010
Carbon culture programme focussed on behaviour change in public sector workers	ongoing
Dialogue by Design consultation and exhibitions around proposed Horizon nuclear power development at Wylfa	2011–2012
Dialogue by Design consultation around Hinkley C power station	2012
Dialogue by Design consultation for Surrey County Council on their cycling strategy	2013
Dialogue by Design consultation analysis for National Grid on future of energy system	2010 –
Dialogue by Design consultation around Sizewell C 2014	2014
Dialogue by Design management of consultation process around proposals for new wind farms in Brechfa forest	2014
Kickstarter for project developing open source energy monitoring technologies	2015
Demand Energy Equality group	Current
D:Fuse interactive exhibition with 'Extreme Energy' module, Bloomsbury Festival	2013

Great EDF Energy Challenge with the British Science Association	2014 –
Community Resilience mapping in the Carse of Gowrie	2013
Light project at Bloomsbury festival involving dance and installations	2015
Consultation on new energy from waste plant in Parc Adfer	2014
Calne town public consultation on renewable energy	2015
Government consultation on feed-in tariffs	2015
Consultation on Third Energy's fracking site in North Yorkshire	2015
Consultation on plans to build a new Moorside nuclear power station in Cumbria	2015
consultation about the Mynydd Llest y Graig Wind Farm in Powys	?
Consultation on Peterhead CCS project	2014–2015
Consultation on energy efficiency and fuel poverty in Wales	2014
Consultation on community energy in Glastonbury	2013
Consultation on energy from waste plant in Northwich, Cheshire	2015
EDF 'community forum' around the development of Hinkley C	ongoing
UK Government consultation on fracking – challenged by Greenpeace	2014
Consultation about Freckleton solar farm, Lancashire	2015
Community Energy Coalition convened by Forum for the Future	2011
Energy mapping and Nottingham energy calculator	current
Frack-off: extreme energy network	current
SNP grassroots members anti-fracking group	current
PAS workshop with communities in Falkirk on renewable energy	?
Workshop in Aberdeen planning the city's energy transition	?
Workshops around Scotland on the issue of land use in relation to renewable energy, James Hutton Institute	?
Renewable heating report into public awareness of renewable heating	2014
Energy saving trust research into home water/energy practices and trial interventions	?
Unilever showering practices survey	2011
Household electricity survey	2010–2011
Lancaster survey into declining bathing practices	2013
Stop smart meters campaign	current
Cycling cultures project	2010–2011
Low effort energy demand reduction project	2010–2014
Residential consumer attitudes to time-varying pricing, by the Low Carbon London Learning Lab	2014
Study of social housing residents' social practices related to energy use	2010–2012
Current: project exploring dynamics of energy use in the workplace	2011
Smart metering early learning project and small-scale behaviour trials	2012–2014
The C-Tech project: Energy sharing and energy feedback study in UK universities	?
the APAtSCHE project on older people's attitudes to using electrical appliances and adopting energy saving instruments	2012–2015
Study into homeowners' perceptions of using smart home heating	2013

controllers	
Study into how UK shoppers and sports spectators talk about air conditioning	?
Isle of Gigha heritage trust community energy projects – wind turbines	long running
Hyde farm community action network	2007–2011
Bristol Green doors	2010–
Lyndhurst community centre refurbishment and biomass boiler	2009–2010
South Wheatley community energy trust and wind turbine project	2004–2012
Student switch off	2006–
Brighton energy coop	2010–2012
Barley bridge weir hydro scheme	2007–2011
Carbon conversations	long running
Renewable energy innovation group producing products & advice to empower people to install renewable energy systems + runs hackspace workshops	2010–2014
Study into impacts of community benefits at the Farr wind farm in Scotland	2014
Study of new passivhaus dwellers in Norfolk	2011–2012
Pilot study by Leicester City Council into whether residents would save money from involvement in a community heating scheme	2012
E.ON open innovation platform	2012
10:10 solar schools project	current
Back Balcombe campaign – anti-fracking pro solar	current
Keep the feed in tariffs campaign	current
Smart meters, smart people small scale study in Northern Ireland	2012
Cultural study into social relations with landscape in the Lizard Peninsula, Cornwall	2009–2010
Assessment of different low carbon community programmes in the UK	2010–2011

B Summaries of full case studies

Case 1: UKERC Transforming the UK Energy System national citizen engagement process



UKERC-funded project aimed at achieving public engagement around whole energy system change. Three main methods used: 1) interviews with key stakeholders; 2) six in-depth deliberative workshops held in England, Scotland & Wales; 3) a nationally representative survey of 2441 people. Purpose was for first time to elicit public perceptions, attitudes and values in relation to whole energy system change (Parkhill et al., 2013). Explicitly aimed at research community, as well as policy stakeholders.

Parkhill, K A, Demski, C, Butler, C., Spence, A and Pidgeon, N (2013) *Transforming the UK Energy system: Public Values, Attitudes and Acceptability – Synthesis report*. UKERC: London.

Case 2: Reclaim the power activist group



Protest movement coming out of climate camp, but is a network of other bodies and counts movements like occupy and uncut as close allies. Began in 2012 as 'No dash for gas' when a group occupied EDG's West Burton gas-fired power station for 7 days & blockaded a fracking site. Has since been relabelled as 'Reclaim the Power' and focussed mainly on opposing fracking in organised camps in 2013 and 2014. In 2015 they co-ordinated a day of mass action focussed towards the Paris COP in December which had more of a focus on investment and the oligopoly of the Big Six.

www.nodashforgas.org.uk

Case 3: DECC's Low Carbon Communities Challenge



22 communities (out of 295 applications) across England, Wales & Northern Ireland received financial and advisory support with community energy projects related to renewable energy & other low carbon technologies, as well as behaviour change initiatives. All were communities deemed to already be active in this area & were given £450,000 on average to spend mostly on capital. Supported by the consultancy, Dialogue by Design. 4 communities did not complete their projects to timetable (DECC, 2012).

DECC (2012) *Low Carbon Communities Challenge: Evaluation Report*. HM Government: London

Case 4: BBSRC's Bioenergy Distributed Dialogue



Public dialogue based on a card deck and different future scenarios on the topic of bioenergy, designed to be carried out by interested community groups or BBSRC researchers who then report back to the BBSRC, though take up was lower than expected. Several dialogue sessions also run by BBSRC engagement specialists. Aimed to iteratively inform the direction of BBSRC research into bioenergy, which would in turn lead to more cards and scenarios being added to the game.

www.bbsrc.ac.uk/engagement/dialogue/activities/bioenergy-dialogue

Case 5: UK Government public engagement with shale gas and oil



Public dialogue carried out by TNS-BMRB on behalf of DECC and supported by Sciencewise with workshops in Winchester, Liverpool & Northampton to inform how DECC engaged with local communities and stakeholders affected by fracking projects. The official aim was to inform the Government's public engagement policy with affected communities and industry design of public benefits packages.

TNS-BMRB (2014) *Public engagement with shale gas and oil*. TNS-BMRB / Sciencewise: London.

Case 6: DECC's My2050 simulator and public dialogue



Used deliberative workshops and a UK energy mix online game to gather participants' views on how the UK should alter its energy mix to meet the 2050 GHG reduction targets, using a mix of demand and supply side measures. In the workshops worked with 2050 calculator in small groups to submit a final pathway at the end of the session, though not all groups submitted a pathway which achieved the target. All groups had an on demand expert to help them with the task. Also supported the creation of a youth panel, made up of young activists to advise on achieving the 2050 targets. The workshops were carried out by Ipsos MORI who also analysed the My2050 simulation on behalf of DECC, and was supported by Sciencewise.

OPM (2011) *Evaluation and Learning from the 2050 public engagement programme*. OPM / DECC: London.

Case 7: Wind farm protests in Nant Y Moch, Wales



In 2011 SSE proposed to develop a wind farm in Nant Y Moch, Ceredigion in Wales, with support from the Welsh Government. At the time it would have been the largest onshore wind farm in the UK. The development was opposed by several groups drawing on arguments of social justice linked to landscape, such as the Cambrian Mountain Society & local Friends of the Earth groups. Eventually the development and another of other related developments in the same area were postponed, causing the Welsh Government to reconsider its deployment of the policy (TAN 8) which designated certain areas in Wales for wind farm development, and SSE to transfer the rights to the site to the company Vattenfall.

Mason, K A & Milbourne, P B (2014) Constructing a 'landscape justice' for windfarm development: the case of Nant Y Moch, Wales. *Geoforum* 53: 104-115.

Case 8: Northern Ireland's first community energy collective



www.nicomunityenergy.org

Not-for profit social enterprise established in December 2014 by a group of volunteers with experience working in renewable energy and community development. Based in Belfast but working across Northern Ireland. In March 2015 they launched a community share offer to allow residents of NI to "buy into a community benefit society". The first phase of the project involves installing solar panels on buildings owned by third sector organisations.

Case 9: Tilting at windmills dance installation



Participatory dance/ 'tractivism' project involving an 8 day lone walk through the mid Wales uplands, near wind farms in August 2010. Sound recordings from the walk and encounters with people during the walk were then used as a sound track for a film installation created by the dancer and a film-maker featuring images of wind turbines and the dancer's interactions with them.

Allen, J & Jones, S P (2012) Tilting at Windmills in a changing climate: a performative walking practice and dance documentary film as an embodied mode of engagement and persuasion. *RiDE - The Journal of Applied Theatre and Performance* 17(2): 209-227

www.tiltingatwindmills.org.uk

Case 10: Customer Led Network Revolution academic project



Large (£54 million) smart grid project in the Northeast of England, funded by Northern Power Grid, OFGEM's Low Carbon Network fund, British Gas & EA technology, involving an interdisciplinary team of researchers from Newcastle & Durham Universities. This was the only project from the Low Carbon Network fund to include large component of social science. The project aimed to trial different smart grid technologies in homes & SMEs to determine their use and effectiveness. Social scientists were interested in understanding the coevolution of new social practices and smart technologies.

Bulkeley, H, Powells, G & Bell, S (2016) Smart grids and the constitution of solar electricity conduct. *Environment and Planning A* 48(1): 7-23.

Case 11: DECC's public attitudes tracking



Tracking survey set up by DECC in 2012. It runs four times a year: one large annual survey (in March), and three smaller surveys which focus on a subset of questions which are judged to be changing quickly or affected by seasons. Surveys involve on average around 2000 respondents each time, and are collected by the TNS UK omnibus using a random location quota. Questionnaires are designed by DECC & TNS-BMRB.

www.gov.uk/government/collections/public-attitudes-tracking-survey

Case 12: Energy Babble academic project



Researchers undertook co-design projects around energy with several different geographically defined community groups: Meadows Partnership Trust, Nottingham; Reepham Green Team, Norfolk; Transition Laddock and Grampound Road, Cornwall; Sid Valley Energy Action Group, Devon; Energise Hastings, East Sussex; Goldsmiths College, London. Based on field trips, workshops and probes they designed novel devices for communities to test in their own settings. One of the devices produced for a partner community was 'energy babble' a kind of smart meter which also streamed pro-environmental tweets. The broader project also led to the creation of a number of twitter bots embodying conceptual characters.

www.ecdc.ac.uk

Case 13: RENERGY Living Labs academic project



Project developing the innovative methodology of 'energy living labs' in 11 different 'energy conscious' communities across the EU (Durham & Sheffield, as well as communities in Lithuania, Portugal, Italy, Denmark, Hungary, Romania, Austria & Poland) to inform strategy at a regional level. Durham workshop orchestrated by Durham City Council. Sheffield workshop run by Building–For–the–Future. There are further workshops still to be run in each location to help to feed into policy and more concrete community actions.

Dvarioniene, J, Gurauskiene, I, Gecevicius, G, Trummer, D R, Selada, C, Marques, I & Cosmi, C (2015) Stakeholders involvement for energy conscious communities: The Energy Labs experience in 10 European communities. *Renewable Energy* 75 (2015):512–518

Case 14: Experiences of fuel poverty academic study



Project trying to understand UK fuel poverty through bottom–up experiences, rather than top–down imposition of theory or statistical definitions. Involved representatives of 15 households in different areas and of different family, household, job types. Aimed to contribute to the creation of a set of qualitatively derived indicators of fuel poverty to inform policy which are much more multi–dimensional than current measures, by highlighting the importance of broader structures and power relations affecting experiences of fuel poverty.

Middlemiss, L, & Gillard, R (2015) Fuel poverty from the bottom–up: Characterising household energy vulnerability through the lived experience of the fuel poor. *Energy Research & Social Science* 6 (2015): 146–154

Case 15: Energy Biographies



Longitudinal qualitative study based on lifecourse analysis approaches to understand how peoples energy practices and their understanding of them shift over time, particularly in response to significant lifecourse transitions, e.g. moving house, bereavement, marriage, divorce. Focus on individual experience and narration of changing practices in context of much broader stabilities and shifts.

Henwood, K, Pidgeon, N, Groves, C, Shirani, F, Butler, C, & Parkhill, K (2015) *Energy Biographies: Research Report*. University of Cardiff.

Case 16: Domestic laundry practices academic study



Study investigating potential to shift timings of energy-using practices such as laundry in the home in order to bring demand response into harmony with the temporalities of renewable energy supply, which in most cases cannot be switched on at will. Study aimed to try to understand existing practices and the ways in which they were fixed and flexible, as well as trialling interventions and challenges which aimed to shift practices.

Higginson, S, Thomson, M & Bhamra, T (2014) "For the times they are a-changin": the impact of shifting energy-use practices in time and space. *Local Environment: The International Journal of Justice and Sustainability* 19(5): 520–538.

Case 17: Understanding Homeowners' Renovation Decisions UKERC project



Research project looking at why homeowners decide to undertake renovations and why they decide to improve home energy efficiency. As part of this project the researchers looked at the effects of the Green Deal and whether this made homeowners more likely to undertake efficiency-related renovations. The researchers surveyed a representative sample of UK homeowners (1028 households) in September 2012 and conducted a follow up survey with 502 households in September 2013 following the introduction of the Green Deal.

Wilson, C, Chryssochoidis, G & Pettifor, H (2013) *Understanding Homeowners' Renovation Decisions: Findings of the VERD Project*. UKERC: London

Case 18: The Brighton Energy Co-op



Co-op organisation running and financing small-scale renewable energy projects in Brighton. Began in 2010 and launched with shares for the community in 2012. Currently has 8 solar PV installations all owned by the community share-holders. Set up and run by three key individuals following meetings organised by one disillusioned climate activist responding to COP 15 in 2009.

Hielscher, S (2012) *Brighton Energy Co-op: An Innovation History*. CISE report.

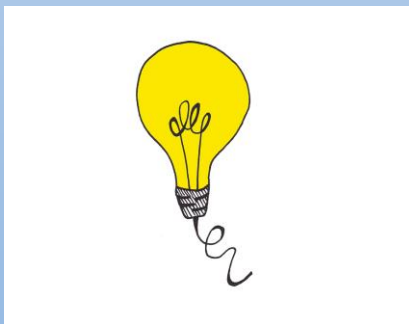
Case 19: iconnect academic study into commuting behaviours



Cohort longitudinal study in Cardiff, Kenilworth & Southampton into the effects after 1 and 2 years of newly introduced infrastructures for walking and cycling on CO₂ emissions from transport. The infrastructures studied were those introduced by the Sustrans Connect2 project. The project also aimed to assess the impacts of these new infrastructures on public health outcomes such as BMIs. The study found that the new infrastructures had no significant causal link with changes in commuting behaviours and public health outcomes.

Brand, C, Goodman, A, Ogilvie, D, Bull, F, Cooper, A, Day, A, Mutrie, N, Powell, J, Preston, J & Rutter, H (2014) Evaluating the impacts of new walking and cycling infrastructure on carbon dioxide emissions from motorized travel: A controlled longitudinal study. *Applied Energy* 128: 284–295.

Case 20: Drawing energy project at the Victoria & Albert Museum



Design project which started as an investigation into people's use of energy and energy technologies in the home, but developed into a participatory artistic project where participants were invited to make art in response to the question 'what does energy look like?' at three different workshops/exhibitions in 2013 & 2014. 180 people took part in drawing. As part of this exhibition the team also developed a prototype device 'Powerchord' which converted energy use into sound.

Bowden, F., Lockton, D., Gheerawo, R. and Brass, C. (2015). *Drawing Energy: Exploring perceptions of the invisible*. London: Royal College of Art.

Case 21: Demand Energy Equality group



Bristol-based activist group founded in 2012 "working for systemic change in the way energy is used, controlled and produced". They frame this aim in the context of fuel poverty as well as the costs of fossil fuels and climate change. The group has engaged in several different activities, including: creating 'energy trees' as practical pieces of community art and awareness raising; running open public workshops in London teaching people to make their own solar panel chargers or about off-grid living; and carrying out consultancy work for organisations with similar aims. The group also has a blog and a twitter account used to contribute to debates about energy futures.

www.demandenergyequality.org

Case 22: Reporting of fracking in the UK press academic study



Study looking at reporting of fracking in British press April–May 2011, November 2011 and April 2012, following different phases of the debate, and how different papers responded to new events. Analysis of articles using the keywords 'fracking' or 'shale gas' from the Nexis database from the Telegraph, the Times, the Guardian and the Independent.

Jaspal, R & Nerlich, B (2014) Fracking in the UK press: Threat dynamics in an unfolding debate. *Public Understanding of Science* 23(3): 348–363

Case 23: Thermal comfort behaviours in UK office buildings academic field study



Year-long field study looking at experiences of thermal comfort and thermal comfort adaptations amongst those working in offices at the University of Reading UK, carried out April 2010–April 2011. Short surveys were carried out by the 41 participants 2 days a week verbally with the researcher to determine their level of thermal comfort. In addition to this they were asked about what they were doing to adapt to these temperatures and their clothing level was quantified by the researcher. At the time of the surveys air temperature, humidity, globe temperature & air velocity were also measured.

Liu, J, Yao, R & McCloy, R (2014) An investigation of thermal comfort adaptation behaviour in office buildings in the UK. *Indoor and Built Environment* 2014, Vol. 23(5) 675–691

Case 24: Sentiment analysis of perceptions of the Big Six energy companies by Talkwalker



Sentiment analysis of Twitter carried out by the social data intelligence company Talkwalker to see how the Big Six energy companies were being talked about by users on Twitter, Jan 20th–February 18th 2015. The company also looked at mentions of the Big Six energy companies on consumer forums to get more detailed information, Feb 4th –March 5th 2015. A further analysis of discussions on Twitter and forums about switching energy companies was carried out Jan 20th – Feb 18th 2015. They also identified dominant hashtags from this period which were being used more generally related to discussions about energy.

<http://www.energypost.eu/energy-companies-can-learn-social-media/>

Case 25: Back Balcombe campaign



The community of Balcombe was involved in protesting against a proposed fracking project in their area in 2013, which they won with the support of other protesters and NGOs. With the support of local NGO 10:10 the community then decided to work towards a community-owned solar panel project which could power the whole village in a 'nature friendly' way. A small group of volunteers formed the group 'Repower Balcombe' and were about to buy the lease on the land for the solar farm when the Treasury unexpectedly abolished the subsidy for community energy groups, so the project had to be cancelled. Back Balcombe was the crowd-funding campaign and website which 10:10 launched to allow others to support the community. The solar panel project will still go ahead, with some benefits for the community, but it will be owned and controlled by a commercial developer.

<http://backbalcombe.org/>

Case 26: UK residents' responses to high voltage power lines academic study



Study into UK public preferences for different high voltage pylon designs, as well as broader preferences related to electricity networks, in relation to demographic factors and other personal preferences. The researchers' questions were part of a larger online survey on the topic of energy transmission carried out by YouGov with 1519 participants in January 2012.

Devine-Wright P, Batel S (2013). Explaining public preferences for high voltage power lines: an empirical study of perceived fit in a rural landscape. *Land Use Policy* 31:640-649.

Case 27: Smart Meters, Smart People field study in Northern Ireland



Year-long Smart Meter trail in Northern Ireland carried out by academics at the University of Ulster in partnership with the Utility regulator & some energy companies, of 56 low-income households experiencing fuel poverty. Responding to promotion of smart meters by DECC & the EU aim to have smart meters installed in 80% of households by 2020. Also a response to findings that 42% of households in Northern Ireland are in fuel poverty, and could potentially benefit from improved energy metering.

Liddell, C (2013) Smart Meters, Smart People. University of Ulster

Case 28: Imaginations of low carbon rural futures in English villages academic study



Questionnaire-based study of people's lifestyles and visions of energy and climate futures in four English villages (in Harborough, West Berkshire & East Lindsey), selected to represent different aspects of the rural environment from isolated settlements to the commuter belt. Carried out between October 2011 and May 2012. Part of larger RELU project into rural futures in the UK. 194 participants involved across the four villages. The study found that many participants put forward narratives of stasis rather than transformation, highlighting the multiple challenges faced by the low carbon rural transition talked about in policy documents.

Phillips, M & Dickie, J (2014) Narratives of transition/ non transition towards low carbon futures within English rural communities. *Journal of Rural Studies* 34: 79–95.

Case 29: Community food waste energy production projects in Sheffield and Devon academic study



Study of ongoing attempts to (re)develop or resist energy-from-waste plants in central Sheffield and in Holsworthy, Devon. The Holsworthy plant is currently operational, but heat pumps are underfunded and incomplete. A small local pressure group continues to campaign on issues related to the plant, securing compromise, for example around the use of access roads to the plant. The Holsworthy plant is rarely talked about in broader (national) debates about energy-from-waste, and much information about it is no longer accessible on the internet. The Sheffield plant is much more infamous nationally and was the subject of a high-profile Greenpeace direct action in 2001. The Sheffield plant is operational, but continues to be resisted at a local and national level.

Alexander, C & Reno, J O (2014) From biopower to energopolitics in England's modern waste technology. *Anthropological Quarterly* 87(2): 335–358.

Case 30: Londoners on Bikes



Pop-up cycling campaign in London focussed around mobilising the bike vote for the 2012 mayoral elections. Gained 6644 'sign-ups' and organised several awareness raising events including an intervention in a 'Critical Mass' event, flyer, general meetings, blogging and social media debate. Was seen as successfully influencing mayoral candidates.

Aldred R (2013) Who are Londoners on Bikes and what do they want? Negotiating identity and issue definition in a 'pop-up' cycle campaign. *Journal of Transport Geography* 30: 194–201