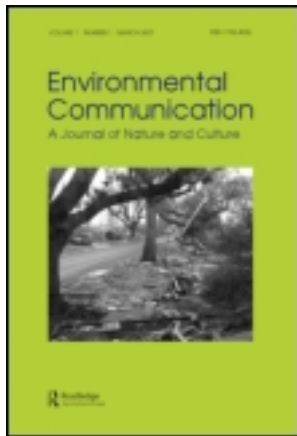


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Energy Futures: Five Dilemmas of the Practice of Anticipatory Governance

Sarah R. Davies & Cynthia Selin

Public participation has become standard practice in both environmental communication and science and technology studies, with such engagement increasingly moving “upstream” to the early stages of technological development. One framework for these activities is anticipatory governance, in which foresight and public and stakeholder engagement are used to reflect on—and direct—the impacts of new technology. In this essay we draw on our experience of anticipatory governance, in the shape of the “NanoFutures” project on energy futures, to present a reflexive analysis of engagement and deliberation. We draw out five tensions of the practice of deliberation on energy technologies. Through tracing the lineages of these dilemmas, we discuss some of the implications of these tensions for the practice of civic engagement and deliberation in a set of questions for this community of practitioner-scholars.

Keywords: Nanotechnology; Energy; Public Participation; Deliberation; Reflexivity; Anticipatory Governance

Environmental communication, Brulle (2010) has argued, should not only—or even primarily—be seen as a one-way, top-down process. To bring about social and environmental change we cannot imagine broader society as a passive recipient of the information communicators provide; instead, publics “should be treated as citizens involved in a mutual dialog” (Brulle, 2010, p. 91). Such an approach is particularly important given the far-reaching effects of the changes in our environment and energy supply that the globe is facing. If, as seems likely, choices made today will reshape the way of life of whole populations tomorrow (Miller, 2009), then there is an urgent need to open up those choices to broad societal debate.

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In the context of environmental communication, public involvement has frequently been focused around the use of particular sites and related to land use controversies such as, for example, decision making about the siting of a dam (Martin, 2007) or of a wind farm (Aitken, 2009). The importance of such participation—as set against top-down models of decision making in which policy or scientific elites impose “expert” choices upon communities—has been established for some time. Webler and Tuler write that:

In decisions that broadly affect the public interest, such as the cleanup of contaminated sites, the siting of unwanted facilities, and watershed and forest management planning, it is now widely accepted that members of the public should be involved. . . . In some cases, simply providing opportunities to comment at public hearings, vote in referenda, or participate as members of an interest group or a social movement satisfies people’s needs to participate. In other instances, more elaborate forms of involvement are necessary. (2002, p. 179)

These comments point to the wealth of literature that exists around the practice of such participatory processes, but also to a degree of controversy surrounding them. When, exactly, are “more elaborate forms of involvement” necessary? Should the “simple provision” of opportunities to comment or be involved in consultation exercises really be understood as participation? While Webler and Tuler (2006) are content to emphasize that, within their theoretical framework for understanding public participation, processes need only be “fair” and “competent,” and that there is flexibility even within these criteria, others have been more critical. Within development studies—another field in which participation has become ubiquitously referenced if variously interpreted—a number of authors have suggested that the move to participation has become a new “tyranny” which simply instigates new patterns of oppression (see Christens & Speer, 2006). In the context of environmental decision-making, increasingly critical analyses have pointed out that participatory processes may shore up existing power structures (Martin, 2007), privilege scientific knowledge (Endres, 2009), reveal significant gaps between rhetoric and practice (Burgess, Harrison, & Filius, 1998), and lay themselves open to manipulation (Niemeyer & Spash, 2001).

Work from science and technology studies (STS) has, in recent years, similarly made the case for a wholesale move toward civic engagement and participation from more “deficit model” approaches (Irwin & Wynne, 1996), as well as having highlighted flawed practices within this move.¹ STS scholars have emphasized the need for democratic engagement with potentially world-shaping technologies at their earliest stages, including emerging technologies which may provide new solutions to contemporary and developing energy crises. Sheila Jasanoff (2003), for example, has convincingly argued that society is in the midst of an era in which radical uncertainties, “normal accidents,” and increasingly powerful technologies call for new forms of technoscientific governance. The issue, she says:

is no longer whether the public should have a say in technical decisions, but how to promote more meaningful interaction among policy-makers, scientific experts, corporate producers, and the public. [. . .] Today, there is a need for “technologies of humility” to complement the predictive approaches: to make apparent the

possibility of unforeseen consequences; to make explicit the normative that lurks within the technical; and to acknowledge from the start the need for plural viewpoints and collective learning. (Jasanoff, 2003, pp. 238–240)

Such calls have been interpreted as a need to govern new technologies in ways which, from their very conception, incorporate non-technical knowledges and values and which will ensure that they are not just scientifically but also socially robust (Guston & Sarewitz, 2002). One framework for doing this is anticipatory governance (Barben, Fisher, Selin, & Guston, 2008). As with more general calls for the “democratization of science” (Wynne, 2005), anticipatory governance emphasizes the need to consider the futures that emerging technologies might lead us to before those futures are actually upon us. Taking the contemporary emergence of nanotechnologies as a case in point, Daniel Barben and colleagues write that this program of building capacity for anticipation “is developed at the interface of and in close interaction with key social processes that underlie research conduct, policy making, public education, and the collective anticipation [of nanotechnologies]” (2008, p. 989). Anticipatory governance is therefore significant in taking a fully integrated approach to technological development, enabling reflection “across a broad front of networks and systems” (Barben et al., 2008) through an ensemble of different activities. While one such focus is public deliberation and discussion (“engagement”), other activities include futuring and scenario-building (“foresight”) and the thoroughgoing “integration” of natural science with social studies, humanities, policy, and civil society. As an ultimate outcome, anticipatory governance seeks to enhance “the ability of a variety of lay and expert stakeholders, both individually and through an array of feedback mechanisms, to collectively imagine, critique, and therefore shape the issues presented by emerging technologies before they become reified in particular ways” (Barben et al., 2008, p. 993).

Anticipatory governance is, then, a significant program which engages with technological futures in a number of different ways, many of which we—the authors—have been involved in. As with those who have organized, analyzed, and critiqued participatory processes in other areas (Chilvers, 2008; Endres, 2009; Martin, 2007), our experiences have been mixed. Our roles double as analysts and instigators of societal deliberation and debate on emerging technologies, and on the one hand we are enthusiastic proponents of civic engagement as a more effective way of enabling shifts in environmental behavior (Brulle, 2010) and, indeed, as a normatively better means of democratic decision making (Fiorino, 1990; Laird, 1993). On the other, as we have sought to carry out such engagement (and related anticipatory activities) we have experienced frustrations, challenges, and tensions, many of which are—we have found—uncharted in the literature. In this essay we therefore draw on our combined experience as practitioners and researchers of processes of anticipatory governance to present something of a meta-analysis. Taking seriously the call for reflexivity the literatures on environmental communication, STS, and anticipatory governance all include, we want to reflect on the challenges which arise as we, as organizer-analysts, become entangled in practices of deliberation and anticipation (cf. Davies, Wetherall, & Barnett, 2006; Goven, 2006).²

In what follows, then, we are seeking to open up a conversation around the tensions and dilemmas of deliberation on the desirability and implications of emerging energy technologies. To do this we start by briefly describing some of the engagement processes we have been involved in, all of which aim, by one means or another, to increase societal capacity for reflection on technological futures. We draw out one case study in particular, the NanoFutures project, to focus on the specificities of energy technologies. The bulk of our discussion is found in the following section, in which we use these experiences to pull out five tensions of deliberation on emerging energy futures. These tensions are not especially theoretical, though we draw on relevant literatures in discussing them. Rather, they are rooted in the experiential and often affective expertise we have developed as practitioners of anticipatory governance—they articulate, in other words, tacit knowledge (Collins, 2001) concerning facilitation, organization, and reportage. As we close we discuss some of the implications of these tensions for the practice of civic engagement and deliberation through a set of questions which aim to stimulate discussion within this community.

Anticipatory Governance in Practice

The experiences on which we will be drawing derive largely from our participation in a National Science Foundation-funded research program, the Center for Nanotechnology in Society at Arizona State University (CNS-ASU). The Center aims, through a number of focused programs of work (including real-time technology assessment, student education, and public outreach), to increase both societal and scientific capacities for anticipatory governance of nanotechnology (the “science of the very small” predicted by some to kickstart a new industrial revolution; NNI, 2009) and other emerging technologies.³ In the paragraphs below we summarize some of the sub-projects on anticipatory governance of nanotechnology we have been involved in through CNS-ASU. Our aim here is not to provide comprehensive assessments of the methods and results of these processes (though such assessments can be located through the references provided), but to give a flavor of the various anticipatory and deliberative experiments we are building our larger analysis upon. We give a fuller account of the final example, the NanoFutures project, as we use this as the focal point of our later discussions.⁴

Anticipatory Governance in Practice: Some Examples

As described above, anticipatory governance involves a range of activities and processes. One CNS-ASU activity, for instance, took the form of a scenario development workshop focused on medical diagnostics and conducted in collaboration with ASU’s Biodesign Institute (Selin, 2007): this involved a three day, highly structured participatory workshop in which a group of scholars and professionals—with expertise ranging from bioethics to natural science and medicine—investigated the broader societal and political implications of diagnostic tools under development in the laboratory (and in particular “Doc in a Box” technologies). The workshop thus

involved the development of scenarios that critically probed the forces that embed, enact, and shape such technologies (see Selin, 2008).

Public events are also important. A recent US trial of the Danish consensus conference model (see Guston, 1999) resulted in the National Citizens Technology Forum (NCTF), a nationwide deliberative process which convened six citizen panels in six cities to discuss the enhancement of human mental, emotional, and physical abilities. The Forum involved both face to face and virtual discussion, including the opportunity to question experts in an online discussion forum, and, in the final stages, asked citizens to make recommendations in a consensus report about the impacts and consequences of human enhancement technologies (Hamlett, Cobb, & Guston, 2008). More broadly, many of CNS-ASU's more informal activities—such as outreach through museums and science centers, education at the K-12 and university levels, and the production of public-facing literature, films and web material—can also be understood as forming part of a suite of anticipatory governance activities which “imagine, critique, and therefore shape the issues presented by emerging technologies” (Barben et al., 2008, p. 993).

The NanoFutures Project

Energy technologies are currently a key focus for CNS-ASU activities, and in particular for research on deliberation and engagement. As part of this work, the NanoFutures project—the case which we will use as a focus for our discussion—has sought to use scenarios to stimulate deliberative discussion of future nano-enabled energy applications and their potential societal implications. NanoFutures, we should be clear, is not an attempt to get the future “right” by predicting the most likely applications of a technology. Instead, this work explores the idea that scenaric thinking can help build a broader social capacity for anticipation (Selin & Hudson, 2010). Work on the NanoFutures project has involved a set of interlocking research engagements designed to enable reflection on plausible new energy technologies in different audiences and to create deliberative spaces for debate on their outcomes and desirability.⁵ As the project develops, it is anticipated that its outputs will be used in museum activities, graduate and undergraduate education, public engagement events, and K-12 education. Previous iterations of the project (focusing on a different technological application area) have been used in all of these fora as well as being taken up within policy and, through a web presence, broader public debate (Selin & Hudson, 2010).

The emphasis within NanoFutures so far has been to create space for stakeholder (i.e., scientists, engineers, social scientists, students, and policy expert) discussion of potential energy futures. This was achieved through the development of brief scenarios of a number of different prospective energy technologies, which then led to stakeholder interviews and a visioning workshop around a single technological focus (“solar to fuel” pathways).

The methods and findings of the NanoFutures project are not the focus of this essay; instead, our aim is to reflect on the practice of deliberative processes rather

more generally. To aid our later discussion, however, it will be helpful to concisely sketch the main themes which emerged in the various NanoFutures research encounters, before using these as a springboard to discuss more general tensions. These encounters were, as we have noted, designed to stimulate discussion of the ways in which energy technologies were likely to develop, including their “barriers and carriers” and pros and cons. The following themes were important in these discussions:

1. Some participants argued that *there are no societal issues connected with energy technologies*: any problems or challenges in their development are purely technical.
2. Others saw *society itself as a problem*. Publics were at times described as holding back the development of new technologies through lack of understanding or not being “bothered” to make inconvenient choices.
3. *Safety, uncertainty, and the possibility of unanticipated (adverse) effects* were central concerns.
4. *Cost and economics* were viewed as vital in dictating how particular energy technologies will develop, leading to discussion of, for instance, the necessity of price engineering.
5. One repeated issue was that of *land and water use*: participants noted that many energy technologies—including solar to fuel, solar power stations, and biodiesel—are land and water intensive, raising questions around ownership, access, and public concern about issues such as biodiversity or protected sites.
6. Finally, participants argued that there is a choice to be made between *a (primarily) centralized and a (primarily) distributed energy network*—each of which entails different assumptions regarding the role and behavior of energy consumers.

These themes clearly provide scope for further deliberative and participatory interrogation of energy technologies: decisions on questions such as the need for carbon taxing and whether to force, enable or discuss behavior change around energy use cannot and should not be made without broad civic engagement. The deliberative processes by which these possibilities were identified, then, should be seen as only the first step in a wider process of public, policy, and stakeholder debate around the directions new energy technologies and their governance should take.

Five Tensions in Deliberating Energy Futures

Anticipatory governance, as we have described it in practice, encompasses a range of different techniques for interrogating the role technology has in society (Barben et al., 2008). Rather than being solely focused on engagement with lay publics—as in discussions of civic engagement or public participation—it involves a suite of mechanisms for voicing diverse perspectives, from interdisciplinary discussion to the development of classroom resources. Many of these mechanisms are driven by what we

might describe as a deliberative impulse—defined in the very broadest terms by Simone Chambers as “a view [of democracy] anchored in conceptions of accountability and discussion” (2003, p. 308). Both the NanoFutures stakeholder workshop and the NCTF, for instance, are structured around the idea that extended conversation about a technology can ultimately lead to “reasonable, well-informed opinions” (Chambers, 2003, p. 309) which will be of use both to decision makers and citizens.

Deliberative theory, however, is somewhat notorious for being rather better defined in ideal-type arguments than it is understood in practice (Davies et al., 2006). (Indeed, we would suggest that many calls for public participation can similarly err toward the glib, with little reflection on the situated nature of participatory practice; see discussions in Christens & Speer, 2006; Cooke & Kothari, 2001; Goven, 2006.) The call for reflexivity which we noted above is therefore doubly important: only assessment of “messy” (Davies et al., 2006) practices of engagement and deliberation will help refine thinking on this move. With this in mind, in this section we discuss our experiences of the challenges of anticipatory governance and, in particular, of deliberation on emerging energy technologies. Drawing out five key tensions, we discuss how these are constituted through the location of energy at the intersection of a particular set of normativities, technologies, and behaviors. In doing this we use the NanoFutures project as our primary case study.

The Invisibility of Emerging Technology

NanoFutures took as its focus emerging energy technologies enabled by nanotechnology: a technoscience which focuses on understanding and manipulating material at the scale of 1–100 nanometers (NNI, 2009). It is what we might call an “invisible” technology—to publics (Peter D. Hart Research Associates, 2009), and even, in a slightly different sense and given its focus on the sub-visual level, to those who study it (Nordmann, 2005). While nanotechnology has become an almost paradigmatic case for anticipatory governance (Barben et al., 2008; Macnaghten, Kearnes, & Wynne, 2005), the literature on how to carry out public engagement with it (and indeed with other emerging technologies that are similarly invisible in most people’s day-to-day experiences) remains under-theorized. Davies, Kearnes, & Macnaghten (2010) have built on analyses of the uniqueness and unfamiliarity of nanotechnology to suggest that there are two key challenges to deliberation on such technologies: problem and stakeholder definition. In other words, how can organizers of deliberative processes frame a problem for diverse actors to discuss when the very nature of emerging technologies means that they are uncertain and intangible and that “issues” remain inchoate (Marres, 2007)? And, similarly, how can deliberation draw in all affected stakeholders when it remains unclear who might be implicated in a technology’s effects and actions? In this context we might compare the drive toward “upstream” engagement and discussion noted earlier with NanoFutures participants’ concerns regarding the uncertain effects of energy technologies: the tension here is between the need for early discussion of world-shaping technologies and their as-yet unknown impacts.

These were certainly issues within NanoFutures. We were interested in discussing the material consequences of emerging energy technologies: this, we found, was difficult given the complex nature of such technologies and their upstream position. In the interviews and workshop, for example, discussion was at times laborious because many participants had not heard of—and did not fully understand—solar to fuel technologies. While we, alongside our stakeholder partners, were keen to discuss how best these technologies could be developed in ways that were socially robust and sensitive to a broad range of societal values, in practice this aim frequently foundered because the only language available to scientific experts was that of technical development (rather than application, outcomes, or effects). If anticipatory governance and related forms of civic environmental engagement seek to enable discussion of societal implications of technologies before their trajectories become fixed, practitioners of these processes need to consider how to make the unfamiliar and uncertain visible.

The Invisibility of Energy

In addition, in NanoFutures we were dealing with technologies rendered intangible not just by their “blue sky” nature but also by their constitution as technologies which captured, transformed, or distributed energy. Here, then, there is a key difference to deliberation on, say, upstream medical or communication technologies: most people—lay or technically expert—have direct and immediate contact with health care and communications. Such technologies are tangible, immediate. Even where they are still at a highly upstream stage—such as the “Doc in a Box” technology discussed in the Medical Diagnostics workshop—their potential effects clearly impinge on familiar everyday experiences or explicit value systems. Our experiences with NanoFutures scene development and in the interviews and workshop convinced us that we and others were not simply struggling to think through the implications of energy technologies because of their upstream and highly technical nature; rather, energy itself was particularly slippery to grasp hold of. This point emerged explicitly within the workshop discussions, with participants pointing out that while those who carry their own firewood and fetch their own water are acutely aware of their energy use, to many in the global north energy has, through an extended social and historical process, become invisible. It is negotiated through diffuse infrastructures and taken-for-granted behaviors (such as going to the gas station) which render it invisible and—when it comes to reflecting on its future forms—fundamentally elusive.

While this invisibility is, of course, in practice patchy, with some acutely aware of their energy behaviors and costs, we would suggest that such awareness is an achievement against a weight of socio-technical history to which many of us are entirely blind. We should also differentiate here between energy on a global scale, around which increasingly familiar discourses of disaster, shortage, and risk have been emerging since the 1970s (Beck, 1992; Illich, 1973), and energy on a mundane, everyday level. There can only be a limited number who are unaware of the

potentially cataclysmic effects of climate change—even if it is only as a rejection of its human causation or through films such as *The Day After Tomorrow*—but few of us grasp the intimate ways in which energy use has shaped our cities, homes, and day-to-day lives. As a result, it is difficult to imagine how our lives might change in tandem with emergent energy systems. This invisibility of energy in everyday life is also affirmed by the challenges of changing energy behaviors. Even when information and incentives are provided, engrained patterns of day-to-day behavior tend to have a high degree of obduracy (Abrahamse, Steg, Vlek, & Rothengatter, 2005). Deliberation on energy technologies, then, will always have an extra barrier to overcome in making taken-for-granted networks and behaviors visible and thus open for discussion.

The Flexibility of “Social Issues”

The first two tensions we have described relate to the intangibility of energy infrastructure, in terms of the increasingly abstract science which underpins it and its taken-for-granted materialization within everyday life. The third challenge for deliberating emerging energy futures relates instead to the diffuse, readily unfocused nature of that deliberation itself. In particular, we would suggest that deliberation of societal effects and impacts can in practice be especially difficult, largely because the category of the “social”—as opposed to the scientific or technical—can mean very different things to different people. In the context of NanoFutures, our aim—to enable discussion of the implications of new energy technologies—was continually open to re-negotiation because the nature of “social issues” was flexibly interpreted by our stakeholder participants.

This is perhaps demonstrated most effectively by returning to the range of responses elicited from participants on “social issues” new energy technologies might present (of which there is a summary in the brief project description above). Societal implications raised by participants included everything from the scientific development of a technology to potential land use controversies. One response to a scene based on photovoltaics (PV) technology, for example, suggested that a “societal issue” was that “Si-based PV technologies have a 20 year lifetime . . . Organic-based technologies will have a hard time to compete and show similar robustness”. Similarly, one interviewee argued that the “challenges are [solely] technical,” while others suggested that the only societal implication new energy technologies present is the challenge of gaining public acceptance. From our perspective—as social scientists interested in understanding the radical changes potentially influential technologies may have on global societies—it seemed that important questions were often occluded because the notion of societal implications is flexible enough to be interpreted in whatever manner participants wish. If they were interested in thinking about technical development independently of any social context, or see society merely as a problem to be overcome (the challenge of “public acceptance” noted by several participants), then these meanings could certainly be mapped onto the term.

This diversity of meaning is in many ways positive: one of the central tenets of deliberative theory is that diverse perspectives should be brought to the table and different meanings opened up for discussion (Dryzek, 2000). But we have been made acutely aware of two practical implications of this flexibility of the “social.” The first is that different assumptions of what societal implications are or should be—technical challenges, gaining public acceptance, thinking about potential impacts on everyday life—are generally implicit rather than explicit, in practice lending themselves to conversation at cross purposes rather than deliberative discussion. Second, the context of STS work on deliberation on science and technology is important here: such work has repeatedly shown that scientific and technical perspectives are not only understood as carrying more weight than those of other stakeholders (Elam & Bertilsson, 2002) but that they have a tendency to ignore wider but essential contexts (Wynne, 1993). When a technical expert suggests, in a deliberative forum, that the key societal implication of an energy technology is simply “production cost,” their opinion is likely to be influential despite the fact that other perspectives might be valuable. (What makes something too expensive? Who will be able to access new technologies? Are there other costs outside of the economic?) Instrumentally, then, we would suggest that the flexibility of “social issues” as a focus of deliberative discussion may work to close down debate and ultimately result in “sociologically naïve” technologies (Irwin & Wynne, 1996).

The “Brilliance” of Sustainable Energy

If one of the challenges we have discussed relates to the “taken-for-granted-ness” of energy infrastructures and technologies in many North American’s lives, another stems from a similar taken-for-granted-ness of particular arguments employed in conversation on these issues. In particular there is a sense that, as one interview participant noted, “it’s hard to look past the ‘great-ness’ of green fuels [and similar technologies]” as solutions to the looming threat of climate change.

Our suggestion here is that the sense of urgency around energy transitions is so strong that technologies which are framed as aiding such transitions become “inarguables”: their benefits are seen as undeniable and as automatically far outweighing any potential concerns around their wider implications, dilemmas, opportunities or disadvantages. In brief, the automatic response to a “green” technology becomes: that’s brilliant! In our fieldnotes on the NanoFutures data we also refer to this effect as the use of “climate change as trump card” arguments. Climate change (in particular, though it is discussed in tandem with other encroaching crises such as energy insecurity, overpopulation and peak oil) is constructed as an impetus for the realization of new energy technologies which drives all before it. The result is a context for discussion in which climate change effectively trumps any other arguments or concerns: as one workshop participant said, “to me the whole social thing is saving the planet”. Or, again, “mankind may not have too many other choices.”

In noting this effect we are not denying that the global situation around climate change is, indeed, urgent: our own commitments are toward the need for dramatic changes in energy uses and behaviors. Rather, our point is that this shared sense of urgency inevitably shapes discussion of emerging energy technologies, and tends to crowd out space for imaginations of the detailed material consequences of those technologies. This became particularly apparent at the end of the NanoFutures workshop, after a wide-ranging conversation about the effects of climate change and the policy impacts this would have. One participant commented:

I'm very struck by this idea that we're going to start to have draconian [policy actions], whereas some of us are asking how can we most ethically site solar power plants. Maybe we're not giving enough consideration to the time issue. Maybe we need to start saying, okay tortoises [*laughs*] along you go.

The speaker is a social scientist who researches land use controversies and who is currently looking at a case study around the siting of a solar power plant; the site is controversial, in part, because of the presence of a particular breed of tortoise. Her point is that these concerns are, perhaps, merely a re-arrangement of deckchairs on the Titanic—that such small-scale consequences of new energy technologies should simply be ignored in order to deal with larger-scale effects. Here, as at other points in the workshop conversation, a sense of impending disaster directed conversation away from the implications of technology for everyday life toward discussion of what will happen if change is *not* achieved.

Should we care about the tortoises—and, by extension, other relatively small-scale public concerns or values? We are unclear about the correct answer to this question. But in contexts in which the aim is to deliberate the wider societal implications of energy technology, it seems that those who can portray such technology as mitigating the effects of climate change (or similarly catastrophic developments) have an automatic and overwhelming rhetorical advantage which may, in fact, act against the full discussion of such implications.

A further example of this effect can be drawn from current discussion of geoengineering (the “deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change,” Royal Society, 2009, p. 1). As a recent report from the UK's Royal Society argues, much of the contemporary debate on geoengineering technologies—which includes suggested techniques such as artificial carbon sinks and the use of stratospheric aerosols to increase the earth's reflectivity—construes the dangers of climate change as so urgent that untested technological fixes are framed as the only possible response (Royal Society, 2009). In this case, again, climate change appears to function rhetorically in a manner that can make deliberation difficult.

Competing Normativities

Finally, one further tension emerged within NanoFutures and similar projects. We have summed this up as the presence of competing normativities, or instances where

firmly held values or principles oppose each other. The difference between this and theoretical models of deliberation—in which the expectation is that diverse actors will articulate different and at times competing perspectives on an issue (Dryzek, 2000)—is that, in our experience, such competing values can be held by one individual. In particular, our analysis has pointed to participants' (and indeed our own) struggle between commitments to both the urgent need for action on climate change and to the empowerment of lay publics through “bottom-up” democratic processes. What happens when—as was frequently asserted in the data—publics simply do not wish to respond to the threat of climate change or to change their behaviors around energy?

The answer to this was never articulated. Instead we see in the data frequent references to both of these commitments, often by the same individuals. Thus, as we have described, the problematic knowledge and behaviors of wider society was a common reference point: the public variously require educating, convincing, and persuasion; “can't be bothered” to change their energy use; and are the prey of “sensationalist” media. Overall there is the sense of a recalcitrant, environmentally naïve mass, whose knowledge, attitudes and behaviors need urgently to alter given the context of climate change. (At one stage in the workshop one break-out group suggested, only partly tongue in cheek, that what was needed was a dictatorship to control and reconfigure US public behaviors around energy use.) At the same time, however, there was an overt and self-conscious move away from the language of education and of “arrogant” technology. One participant emphatically argued that the public should *not* be seen as a problem, but that technologies and lay behavior should co-evolve, while others cited the need for a “level playing field” and for publics to participate in energy policy making.

This tension hinges, then, upon the character of the public. Are they a feckless mass whose actions must be changed, or responsible stakeholders who should be consulted? Outside of the NanoFutures context, this is at least in part a research question (Devine-Wright, 2007). But the wider dilemma—and challenge to the deliberative process—remains. Does the urgency of climate change trump any normative commitments to civic engagement? Or is there a way for environmental communication to acknowledge both the challenges that face the planet and the democratic necessity of reflexive public deliberation (Brulle, 2010)?

To summarize: we have charted five key tensions which have emerged in our practice of anticipatory governance of emerging technologies. These dilemmas are tied to deliberation of upstream, “invisible” technologies such as nanotechnology; to discussions of energy uses and behaviors so firmly embedded in the contemporary infrastructures of the global North that they require effort to make them visible; to the multiple meanings that “social issues” encompass; to the way in which environmental problems are construed as so urgent that they can quash in-depth discussion of the implications of energy technologies; and, finally, to the sense that deliberation can readily become a site in which competing normativities are conjoined. Though we have used a specific anticipatory process, the NanoFutures project, as a case study for discussing these dilemmas, our experience has been that

they have much wider applicability. They are, we suggest, part of the inherent imperfection and messiness of deliberative engagement.

Conclusion

This essay has offered a brief survey both of a set of activities which make up “anticipatory governance”—from a large-scale public engagement process to the focused stakeholder discussion of the NanoFutures project—and of our experiences in carrying out those activities. What implications do these reflections have for wider worlds of practice and analysis of environmental communication and engagement?

Perhaps the primary role of our discussion has been to raise new sets of questions, most of which have not been addressed in the different literatures we have referred to but which are, we believe, pressing, given increasing moves to integrate engagement and deliberation into political processes (Brulle, 2010; Macnaghten et al., 2005; Webler & Tuler, 2002). The five tensions we have described all raise challenges for the practice of anticipatory governance, deliberation, and civic engagement. In the paragraphs below we summarize these challenges in five key questions we believe the wider community should engage with, and reflect on our own initial responses to them.

Firstly, then, what innovations are needed within methodologies of engagement to better make visible complex, speculative technologies? This relates, of course, to our experience of working with “invisible” emerging technologies such as nanotechnology. As thinking on upstream engagement (Macnaghten et al., 2005) and anticipatory governance (Barben et al., 2008) becomes more entrenched within policy on energy, the environment, and science, this challenge is only going to become more pertinent. Lay publics, stakeholder groups, and even scientists all struggle to visualize and debate the concrete effects of new technology when it is at the “blue-sky” research stage. If such debate is to be productive, we would suggest that new kinds of experimentation are necessary for dealing with upstream research: the use of scenarios which embed a technology into a potential social context, for instance, or the production of graphics depicting possible technological trajectories. Selin and Boradkar (2010) have explored the use of prototypes as pedagogic tools to bring to light the societal dimensions of emerging technologies. Such approaches may, we speculate, help both to introduce complex technologies to participants and to draw out their applications.

Similarly, we also want to raise the question of *how we might open up implicit materialities of energy use*. This move will involve making visible taken for granted energy infrastructures and behaviors, allowing discussants to ask whether other ways of using electricity or gasoline, say, are possible. Our sense is that this may require creative incursions into everyday experience which shock or surprise, producing revelatory experiences that life could in fact be lived differently. As one example of how this might be achieved, we might take the work of the filmmaker and media scholar Ashley Perry,⁶ who creates images and short films which depict the “carlands” of contemporary Melbourne. By recording the mundane geographies of travel—motorway bridges, abandoned cars, traffic light patterns—he calls attention to the

sheer time we lavish on car-based journeys and opens up questions about the way of life which is engineered into freeway-garnished, public transport-lacking cities. As he does so, we are invited to speculate as to whether other modes of travel could be possible and—in the context of deliberation on technological futures—how technology could enable these possibilities.

Our third challenge relates to the difficulties of deliberation in which meanings—such as of “societal implications”—are profoundly flexible. From this, we ask: *how can meanings be opened up and debated in ways that do not privilege already powerful groups?* Or, in other words, how can we enable both clear communication and equitable debate? As with the first two questions, part of the answer to this, we would suggest, is innovation in methodology and practice. Organizers of engagement and deliberation should be aware that meanings of familiar terms are likely to be contested by different actors but that this contestation may not be overt. Skill is therefore required in encouraging discussion of these meanings; moreover, such discussion should seek to include many different perspectives and voices (Rip, 1986). One application for ourselves, then, is that deliberation is most likely to include such diverse voices when it is open to public as well as “expert” groups. In the context of NanoFutures, it is possible that having a lay presence would have allowed greater discussion of the assessment that “there are no societal issues” to energy technologies, for instance.

Our final two questions relate to one another. In response to tensions around the rhetorical power of energy crises and between commitments to both civic engagement and the necessity of behavior change, we ask: *Is it possible to engage both with the urgency of climate change and the possibility of catastrophe on the global level and with public concerns at the level of the small-scale and local?* And: *What should our own commitments be within contexts where public debate leads not to change but to the maintenance of ways of life which seem to us environmentally dangerous?* Both questions speak to our own normativities and commitments as researchers, and they are the ones we find most difficult to answer. They also open up a broader question of whether there are limits to the value of deliberation. Our sense is that it will always be difficult to provide comprehensive answers to these loaded—even troubling—points of debate. As questions, they emerged from our experiences of a particular set of deliberative experiments. Their answers may also require grounding in specific contexts—and, indeed, in the beliefs of individual researchers and practitioners.

In one sense all five of these questions call for further research on stakeholder engagement and for a better understanding of the relationships between public and expert knowledges, attitudes and behaviors in the context of deliberation (Devine-Wright, 2007). But we would also suggest that they require recognition, and an opening up for debate, within the community of those who carry out and research environmental communication and engagement. Our aim in this essay has thus been to start a conversation around the practice of anticipatory governance, deliberation on energy, and our own role as practitioners and scholars within these.

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Notes

- [1] There are, of course, overlaps with other literatures, of which that around risk communication is a key example given that many of the same discussions (one way communication versus dialogue, the role and interests of public groups) are currently occurring (see Besley & Tanner, 2011).
- [2] We use a number of terms to refer to these practices, largely because the literatures we are drawing on are similarly profligate (see Davies, 2009). Brulle (2010) uses the term “civic engagement” to refer to “participation in collective decision-making processes” (p. 84) in the context of environmental communication; “public participation” is used in much the same way (Webler & Tuler, 2002). “Deliberation” should be seen as the fount from which this movement ultimately springs, given that theories of deliberative democracy—including deliberation between stakeholders as well as that involving lay public actors—have provided the impetus for a turn to participation in a number of different fields (Chambers, 2003). Anticipatory governance, as we have discussed, encompasses a rather broader range of activities, all of which aim to enhance societal reflection on technological futures (Barben et al., 2008). It therefore includes both stakeholder and public deliberation, as well as activities such as lab interventions (Schuurbiers & Fisher, 2009) and foresight (Selin, 2007).
- [3] See www.cns.asu.edu for further information on CNS-ASU.
- [4] The projects we describe have all been located in the US. Our analysis therefore focuses on this context. While there will be some similarities with deliberation in, for instance, Europe or the global South, our sense is that different cultural and national contexts will produce different kinds of tensions and dilemmas.
- [5] The NanoFutures project aimed to understand the directions emerging energy technologies are taking and to consider the social implications of these directions in ways that can be used to feed into broader scientific and public debate. NanoFutures thus sought to populate the landscape of emerging energy technologies—to ask not just what particular technologies are being developed, but to examine how they might be received and alter lived experience. Beginning with the articulation of a number of nanotechnological applications likely to impact the energy sector, we followed a vetting procedure (Selin & Hudson, 2010) to establish the plausibility of each emerging technology before honing in on “solar to fuel” technology as a focus for exploring key uncertainties and concerns. These research engagements took place in three phases:

Scene development. Short vignettes of possible nanotechnological futures (“scenes”) were developed based on a review of the literature on nanotechnologies and the energy sector. The final scenes were the products of an extensive vetting procedure, involving identifying relevant experts through bibliometric studies and running a survey (asking closed and open ended questions about the scene’s technical plausibility, whether it captured the key issues at stake, and what its social implications might be) to assess plausibility.

Stakeholder interviews. We then focused in on one energy application currently in development at Arizona State University, solar to fuels technologies. This was the focus of an interdisciplinary workshop (see below); prior to this workshop, we carried out 15 semi-structured interviews with participants and others with related research interests.

Solar to fuels workshop. A half-day workshop was convened between key local actors—including scientists, policy experts, engineers, those with a technology transfer role, and

social scientists—in emerging “solar to fuel” technologies (which aim to enable the production of fungible fuels from sunlight and accessible and sustainable raw materials). Solar to fuel systems are at the earliest stages of technological development, with many of the potential technical pathways involved not yet fully understood. The workshop brought together researchers of these pathways and of related technological platforms (such as PV) with those with research interests in energy and society, and sought to develop a deliberative conversation around the technology’s implications and realization. The workshop was written up as a public report (Davies et al., 2010).

[6] See <http://vimeo.com/user1631907>.

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