

Technological Transitions and Public Engagement: Competing Visions of a Hydrogen Fuel Station

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1. Introduction

Over the last five years a new body of literature has attempted to shift away from assessing the ‘impacts’ of technologies to highlight the multi-actor informed possibilities and constraints for socially shaping systemic technological transitions (TT), involving multiple issues at multiple levels (see for example Geels, 2004; Elzen et al, 2004). Although we are sympathetic to TT approaches and their illumination of the possibilities for broadening ‘participation’ in ‘managing’ technological transitions, such approaches say relatively little about the wider role of ‘publics’ in transitions, the places in which transitions take place and the role of different social interests in shaping the production of societal visions and technological expectations.

Our concerns, and motivation for writing this chapter, are therefore primarily threefold. First, even though TT is concerned with understanding (and with shaping) systemic transitions in the socio-technical organisation of large scale systems and infrastructures the approach has a relatively narrow conception of users that focuses on the users of the approach and policy makers. The role of publics and wider societal engagement is not systemically considered within an approach that would often require ‘publics’ involvement in transitions. Second, the technological transitions approach is largely agnostic about place and scale. While the niche is assumed to be a site of demonstration there is a lack of specificity about where the landscape and regime may be located. At best it is ambiguous about the role of the local, urban and regional, national and international. This is odd in an approach that has to deal with the local demonstration that is then developed – out there – through the system. Finally the approach does not adequately develop an understanding of the power

relations and asymmetries in the development of what are claimed to be wider societal visions and socio-technical expectations of technological transitions. Critically we need an understanding of whose visions are normalised, an assessment of the resonances and dissonances between different social interests' visions, and the power of a vision in overcoming resistance and barriers to transition pathways.

But if we are to move the debate forward we want to constructively engage with these issues through the development of an approach through which we can more productively analyse social-technical innovation, publics, place and power. In this chapter we therefore critically assess and positively contribute to wider debates around technological transitions by developing a framework through which 'public engagement' in local contexts can be connected to TT debates. In 'operationalising' this framework, we analyse BP's attempts to locate a hydrogen fuel station in Hornchurch, east London¹. Here we address the interplay between 'public engagement', technological development and the local context of its (non-)appropriation. The context within which we address the fuel station case is one in which the dominant discourse of 'downstream' 'risks' and 'impacts' in technology assessment, which has been dominant for many decades, is being challenged from a number of perspectives (see, for e.g. Schot and Rip, 1997; Wynne, 2005).

The rest of this chapter is structured in 4 sections. Section 2 considers disconnections between publics, place and power in conventional TT and in response develops an alternative framework for analysing technological transitions. Section 3 further develops this framework by operationalising it within and through a case study of socio-technical innovation involving publics, place and power in the development of the Hornchurch hydrogen fuelling station. Section 4 concludes by considering the implications of this approach for TT and by briefly summarising the research implication of this framework.

2. Disconnections of Transitions, 'Publics', Place and Power

Technological transitions and managing transitions approaches (Geels, 2004; 2002; Elzen et al, 2004; Rotmans et al, 2001) have developed a multi-actor, multi-factor, multi-level framework for exploring and interrogating socio-technical *systems* and in

understanding the possibilities and constraints on systemic transitions. A key feature of the technological transitions literature is the development of a long-term ‘vision’ which informs the formulation of short-term objectives and underpins evaluation of existing policy. In transitions approaches, the production of visions is an important participatory process used to engage, inspire and mobilise social actors. As part of a long-term process transition, visions and the goals encapsulated in them are subject to evaluation and modification over time (Rotmans et al, 2001).

There are, however, difficulties with this particular conceptualisation of a vision (see Berkhout et al, 2003). For instance there remain questions about ‘who’ becomes involved in producing transitions’ approaches normative visions. The processes through which visions are produced requires a focus on ‘whose’ views inform such visions, and importantly ‘who’ is excluded, underpinned by what forms of expectations and aspirations as well as resources, through what mechanisms or foras were they negotiated, with what forms of dissent and compromise? This, then, relates to what is often seen as a shortcoming of transitions approaches – the motivations, negotiations and unfolding aspects of actors in transitions – even amongst key transitions authors (Rotmans et al, 2001, p.15).

Yet transitions approaches, however, do not explicitly say an awful lot about the role of ‘the public’. As transitions approaches are predicated on multi-actor, multi-factor and multi-level aspects (Elzen et al, 2004) this is undoubtedly an important but challenging issue to address. Often when this ‘gap’ is noted and flagged-up by transitions researchers it is in terms of developing the transitions research agenda around understanding of the role of ‘users’ (Elzen et al, 2004) and moves to ‘explicitly incorporate the user side in the analysis’ of technological change (Geels, 2004, p. 897). There has also been acknowledgement of the desirability of a focus on aspects of ‘consumption and ways of life’ (Elzen et al, 2004, p.283). A key figure in TT approaches, Frank Geels (2004, p.901), acknowledges that ‘[t]echno-scientific knowledge has become more distributed over a widening range of actors (universities, laboratories, consultancies, R&D units in firms)’, that ‘[c]ultural appropriation of technologies is part of consumption’ (Geels, 2004, p.902), but that ‘in many studies, markets and users are simply assumed to be “out there”’ (Geels, 2004, p.902) and that

it therefore necessary that we must pay more attention to interactions between actors (Geels, 2002).

But when we start to think about interactions between actors, the existing notion of 'users' is far too narrow. Critical to an understanding of systemic innovation and the possibility through transitions to fundamental shifts in the ways in which 'publics' conduct their everyday life, are questions about who, when, how, on what terms and in what ways 'publics' become involved in transitions. TT imply significant shifts in the relationships between technology and society, and consequently the politics of how technological change is managed (Schot and Rip, 1997), in the widest sense of that term.

When addressing the challenges and consequences faced by, for example, systemic change in energy, water and mobility systems, Constructive Technology Assessment (CTA) an approach closely linked to transitions approaches, offers some pointers as to how we might think about the role of 'publics (see Schot and Rip, 1997; Schot, 2001; Genus, 2006),'.

Rather than 'assessing' 'black-boxed' technologies in terms of their 'impacts', CTA broadens out the assessment of technologies to focus on the design of technological developments and the 'participation' of non-technical experts in shaping technological development. This broadening of participants in technological development projects and the aspirations for dialogue should be viewed in the context of wider debates in recent decades around the 'decline' of trust in expert knowledge (e.g. Beck et al, 1994) and with the deficiencies of what has been termed the 'deficit model' (Wynne, 1991) of the process of one-way expert-public science and technology communication predicated on notions of an ignorant public.

The move CTA makes is to bring technology developers together with 'interested parties' of policymakers, users and citizens to become involved in the design process. By contrast to traditional technology assessment approaches, which focus on the 'impact' of technologies, there is an important role for human agency across a range of interested parties. In particular there is an emphasis on the anticipations of the future consequences of technologies with the assumption that this encapsulates the

values and interests of social actors from various different perspectives. These anticipations may be subject to change as part of an unfolding process and, thus, the reflexivity of various social actors becomes an important facet of CTA approaches, as does the interactions between social actors which underpin this and consequent social learning. Processually, there is an ongoing modulation of demand and supply issues through the interests of different social actors. In this respect there is not just an important contribution in terms of initial phases of design but also through demonstration projects and ongoing processes of social learning.

Through taking a focus on an unfolding assessment of technologies through dialogue and interaction, CTA draws on various methods which are not specific to CTA, including: consensus conferences, scenario workshops, electronic consultation, public inquiries and citizens juries (Genus, 2006, p.14). In short:

A basic tenet of CTA is that the design of technological development should be a broader, interactive process including a variety of societal actors in addition to technical experts. The effect of broadening the design process is that the designers', users', citizens' and policymakers' ideas and values are articulated quite early, and are negotiated and renegotiated throughout the course of the technology development process (which is itself a process of constant design and redesign). This will counteract the prevalent tendency to organize technology development in a basically linear fashion (from development, to market introduction, to regulation) and will allow for more continuous evaluation and modification of new technologies in the making (Schot, 2001, p.41).

CTA undoubtedly has aspirations to move on from what Johan Schot suggests is the 'the current patten of technology management...[which] is to sponsor development and regulate application' (Schot, 2001, p.40). There are also significant potential benefits of debate, dialogue and the development of more 'socially robust' knowledge prior to the development of physical infrastructures and their associated sunk costs.

CTA does offer some significant and important insights that could begin to re-populate TT approaches with its missing publics. But there are also four issues raised by CTA researchers that mean we cannot simply and uncritically import this approach into TT.

First whilst CTA broadens out the possibilities to ‘participate’ in technology design this usually takes place after the decision to develop a technology has been made and, as such, focuses on the design of technology rather than issues of purpose prior to the business decision.

Second, this begins to make visible hidden aspects of power relationships and structural concerns including issues of ‘access’ and resources (Genus and Coles, 2005) and, in particular, asks questions about who frames what, in CTA terms, is a focus on technology development?

Third, if there needs to be a focus on who frames an issue there are also necessary concerns about what their expectations are and for what purpose is an issue framed in a particular way.

Finally, there is importance in analysing the methods and processes through which these expectations are translated into action and through which attempts are made to engage others in negotiating and renegotiating expectations through processes of ‘engagement’ and ‘participation’.

Consequently we argue that if we are to develop an approach to TT that takes publics seriously then it is critical that we address the following four issues:

- The role of publics in framing visions of the future through technologically-informed change before they are closed.
- The issue of who frames visions of the future and with what expectations?
- The ‘engagement’ or ‘participation’ processes and methods in negotiating and renegotiating the future.
- The analysis of the relationship between vision and actuality and the lessons we can draw from this.

3. Competing Visions of a Hydrogen Fuel Station: Developing and Demonstrating a Research Framework

These four issues are now addressed by developing a framework for analysing the role of ‘publics’ in framing and translating into action technologically-informed visions of the future. We do this through developing the framework through a case study of the Clean Urban Transport for Europe (CUTE) initiative and a related hydrogen fuel station development in Hornchurch, east Londonⁱⁱ.

a) Framing a Vision of the Future

CTA highlights the critical importance of human agency, contingency and the possibilities of socially shaping technologies (Williams and Edge, 2000 [1996]; Mackenzie and Wajcman, 1999). But by focusing on the design of technologies after the business or policy decision has been taken to develop them, CTA then frames (see Goffman, 1974) technology development as ‘designing in action’ rather than addressing issues of the purpose of technological development (Wynne, 2005). Our argument is that in view of the challenges to the legitimacy of expert knowledge and the increasingly porous boundaries of scientific and technological knowledge production, the aspirations of CTA, whilst laudable aspirations, do not go far enough. Or to be more specific, they do not go far enough ‘upstream’ (see Wilsdon and Willis, 2004).

CTA in questioning the focus of technology assessment on ‘impacts’ does seemingly move some way upstream yet, through neglecting issues of purpose, still ultimately takes a focus on assessing impacts of technologies (see Wynne, 2005). Brian Wynne has pointed out that in terms of what is frequently claimed to be upstream engagement ‘this radical apparent potential is compromised by deeper, less manifest cultural assumptions and commitments framing most such initiatives, and that these problematic foundations have yet to be identified, confronted and changed’ (Wynne, 2005, pp.66-67). The key point for us here, if we think about Wynne’s argument which he makes in the context of the upsurge in contemporary ‘participatory’ initiatives, is in terms of the ways in which CTA encourages dialogue after the business or policy decision has been made, which crucially:

‘reflects an assumption that the public meanings, or issue definitions, are naturally and properly the sovereign domain of authoritative expert institutions, and that citizens have no capability or proper role in autonomously creating and negotiating such collective, and potentially more diverse, public meanings’ (Wynne, 2005, p.67).

If one thinks back to the guiding normative visions fundamental to the iterative process of steering transitions, this then suggests that diverse public meanings may be framed-out or closed-down at the earliest ‘upstream’ stages of the production of visions (Stirling, 2005). This is important as visions are important media in mobilising and shaping expectations and commitment around transitions (see Russell and Williams, 2002, p.60).

Visions have been used in the Science and Technology Studies literature to offer prospective views on the form, features, functions and benefits of technologies in relation to domains of application. In this sense, visions articulated at an early stage of development can be viewed as highly aspirational and be seen largely in terms of their symbolic representational articulation of a future rather than a material one (although this is not to neglect the material production and media of communication of the vision). In this respect visions are ‘culturally anchored’ (Borup et al, 2006) and offer particular characterisations of the future from the present, often invoking particular attributions of the past. The purpose of these visions and the goals they outline provide a focus through which networks can be built, gaining commitments to ‘participate’, orientating the actions of potential participants and constituencies, and in persuading potential participants of the desirability of transition (see Russell and Williams, 2002, pp.60-1). Although visions are not fixed and will change over time with the variety of social interests who become involved, the key point is that there is an issue of whether visions are initially articulated around narrow self-interests rather than in terms of a broader sense of societal purpose. There is, thus, a crucial issue of who, or which social interests, produce these early visions of the future and with what expectations?

To take the example of the CUTE initiative, the vision of the future initially developed was that from 2001 a ‘public-private partnership’ of multinational

corporations and supranational political interests would develop a project in which there would be demonstrations, over two years, of 27 fuel cell powered buses in nine European cities (Amsterdam, Barcelona, Hamburg, London, Luxembourg, Madrid, Porto, Stockholm and Stuttgart). Though the project was a two year initiative this needs to be couched in the 'evaluation' of the buses being part of a 'long-term' multinational capital and supranational political vision of the future as encompassing some sort of shift to an alternative fuel and transportation system.

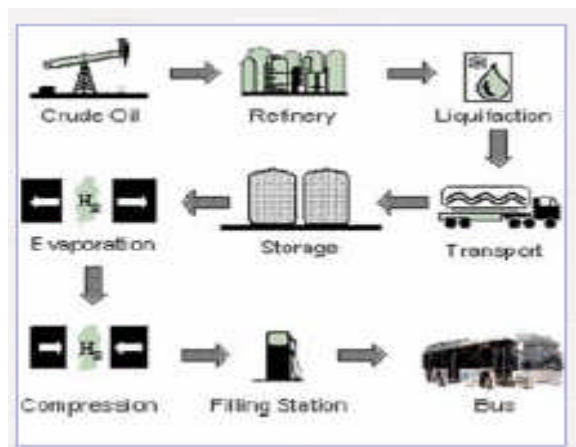
The objectives of the vision were:

- 'To illustrate the large spectrum of different operating conditions [for fuel cell buses] to be found in Europe';
- To assess the 'design, construction and operation of the necessary infrastructure for hydrogen production and refuelling stations',
- There was a focus on the: 'collection of findings concerning safety, standardisation and operating behaviour of production for mobile and stationary use, and exchange of experiences including bus operation under differing conditions among the numerous participating companies for replication',
- Further objectives included an: 'ecological, technical and economical analysis of the entire life cycle and comparison with conventional alternatives' and the 'quantification of the abatement of CO₂ at European level and contribution to commitments of Kyoto' as well as 'investigating the acceptance of these vehicles' (European Commission, undated, p.2).

The initiative was part-funded by the European Commission, through its Directorate-General for Energy and Transport (DG TREN), to the tune of around €21 million of a total of €60 million. The remainder of the funding came from the partnership. The network built around the initiative was brought together by Daimler-Chrysler, included a central role for the energy provider BP and to varying degrees 'more than 40 organisations throughout Europe and the rest of the world are now involved in the project' (European Commission, undated, p.4) .This included local networks of transport providers, energy suppliers, political supporters etc.

The London project, as one of the nine demonstrations, commenced in 2003 and involved a network including Daimler-Chrysler, BP, BOC, Transport for London, London Buses with First Group as the bus operator and the Energy Savings Trust. A key issue in the CUTE project was the relationship between the functioning of the fuel cell buses and associated infrastructure development. This emphasis on configurations of technologies to be ‘tested’ is captured in the project’s representation of the relationship between technologies and local context (see Diagram One), where London was seen as a site within which these technologies could be ‘dropped-in’, ‘tested-out’ and ‘performance data’ extracted to inform subsequent iterations of technology development.

Diagram One: Representing the CUTE Project in London



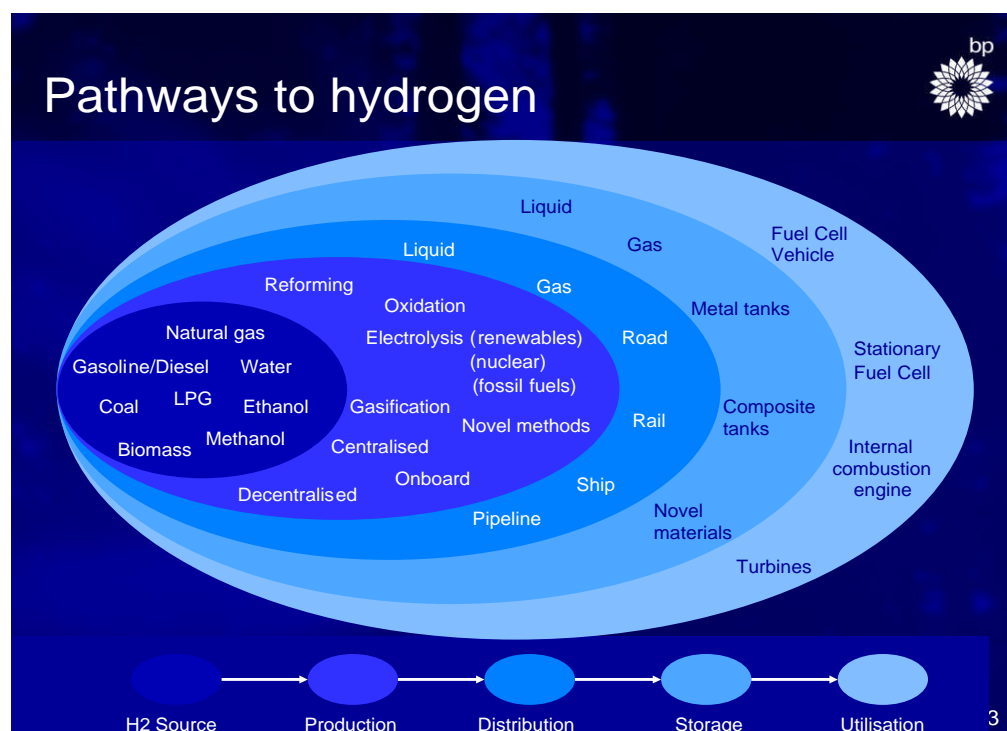
Source: European Commission (Undated).

The development of an associated infrastructure was critical to the vision of the CUTE project. In this respect there was a key role for BP in addressing hydrogen fuel station development, which was characterised in the vision as:

‘identifying the most efficient and effective pathways to the Hydrogen Economy. At this stage we don’t believe there is one clear winner, so the best way forward is to work a number of these paths by testing various technologies and the customer acceptance of them in detailed ground-level demonstration projects’ (BP, 2004).

This was part of BP's 'evolving strategy' of identifying different 'pathways' from a variety of technological options (see Diagram Two) and then modifying these pathways through feedback from local demonstration projects.

Diagram Two: Technology 'Pathways'



Source: BP.

A key aspect of vision of the London demonstration was that there should be a publicly accessible hydrogen fuelling station forecourt, next to an existing petrol filling station in Hornchurch in the east London Borough of Havering. This was the only publicly accessible location of the five fuelling stations being developed across the cities involved in CUTE, and was designed to test out different 'pathways'.

b) Making-Up a Vision of the Future

The issue this raises is who, or which social interests became involved in producing this vision, with what expectations and with what views of particular 'publics'? The literature in the sociology of expectations (see Borup et al, 2006) offers a fruitful

focus here, although we are necessarily selective in drawing on this emerging literature. In the early stages of framing and producing a vision of the future in relation to technological change – given the importance of visions in the subsequent mobilisation and shaping of expectations – the issue becomes one of articulating the variety (or otherwise) of expectations which inform the early stage production of a vision and importantly the ways in which these are communicated.

In focusing on the social construction of visions, through the variety of expectations which inform this, we also acknowledge the differential capabilities and positioning of social interests to meaningfully engage in this process of framing the future. The degree of contestation and the breadth of expectations involved in producing a vision may be narrowly or broadly framed. The importance of whose expectations inform the early stages of a vision are that expectations are ‘constitutive’, particularly at the early stages of innovation, in defining roles, attracting interest and building mutually binding obligations (Borup et al, 2006). Additionally, and importantly in view of the spatial shortcomings of transitions approaches, there may also be a significant socio-spatial variability of expectations (Borup et al, 2006), from and of particular places.

Captured within these expectations, either implicitly or explicitly, are views of the relationship between those producing the vision of the future and ‘publics’. This relationship can be seen in a number of ways, but it is useful here to highlight views of ‘publics’ and ‘participation’ in terms of Andy Stirling’s conceptualisation of forms of ‘participation’ in the social appraisal of technology as normative, instrumental and substantive (2005, pp.220-222):

The first of these, the ‘normative’ approach, is underpinned by a sense of the democratic empowerment of citizens participating in decision-making around technological decision-making as ‘the right thing to do’ and ‘an end in itself’.

Second, the ‘instrumental’ approach can be seen as ‘a better way to achieve particular ends’ from the strategic viewpoint of incumbent interests, through, for example, the extraction of strategic intelligence from ‘participatory’ relationships which may also be used in the presentation particular, already determined, decisions.

Finally, the ‘substantive’ view focuses on issues of the ‘social robustness’ of particular technological developments and possibilities in respect of the diverse potential array social knowledges, values and meanings and the ways in which appraisal is sensitive to differences in this respect and thus produces ‘authenticity, robustness and quality in choices that actually result from appraisal’ (Stirling, 2005, p.222).

In the case of Hornchurch, the vision was produced by multiple actors, with a variety of expectations, at the city-regional, national, European and international levels. The central actors in the initial stages of the project were: the European Union, who co-financed the demonstration; Daimler-Chrysler who developed and manufactured the buses and provided technical support during the trial; and BP who provided the hydrogen-refuelling facilities for the fuel cell buses. There were also roles for BOC who supplied the hydrogen technology to BP in London; Ken Livingstone, the Mayor of London, who backed the introduction of the hydrogen economy in London via emerging planning policies and transport and air quality strategies; Transport for London who were responsible for achieving environmental targets and standards for London’s bus fleet as required by the Mayor’s Air Quality Strategy; and London Buses Limited who are part of Transport for London and First Group who operate around one sixth of the London bus network. There was additional support from the Energy Savings Trust, through a grant from its New Vehicle Technology Fund Programme (supported by the UK Department for Transport).

The variety of expectations of these actors is captured in Table 1. What is also noted in this table is the ways in which these actors made particular attributions, either implicitly or explicitly, to ‘publics’.

Table 1: Actors, Expectations and ‘Publics’

Actor	Expectation	Speaking for ‘publics’
Daimler-Chrysler	To be involved in comprehensive fuel cell vehicle test program on a global scale and to learn from experimentation.	Publics as potential consumers of the hydrogen economy.

European Union	To reduce pollution caused by transport. Understanding of radical social and technical change.	Publics as green consumers in an internationally competitive Europe.
BP	To be at the forefront of the move to a hydrogen economy and to 'test' how the technology 'works' in 'real-world' applications.	Engaging with 'the public' as part of a testing and learning process.
BOC	To lead and develop a programme of initiatives in the evolving hydrogen energy economy.	Publics as potential consumers of the hydrogen economy.
Energy Savings Trust	To support important technological advance in using renewable hydrogen to significantly lower harmful emissions and improve air quality.	Publics as users of new and green technologies.
Mayor of London	Introduced transport and air quality strategies. Supports the development of a hydrogen economy and fuel cell buses. Wants London to be a leading city for sustainable energy.	Improving 'quality of life' issues – air quality, fuel poverty, etc. But also the importance of being seen to be a leading green city in attracting investment.
London Buses and First Group	Hydrogen powered buses to eventually become fully commercialised and replace diesel buses on London streets.	Benefits for 'publics' as public transport passengers i.e. quieter and more efficient public transport.

As the above table demonstrates, there were a variety of different expectations of the actors involved. Important here was the funding role of the European Commission's DG TREN, the role of networks of multinational capital and the implicit assumptions that hydrogen and fuel cell technologies could be 'dropped-in' to particular 'experimental', 'test-bed' contexts and lessons be learned from these contexts. Cities, in this formulation, were largely seen as 'sites' for technology 'testing' within which context there was limited human agency.

According to a source in DG TREN closely involved in CUTE 'in the early 2000, the late 90s, [Daimler Chrysler] had a very clear commitment on hydrogen and fuel cells and they thought that it would be a good idea to set up such a project to learn from real life experimentation'. The rationale underpinning this 'real life experimentation', according to a keen observer of the development of this initiative, was 'radical social and technical change'. In terms of trying to address this way of understanding large-scale social and technical change the claim was made that multiple fuel cell buses and

associated infrastructures needed, in a series of highly ‘visible’ cities, to be ‘tested-out’ under a ‘variety of conditions’.

A key influence in the development of the vision were the ‘big boys’ of multinational capital, in that the CUTE initiative, according to an EU source, ‘wouldn’t have happened at all were it not for the likes of Daimler-Chrysler, and then, later on the energy companies driving it forwards and putting the whole proposal together...and then putting out to the cities for interest if you like’. This was because: ‘You need the major manufacturers involved to bring this new technology forward or to drive this technology forward’. CUTE addressed not only the functioning of the buses but also the development of a fuelling infrastructure for the buses. For BP the CUTE project was ideal in allowing them to try out several different hydrogen supply methods both small and large scale.

The vision of the CUTE initiative was initially produced through the negotiated expectations of a relatively small group of multinational interests (primarily, Daimler-Chrysler and BP) and supranational political interests (the European Commission), with additional expectations (Mayor of London, Transport for London, etc) informing the development of the project in London.

c) (Re-)Negotiating and Materialising a Vision through ‘Participation’ and ‘Engagement’ Processes

Rather than a neutralised or depoliticised view of processes of ‘participation’ and ‘engagement’, the expectations of particular social interests and the ways in which they are embodied in a vision of the future frames unfolding processes of the negotiation and renegotiation of the future. What is crucial to this is not only the symbolic construction of the vision and the expectations underpinning the vision but how these aspirations inform and translate materially.

This then requires a focus on understanding the ways in which these expectations were negotiated, or formed the basis for interactions around the CUTE project debate in Hornchurch over time. Time is key, as the ‘vision’ was an expression of the form,

features, functions and benefits of the CUTE initiative in relation to local implementation, at an early stage of the initiative but continued to inform subsequent interactions and negotiations as the initiative encountered controversy. The controversy centred around the development of a hydrogen fuelling station in Hornchurch, driven by BP.

Important here are the formal and informal processes of ‘participation’ and the methods mobilised. The types of methods that are mobilised, the questions asked, by whom, the timing of their mobilisation in terms of a socio-technical transition and the alignment of social interests and the concomitant resources they can draw upon highlights the politicised extent of ‘participatory’ methods which are often viewed as de-politicised and neutral. It also highlights, in terms of Andy Stirling’s three-fold classification, possibilities to ‘open-up’ or ‘close-down’ (Stirling, 2005) processes of socio-technical innovation. In addition, with the upsurge of new ‘participatory’ methods, alongside the plethora of existing techniques and mechanisms, evaluating the role of participatory (engagement) methods becomes extremely confusing. Indeed what may or may not constitute participation has a long history (see Arnstein, 1969), with key concepts not particularly well-defined even taking into account the fruits of this long history (Rowe and Frewer, 2005). With this background in mind, views of what might constitute ‘effective’ public participation are not only unclear (Rowe and Frewer, 2004), but require a sensitivity but not a capitulation to the local context within which they are mobilised.

In the Hornchurch case, following the CUTE announcement, in March 2001, the initiative subsequently moved into a phase of regulation and site development of the hydrogen fuelling station. In July 2002, other actors became involved including Bovis, an engineering company used by BP to undertake construction work and Ozier, a planning consultant commissioned by BP to process the planning application.

The planning application was submitted to the local authority in September 2002 and subsequently involved the involvement of numerous other actors, including: councillors in the Planning Committee who considered the application; the Health and Safety Executive whose expertise was called upon to assess and advise the local

authority on the risks arising from the presence of a hazardous substance to persons in the vicinity; the Environment Agency was required to assess and advise the local authority upon the risks arising to the environment from the presence of hazardous substances; and London Fire Brigade, offered advice about fire safety and carried out various emergency-planning activities.

Local Hornchurch residents were notified by the council, of the planning application for a hydrogen refuelling station at an existing BP Petrol Station site, in December 2002. Between this time and May 2003 there was a greater involvement of actors who opposed the development. The main objectors were individual residents, the Emerson Park and Ardley Green Residents Association, local councillors and the local media also provided some critical comment. Interactions were mediated through a mixture of formal letters of complaint to the council and local media and informal conversations between residents at the Residents' Association monthly meetings, held at a local school. The position of the Residents was one of unhappiness with what they claimed was BP's lack of communication about the development. According to the Chairman of the Residents Association:

After we had made a number of objections to it [the fuelling station] and raised a number of concerns, the council officers went back to BP about it. We were never given any feedback, we had to go in and find out for ourselves, we never had a meeting offered and we never saw anybody from BP.

In June 2003 the Planning Committee held its first meeting to discuss the development. BP, local councillors and the Residents' Association (including an expert witness supporting the Residents' Association safety concerns) each stated their cases. After consideration of the issues put forward, in July 2003 the Planning Committee refused BP permission. In response BP mounted a campaign against the Committee's decision and revised their planning application, of which the residents received notice in August 2003. In return, the council received a further 26 letters of complaint and a petition and the Planning Committee refused permission for a second time in September 2003. It was at this point that BP appealed again and the decision was made in November 2003 to hold a Public Inquiry. In response to this, in

December 2003, the council received another petition and 10 additional letters of complaint. In January 2004 the hydrogen bus services were launched with refuelling at a temporary (non-public) facility.

The Public Inquiry, held in May 2004 over three days, involved representatives from BP, the Planning Committee (including an expert witness from the Planning Committee who provided evidence to oppose the development on the Green Belt issue) and a local resident, 'representing' the residents of Cornwall Close, Surrey Drive and Suffolk Way, gave evidence and were cross-examined. After consideration of the issues in July 2004 the Planning Inspectorate and First Secretary of State approved planning permission on the grounds of 'very special circumstances'.

...residents remain fearful of the hazards and the proposals clearly represent an intrusion of inappropriate development, in the Metropolitan Green Belt...Set against this, the scheme also provides a rare and valuable opportunity, as part of an EU co-ordinated project, to advance the prospect of reducing CO₂ emissions through the use of hydrogen fuel cell vehicles. The participation in the project, that the development would allow, has the potential to bring environmental improvements on a worldwide scale and to strengthen the competitiveness of the UK industry in this emerging energy sector (Grantham, 2004, p15-16).

Over the next 12 months there was considerably more active engagement between BP and local residents than had gone before. Four public meetings were organised by BP, which were held in local schools and hotels, and an open day on-site was held when the site was near completion. The stated purpose of the meetings and open day, according to BP, was to give local residents chance to directly speak with representatives of BP who were there to answer any questions or deal with areas of concern. One senior BP official claimed:

A lot of the wild rumours could be addressed. We could put people's minds at rest on a number of issues. Some of them were just technically wrong and you could explain why and that what they were frightened of was technically impossible. Other things were just giving face-to-face reassurances that certain things wouldn't happen that people were concerned that we would do.

The hydrogen refuelling site began operation in May 2005. Table 2 provides a summary of the 'forms of participation' in the Hornchurch case. A key point, however, was that in the 51 months from the initial CUTE announcement to site operation, the local residents were given the opportunity to meet informally with BP for the first time in the 42nd month and the opportunity for three more public meetings and one open day over the following eight months.

Table 2: ‘Forms of Participation’ in the Hornchurch Case

Type	Organisers	Where	Involvement	Purpose
Informal meetings	Residents’ Association	Local school hall (monthly)	Local residents (usually 50) Local councillors Invited guests	To discuss local issues of concern and decide action
Petitions	Local Residents	Submitted to local authority (two in total)	300/400 signatures	To demonstrate community opposition to the hydrogen station development
Protest Letters	Local Residents Local Councillors	Submitted to Local Authority (36 letters of complaint)	Local residents Local Councillors Residents Association Other concerned/interested parties	To demonstrate community opposition to the hydrogen station development
Media articles	Local residents Local Councillors	Submitted to local newspaper	Local residents Local Councillors Residents Association Other concerned/interested parties	To demonstrate community opposition to the hydrogen station development
Formal meetings	Havering Borough Council Planning Committee	Council offices (2 meetings)	Planning Committee Members Local Councillors BP representatives Residents Association Expert witness for the RA	To hear evidence from interested parties & discuss the planning application
Public Inquiry	Planning Inspectorate, ODPM	Town hall (lasted 3 days)	Planning Inspectorate Planning Committee Members Expert witness for the Planning Committee BP representatives Local residents	To have quasi-judicial hearing and make a decision on the granting of the planning application
Public meetings	BP	Local schools and hotels (4 in total)	Local residents Interested parties	Informal face-to-face discussion to answer questions and provide reassurance
Open Day	BP	On the development site (one)	Local residents Residents Association Local Councillors	To answer questions and to let local residents see the development

d) Consequences: From Vision to Actuality?

The issue, when moving from a vision and its production, through unfolding forms of participation in trying to translate a vision into action, and the issues that are raised by such processes and the extent to which the vision resonates with actuality or otherwise. In some respects the initial vision of the CUTE initiative was one which viewed local context as a site from which ‘performance data’ could be extracted from the demonstration of hydrogen fuel cell buses and associated infrastructures. This technology-driven vision, and its relative neglect of local context, was perhaps unsurprising given the socio-spatial variation (Borup et al, 2006) encompassed by the coalition of social interests of multinational capital and supranational political interests involved in its production and the relative neglect of local social interests. The initial sets of social interests and their expectations which informed the vision, thus, encapsulated in many respects an ‘instrumental’ (Stirling, 2005) view of the appraisal of technology. This is significant if we situate this within the context of expectations and visions being constitutive in defining roles, attracting interest and building mutually binding obligations (Borup et al, 2006).

This particular framing in terms of technological performance, economic costs and ‘operating conditions’ encompassed little sense of the ‘participation’ of ‘publics’ other than as consumers or customers. Consequently, subsequent ‘forms of participation’ in (re-)negotiating the vision in action became framed through responses to the initial vision. Local objections to the fuel station were mediated through letters, petitions, informal meetings, the local media and a Public Inquiry. These interventions constituted attempts to open-up (Stirling, 2005) technology appraisal and decision-making processes around the fuel station issue.

There were limits to this in that as the ‘participation’ process became ‘formalised’ through planning processes the appraisal of the technology became institutionalised around ‘downstream’ concerns, including, for example, ‘risks’, ‘hazards’ and ‘emergency planning’. Thus, the ‘rules of the game’ had been put in place prior to processes of public ‘participation’. The point being that a limited degree of a ‘substantive’ appraisal of the technology only took place within the (seemingly paradoxical) parameters of an instrumental view of the appraisal of technology.

4. Conclusions

This chapter has developed and demonstrated a framework for analysing the interplay between ‘public engagement’, technological development and the local context of its (non-)appropriation. This provides a framework that attempts to re-connect TT approaches to the role of publics, the specificity of places and competing visions of socio-technical change. By sensitising TT approaches to these issues we have attempted to develop transition perspectives in the following four ways.

First, we have highlighted the critical role and importance of symbolic and often highly partial visions of the future, in the present, through the development of technological change. Critically we need to understand how such visions are constructed, the degree of inclusivity, the assumptions that underpin their conception of a socio-technical systems and the model of social change that is implied by that vision.

Second, we have demonstrated both the variability and particularity of those social interests whose expectations inform a particular view of the future. Critically we need to understand who is involved in developing visions of technological transitions. Which social interests are involved in the construction of visions, who is excluded – either implicitly or explicitly - from the development of visions, and how socially robust and or inclusive are such visions as a consequences of the contingency and selectivity of their production.

Third, we have illustrated the consequences of these differences in the ways in which particular social interests, and their domination of power relationships, informs the negotiation and renegotiation of a vision of the future in its translation to practice. Critically this involves carefully tracing the unfolding of visions and expectations as they interact with unanticipated social interests that challenge or questions the validity or social robustness of a vision that attempts to speak for a collective societal interest.

Finally we identified the key lessons that can be learned from processes of moving from Vision to Actuality. The key lesson from a TT perspective was the interplay between the closing down and opening up of technological expectations and the

highly limited ‘substantive appraisal’ of the technology prior to wider public engagement.

The key issue, and focus for future research, thus becomes developing a better understanding of the interplay of vision, expectations, processes and methods in specific contexts. This call is not to be totally reducible or to capitulate to context but to develop sensitivity to context. In doing this, development of cases in particular contexts are not an end in themselves but should be used to inform comparison of patterns, trends and regularities. Through such a programme of work the TT approach could begin to, more carefully and systemically, become sensitised and transformed to a wider politics of publics, place and expectations that recognises and works within differential and asymmetries of power.

Notes

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ⁱⁱ Fieldwork took place, in two phases, between January 2004 and January 2005 and between June and July 2006 and included 18 interviews with local residents, local, regional, national and supranational policymakers and officials and industrialists. Additionally use was made of documentation – both in terms of those in the public sphere and some internal organisational/departmental documents made available to us on the basis that content and names were not directly drawn upon – and of a number of web sites. Further observational work and discussions were undertaken at a series of ‘relevant’ workshops.

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