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# **London's Hydrogen Economy: Negotiating the 'Global', the 'Regional' and the 'Local'**

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## **1. Introduction**

The material presented here is a draft work in progress for internal UKSHEC members only, building on a number of other working papers and complimenting two further case studies. On this basis we would welcome feedback and discussion from colleagues as part of a process of ongoing analysis.

This paper analyses attempts to develop a hydrogen economy in London. In doing this we broaden out understandings of the development of a hydrogen economy from a dominant way of addressing such processes in terms of economic cost and technical capability issues related to hydrogen economy developments (see Hodson and Marvin, forthcoming), to conceptualise the production of a hydrogen economy in terms of the mutually shaping relationships of hydrogen and fuel cell technologies to the ‘contexts’ of their development – here London. Through an earlier process of conceptualisation (Hodson and Marvin, 2004), we highlighted a series of three key issues to be addressed in understanding these mutual relationships: (1) the importance of the ‘re-emergence’ of regions and the relationship to issues of technology and governance; (2) regional representations and issues of context; (3) and the performance of regional hydrogen economies, through infrastructure development.

In addressing these themes – and drawing on issues raised in this previous paper – we ask: (1) How is the development of a hydrogen economy in London represented in terms of a ‘vision’? (2) How and why is this vision produced and what interests are included and excluded? (3) How does the vision relate to attempts to develop a hydrogen economy on the ground and what key issues are raised? We address these questions through drawing on a series of interviews with, and observations of, key ‘stakeholders’ in this development and also through utilising documentary evidence. In doing this we outline the processes through which the ‘global’, the ‘regional’ and the ‘local’ are negotiated in London in addressing hydrogen economy development, how and why this vision was produced, and highlight a series of issues which arise from the re-embedding of hydrogen and fuel cell technologies in particular contexts. From this we make suggestions around questions of what is ‘transferable’ from the London context, but suggest and encourage that more work is undertaken in different

contexts to compare and contrast issues arising from specific hydrogen economy developments.

## **2. Preparation and Dropping-In: The ‘Local’, the ‘Regional’ and the ‘Global’ in London’s Hydrogen Economy**

The focus here is on two particular representations of the hydrogen economy in London: (1) the re-emergence of London-level government and the development of, and ‘preparation’ for a hydrogen economy and (2) London as a site, a ‘test-bed’, for ‘global’ capital and demonstration projects or ‘experiments’. Where one of these sees attempts to develop a hydrogen economy largely from ‘within’ the context of new political arrangements in London the other relates to the cultivation of networks of ‘global’ capital seeking to demonstrate fuel cell bus and associated infrastructure demonstrations in particular western cities, here London

### **2.1 ‘Preparing’ for the Hydrogen Economy**

The first of these relates particularly to the role of the Mayor of London since the introduction of the position in May 2000. The ‘vision’ of Mayor Ken Livingstone is that by 2050 ‘London has a radically different energy system to that which characterised the 20th Century’ (Mayor of London, 2004a, p.7). In this vision: ‘Our road transport is characterised by highly efficient, quiet, and pollution-free hydrogen fuel cell vehicles’ (Mayor of London, 2004a, p.7). There is, furthermore, extensive use of renewables, Combined Heat and Power (CHP) at the domestic, community and business and industry levels, and a ‘decentralised energy system has provided the foundations for an emerging hydrogen economy’ (Mayor of London, 2004a, p.7). In moving towards this vision various issues are highlighted including:

*Environmental* issues – which is related to the ongoing and projected growth in energy consumption both in terms of global climate change and the issue of poor air quality (see Mayor of London, 2002). This means not only meeting national carbon dioxide emissions reductions but also improving air quality and thus addressing negative consequences for health and quality of life, which are particularly important as London seeks to position itself as a ‘world city’ capable of attracting business and highly skilled individuals.

In *economic regeneration* issues London would take the lead in the application of renewable energy technologies. This relates to a facet of shaping London's role as a 'leader', whereas 'in the past the UK has lost opportunities to lead in a number of clean technology industries, for example wind turbines and PVs [photo voltaics], to countries such as Denmark, Germany, Japan and the United States', in 'an effort to make sure that fuel cells and hydrogen do not become another lost opportunity, a proactive approach is being taken in London to support the hydrogen and fuel cell industries' (Mayor of London, 2004b, p.86). Whilst *social equity* issues, for example fuel poverty, would be addressed through tackling energy efficiency, particularly, through planning processes.

Through the setting and achievement of a range of targets against this agenda the aim is to make 'London a leading city for sustainable energy' (Mayor of London, 2004a, p.8). An important point of this wider agenda is that: 'As Europe's largest city, London is potentially both a major consumer and also a provider of hydrogen technology' (Gavron, 2002, p.4). A key pronouncement is that London can take the 'lead' in fuel cells and hydrogen technologies. A policy analyst with a close understanding of the Mayor's thinking suggested to us:

He [the Mayor] wanted to be at the forefront of the world. He wanted to be seen as *the* city in the world that's leading on the hydrogen economy. Whether that's remotely feasible, you know, we'll see. But that's where he wants to be<sup>1</sup>.

In being an 'early mover', however, a substantial amount of work is required to realise this objective (Mayor of London, 2004b). In particular the suggestion is that transport, which accounts for around 20 per cent of energy consumption in London, and given the large number of taxis, buses and delivery vans 'offers a massive opportunity for developing the use of hydrogen' (Mayor of London, 2004b, p.86; 87-8). This could exploit the 'large potential market for hydrogen' (Mayor of London, 2004b, p.86) and also the development of refuelling infrastructure that 'could "fan out" to the rest of the country' (Mayor of London, 2004b, p.86). Having said this:

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<sup>1</sup> All quotations have been anonymised as agreed in the negotiations to conduct the interviews.

We have to be honest. London – and the UK more generally – has made a slow start. Other world cities are well ahead in developing hydrogen economies (Gavron, 2002, p.2).

The acknowledgement is that there are different scales of activity for London to operate at in terms of the hydrogen economy. These include the unproblematically specified ‘race’ to be first mover in relation to other ‘world cities’, to ‘fan out’ refuelling infrastructure across the UK from London, but also to be able to deal with local level air quality and fuel poverty.

This relates to the view that London offers a specific and unique context for developing a hydrogen economy: ‘And I think the thing about London is basically anything you do in London is going to be...a bigger scale’. The point about this according to one key political stakeholder was that: ‘Everything in London must be the leader of anything [and be] perceived by the rest of the world as being so’. This is achieved through a constant process whereby: ‘You tell everyone you are [the leader] and...people stop disputing it then’. The notion of a leader implicitly suggests a ‘race’ and ‘competition’ where ‘there’s a sense of a league table of who’s making most progress and how you would then catch up’. In doing this ‘we measure ourselves on many things and compare ourselves to other cities...including a consideration of how London’s transport compares with other major cities’.

Attempts to develop hydrogen and fuel cell initiatives, which address the Mayoral agenda, have been undertaken under the auspices of the London Hydrogen Partnership (LHP) since April 2002. The LHP functions in support of four key aims: 1) to produce and implement the London Hydrogen Action Plan; 2) to establish and maintain dialogue among all sectors/actors relevant to the hydrogen economy; 3) the dissemination of relevant materials; and 4) to provide a platform for funding bids and initiation of projects (LHP, 2003). The key aims and issues which arise from the LHP’s Action Plan (2002, p.4) include: supporting the development of a hydrogen economy for the UK; contributing to the growth of London’s green economy through the development of hydrogen and fuel cell-related industry and employment; improving air quality and reducing greenhouse gases and noise in London and improving energy security for London.

## **2.2 Dropping-In the Hydrogen Economy to the ‘Test-Bed’**

A key mechanism for the Mayor for encouraging the development of a hydrogen economy for London is the use of public transport with a lead role for Transport for London (TfL). This leads on to a second key representation of attempts to develop a London hydrogen economy through the CUTE (Clean Urban Transport for Europe) bus project. Although TfL are managing the London buses, as part of this project, they are also part of a much larger European-wide effort.

CUTE is underpinned by a public-private partnership established at the end of 2001 and involves the demonstration, over two years, of 27 fuel cell powered buses in nine European cities (Amsterdam, Barcelona, Hamburg, London, Luxembourg, Madrid, Porto, Stockholm and Stuttgart). The initiative is part-funded by the European Commission, through its DG TREN, to the tune of around 21 million Euro of a total of 60 million Euro. The remainder of the funding comes from a variety of interests in this public-private partnership. The network built around the initiative was brought together by Daimler-Chrysler, includes a central role for the energy provider BP and also 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) - although local networks of transport providers, energy suppliers, political support and so-on may vary.

In undertaking these demonstrations within a number of urban centres objectives included: ‘to illustrate the large spectrum of different operating conditions [for fuel cell buses] to be found in Europe’; but also to assess the ‘design, construction and operation of the necessary infrastructure for hydrogen production and refuelling stations’. In addition 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 CO<sub>2</sub> at European level and contribution to commitments of Kyoto’ as well as ‘investigating the acceptance of these vehicles’ (European Commission, undated, p.2).

The London demonstration commenced in 2003 and involved a network including Daimler-Chrysler, BP, Transport for London, First London and the Energy Savings Trust. A key issue in the CUTE project has been the relationship between the functioning of the fuel cell buses and associated infrastructure development. Central in addressing fuel station development in London has been BP. BP draws on its own array of expertise in hydrogen production, distribution and retailing in ‘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 H2 Promotional Document). This is part of BP’s ‘evolving strategy’ of identifying pathways and then modifying these pathways through feedback from local demonstration projects.

An interesting issue here is in looking at the two representations as negotiating the hydrogen economy between the ‘global’, ‘regional’ and the ‘local’. Although this distinction is often crude it offers a useful way of thinking about the different representations. In thinking, for example, about the development of an agenda of a newly devolved London Mayor and the ways in which structures were built from the context of the GLA as ‘preparation’ for the hydrogen economy – within the constraints of a series of relationships at the national level and above - but also for understanding the attempts of ‘global’ capital, in a public-private partnership with the European Commission to demonstrate the ‘transferability’ of the hydrogen economy through ‘showcase’ cities, of which London was one. It is to the production and negotiation of these representations to which we now look.

### **3. Negotiating the ‘Global’, the ‘Regional’ and the ‘Local’ in Producing London’s Hydrogen Economy**

The negotiation of the ‘global’, ‘regional’ and the ‘local’ can be captured in terms of two processes: ‘preparation’ and ‘dropping-in’. The process of preparation needs to be understood in terms of a new set of political arrangements in London, from 2000, and in particular the creation of the post of Mayor for London. Of particular significance were a series of eight statutory strategies:



Energy wasn't one of them. It was not on that list and is not in the GLA Act, but the GLA Act had a section in it which allows the Mayor to do whatever else he wants as long [as it meets the] purposes of the Act. And he has made a decision to produce an energy strategy because it was seen as a missing one. It was felt that on reflection the other strategies weren't going to be successfully implemented without [an] energy [strategy].

An interesting feature of the development of an Energy Strategy and its relationships to a range of other strategies (e.g. Air Quality and Transport) related to the changing political arrangements in London and in particular the possibilities for the Mayor to develop strategic agendas of personal interest:

One of the benefits of the Mayoral system, could be a disbenefit as well, is that all the power is invested in one individual who is both the chief executive and the chief political figure, who doesn't have to rely on decisions taken by Assembly members who only scrutinise. Which means in a positive instance like this it may be if the Mayor is particularly concerned about an issue he can decide as he has done in this case in energy and [propose] change. Ken is personally very concerned about climate change which is why he's gone to all the effort of having photovoltaic [technology] put on his own council buildings at great expense and stuff....And therefore under the Mayoral system one individual can decide that they want to do it and therefore put a load of resources into it. Perhaps it wouldn't get in the normal sort of great bureaucracy...and would no doubt would be very difficult in the normal council structure but would be relatively straightforward in our system.

The Mayor was, thus, able to define his role particularly through strategies that addressed themes of environmental concern, economic regeneration, social equity and a 'world' leadership role for London. In highlighting these aspirations the suggestion, implicitly, was that London's identity be shaped in terms of a more socially equitable and environmentally-friendly relationship between producer and consumer but also around being a 'leader' and a showcase in respect of the hydrogen economy. It is interesting in view of the Mayor's ambitions to examine the extent to which these aspirations were shaped by relationships of different political, industrial and other interests, of whom and how. That is to say how these notions were appropriated and understood by 'others' but also how this manifested itself in attempts to deliver a hydrogen economy for London.

One key industrial player in the London hydrogen economy was keen to point out ‘there is certainly a strong role that the Mayor and the GLA can play within London to promote these kinds of [hydrogen economy] projects’. This is particularly the case at the level of the local boroughs in that

There’s a niche carved out there and a role for hydrogen and fuel cell vehicles. [The Mayor’s] energy strategy is helpful because that drives the alignment of the sort of unitary development plans within the local boroughs, and how they are driven to implement their own strategies. But... it’s not a sort of strongly commanding and controlling as you might expect. So although the Mayor can come out with a draft energy strategy at the end of the day the local boroughs can make up their own strategies, and implement their own plans, so long as it broadly allies with the direction that he’s set.

In looking ‘outwards’ from London in terms of attracting projects ‘the Mayor and the GLA can have a role in that, but I think, it’s sort of, almost more practical and pragmatic than that’. This stakeholder cited the ‘key role’ of London. In this respect:

What is quite an important role for the Mayor and the GLA is to start communicating positively about the emerging track record of what’s going on in London...If you can sort of portray a positive and welcoming attitude towards these kind of projects, essentially there is a sort of a path of least resistance that people like to follow. That’s what will attract people.

This level of ‘political commitment’ was frequently cited as being important to the development of a London hydrogen economy in the ways that both a number of industrial and central government interests saw the potential London hydrogen economy. So, for example, one view from central government claimed that:

There are sort of political commitments. And the fact that, you know, London is the capital and you’ve got all the media and so on, you know, it has opportunities which aren’t so much open to some other places. So it’s important from that point of view.

### **3.1 Inside the ‘Goldfish Bowl’: the Importance of Proximity**

This confidence about the possibilities of London manifested itself in terms of how a key political stakeholder in London viewed the relationships between the Mayor and GLA and central government. The proximity, or the ‘goldfish bowl’ of London underpinned the fact that: ‘well we have very good relations with the DTI’. But also

that these relationships mean that: ‘we would look to DTI generally but not necessarily’ as the resources available through programmes, for example, around fuel cell technology open up possibilities for demonstrations.

Indeed the rekindled relationship between the Mayor and the Labour government opened up the possibility for another conduit of ministerial contact for London:

When Ken’s manifesto was being put together these were the things that were being discussed with No. 10. You know, the first time we were talking about...the proposals for the Climate Change Agency...That’s the mechanism really, through the Mayor’s contact with ministers.

This level of influence with government and its departments also meshed with the perceptions of the view of London’s scale and ‘importance’ as a ‘world city’ in that: ‘The thing about London is basically anything you do in London is going to be a sort of national news of the world’. The perception, from a player close to London was that many of the demonstrations and attempts to develop hydrogen economies across UK regions were on a small scale:

They do the same sort of thing in London and it’s a much bigger deal. And, therefore, for the DTI getting London to do these things is a big step forward.

### **3.2 London and Whitehall**

The issues of relationships between the centre and London relate to both the construction of policy and strategy and also issues of trying to ‘implement’ policies and strategies. So there was a degree of interrelationship in the processes of producing both the national UK Energy White Paper and the Mayor’s Energy Strategy, according to one key stakeholder who suggested that the Mayor’s Energy Strategy:

Certainly began about four years ago and it began before the white paper started to be drafted. So I think that it would be fair to say that the London Energy Strategy had a major influence on the purpose of the national white paper. There was in general a lack of regional energy initiatives which tackled a whole range of energy issues...And I think they looked to us for quite a lot of guidance.

There was also the sense, according to somebody with a close understanding of various aspects of DTI thinking that the role of the centre in its relationships with the

regions generally is to ‘support and encourage’ through such things as ‘establishing some sort of guiding framework within which they can then see that their activities can play a part’ but also that the centre should in many ways ‘go with the flow’:

I think it’s quite hard to get the regions to do something that the centre wants if they don’t see the need for it and it doesn’t fit with their priorities. So, I mean that’s not to say you shouldn’t try sometimes...but I think if you want there’s a temptation more to sort of go with the flow. I think there are two or three places in the UK where the hydrogen economy might start to happen in a small form. And I think, you know, the role for the centre if you like should be to do whatever it might in terms of facilitating that. But rather than saying somewhere over there must do something because otherwise there’s a gap on the map...I think the role for the centre should be to support and encourage but not to direct too much. That’s because of the sort of current prevailing political climate if you like. You could certainly imagine a change of approach but you know until such time that there was a significantly different approach at high level then I think that’s the correct one to go for.

The issue is one where the centre also takes a key role where ‘there is a funding aspect to it in terms of at what stage there might be support available for sort of...demonstration programmes and that sort of thing. So that’s part of it certainly’. This issue of resources was important, according to one key stakeholder in London in that it is: ‘A big city [with] a big high profile and we can probably lever enough money to match their [central government’s] money’. On top of this: ‘the added attraction, that’s not always been an attraction I suppose, but having Ken [offers] perhaps a little bit more chance to [engage] the private sector’.

There was some uncertainty about the carving up and the balance of responsibilities between the centre and regions generally in terms of developing hydrogen economies. One view from a central government department was that: ‘obviously issues like Health and Safety and so on. I mean that tends to be a Central Government kind of function...and beyond that I’m not totally sure’.

This leads to the issue of to what extent London relies on the national level in terms of developing its hydrogen economy. To the provocative question, do you need the national? A key player in the new political arrangements for London suggested that there was a communications role for central government:

I think it's probably pretty clear that we can do quite a lot ourselves but there comes a point where national assistance enables us to do much more...So simple things like that and there's no national recognition for hydrogen. There's no one who goes to speak to the government about hydrogen...Simple things like that would make things so much easier.

This was implicitly acknowledged by a key stakeholder in central government who suggested that there was not a common position on the hydrogen economy across national government:

Not yet, but we're working on it. I think, speaking frankly, that although in the run up to the preparation of the Energy White Paper there was quite a lot of consideration given to hydrogen, probably it's the first time they've done it. Very little of that actually made it into the Energy White Paper. So what appeared was really sort of specific initiatives and I think much more, there certainly wasn't any sort of coherent framework for, you know, saying either the UK will move to a hydrogen economy or not. So I think the White Paper is still a significant driver in terms of the priority given to environmental aspects, but it's not sufficient on its own in terms of hydrogen.

### **3.3 London and the 'World': Co-operation and Competition**

The confidence of London that it could approach much of the development of a hydrogen economy on its own terms was also largely entangled in its relationships not only with central government but also with a series of 'competitor' European and 'world' cities. The 'sustainability' agenda of London and the part of the hydrogen economy in that was an acknowledgement that 'the big cities in the world both suffer some of the worst problems that we've been causing to our environment and in many cases they [underpin them]. We've got sort of a duty and a more pressing need to start sorting [these problems] out'.

The claim was made by one key London stakeholder that tackling issues such as air quality requires the major cities in Europe to start to come together with also a key mayoral influence:

It's now the major cities in Europe that are starting to come together - although sort of European legislation has been made by national governments - to try and improve air quality it's now the big cities that are getting together to say that the legislation isn't good enough and it needs to go further. We need more pressure from national governments etc. And I think, you know, that's going to happen a lot. It's going to be big cities getting together to try

and tackle environmental problems because they're the ones that are suffering most. And they're the one's sort of [concerned about the] long term future, about the welfare of the city. But it's also important...if you were a politician you'd want to be seen to be remembered as somebody who really changed things. Then one of the real things if you're the Mayor of London is to start to really change environmental policy...That's a real step forward and other people will follow.

There was an element of not just co-operation but also competition: 'There's a sense of a league table of who's making most progress and who's playing catch up'. There was thus a comparative element through which: 'We measure ourselves on many things and compare ourselves to other cities [through, for example] consideration of how London's transport compares with other major cities', particularly Paris and Berlin.

### **3.4 'Inside' London**

At another level a key issue, given the role of regional development agencies in other UK hydrogen economies (Hodson and Marvin, 2005a; 2005b), was the role of the London Development Agency (LDA). In terms of the development of a London hydrogen economy:

As the economic development agency for London, the LDA must be concerned about the changing nature of energy policy. Delivering new businesses, jobs, skills and housing all require safe, secure and sustainable supplies of energy. As such, the challenges facing international, national and regional policymakers are relevant to the LDA (LDA, 2003, p.7).

Others with an understanding of the role of the LDA suggested that:

I think the Agency is sort of slowly gearing itself up to realising that this sort of thing is now becoming a sort of Mayoral priority recently but is really part of their core. What they should be doing in fact - their core business. But previously I don't think [they were] getting themselves tremendously involved in things. But I think now that will start to do because essentially this is driven by the Mayor's policies and the Mayor's priorities.

This in many ways related to processes within the GLA through which the movement from vision to performance occurred:

I mean if you take it back to how some of these things started, Ken will have said at some speech, right we're going to become the lead on the hydrogen economy or something. And then [the job is] to interpret that and try and make it happen. So...find the relevant people in the GLA and say this is what the Mayor wants to happen. Go away and work on it. Come up with an idea of how we can implement it...[They would come] with problems, lists of options and things which we can then either help with or, if necessary, take them to the Mayor for him to make a decision.

Fleshing this process out accounts in many ways for the structures of the LHP through which attempts were being made to develop a London hydrogen economy. The basis of this stems from an approach to the Mayor made in 2000 by a British fuel cell company called Zetec. Zetec's approach centred around locating part of its operations in London. Following a meeting around the issue, and gaining the support of the Mayor and the LDA, according to one key stakeholder 'there was a joint announcement in the LDA and GLA that London should be the world leader in the fuel cell industry'. On the basis of this the Mayor called for a zero-emissions summit to take place. The key issue became: 'What's a summit for and how does it relate to an ongoing programme rather than just being about one event'? This, then, formed the underpinnings of the LHP where the 'the summit was essentially the launch of that' drawing on over 100 people from the London Hydrogen Forum.

From this the genesis of the partnership was 'an internal working group with representatives from all of the members of the GLA group...with also some information being sent to the Assembly to keep them up to date now and again'. There were discussions and 'we had some internal thinking about what might this partnership be for and generally how is hydrogen relevant to the GLA group'. As part of this process the drafting of a hydrogen action plan commenced. The internal GLA discussions were added to through a consultancy report from E4Tech 'who did some further consultation with us within the GLA group but also with some hand picked stakeholders from outside the group from government and from industry... and so on and conducted interviews'. This formed the basis for the outline of an action plan around which 'wider consultation' occurred prior to it being launched in draft form at the event to mark to the start of the LHP. It was 'at that event people had workshops and further shaped the action plan which was then published'. The importance of this

drafting and redrafting of the Action Plan was in the process of shaping different aspects of 'stakeholder' thinking and trying to achieve 'consensus':

So we used sort of a long term visioning document, strategic vision document to try to shape everybody's thinking and bring everybody along...The idea for what the hydrogen economy could look like and what the steps are to get there. So that we [achieved] consensus.

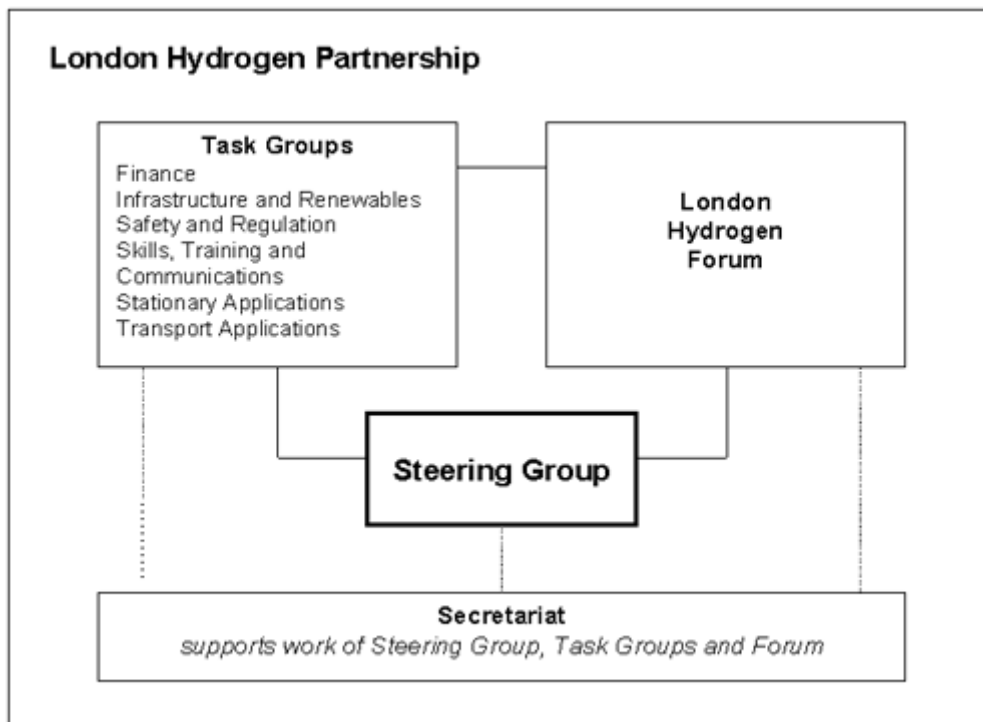
The key point of this is that 'the overarching vision is final production delivery of the hydrogen action plan which contains a set of objectives which we need to fulfil in order to meet the hydrogen economy'. There was acknowledgement that this needs 'considerable review and updating but that's been the overarching driver'. There are various constituent groups of the LHP which includes the London Hydrogen Forum, 'a stakeholder body which has a role in providing some consultation on key developments with core working groups, working as a discussion forum, some networking and so on'. There is also the Steering Group:

Who basically meet as a body which is broken down into a numbers of key sectors which are needed to engage with, to deliver, the hydrogen economy. And we have representatives from most sectors.

The link from there is that the Steering Group manages a series of task groups which 'were selected quite carefully on the basis of how the objectives of the hydrogen Action Plan were falling out and what the actions were...as well'. These include 'the project-focused task groups which are aimed to set up the best project consortium to actually take all of the work on the ground'. There are, however, 'a series of other task groups which [are] called advisory and skills training communications, safety and regulation'.



## Structure of the London Hydrogen Partnership



Source: London Hydrogen Partnership

Emanating from these structures, in particular from the Forum in 2002, was ‘a long wish list if you like of actions that we could take to meet objectives’. This wish list was ‘refined by the task groups...into a meaningful smart list and also as a way of building partnerships’. A key issue here was ‘that took a long time but it was very robust and defensible’. The appointment of development managers allowed them ‘some serious time to whittle that down further to a realistic short list of subjects which we now have’. The outcomes of these negotiations ‘form part of the Partnership’s business plan and advise what business model is necessary to take those forward’.

In addressing this a number of projects have been highlighted as planned or as possible – in addition to which a limited number of small scale projects have already happened. These demonstrations include not only a series of stationary demonstrations, such as a fuel cell powered Christmas tree in Trafalgar Square and fuel cell CHP projects, but also proposed transport demonstrations such as the introduction of 20 Ford Focus cars into London with associated fuelling infrastructure and water transport projects utilising hydrogen. The visibility of the LHP’s activities

can be seen through its 'education/awareness' raising activities such as the development of its website but also through public events including the delivery of a lecture by hydrogen economy 'guru' Jeremy Rifkin in London in October 2004 and a follow-up workshop in partnership with the London International Festival of Theatre (LIFT) exploring the relationship between culture and future fuels.

This leads to the issue of resource. There are two aspects prominent in thinking about this in relation to the LHP. The first is in identifying 'quick win' projects that will take some core resource from the Partnership to actually co-ordinate and get going. The second relates to anticipating the ways in which the LHP may function and setting this up 'in such a way that it can facilitate further projects that come through from anyone, no matter who they are, whatever time'

This facilitation aspect and priming with public money was important, according to one stakeholder in that: 'basically the industrial partners aren't willing to put money into projects unless the public sector's putting money, in many cases'. The issue being that 'they see the public sector putting the majority of the funding in and they know when to come into make things happen. And in a sense the wrong people have been in the room for that'.

In building up partnerships the 'obvious partners in the public sector in London would be the Boroughs'. The issue here is that the GLA, other than in the transport sector is not a service provider and therefore doesn't have services like that. There are possibilities in transport where a budget is allocated. The issue of resources is fundamental as:

We haven't been sort of ready with huge amounts of cash other than to sort of just basically to set a Partnership up and fund the staff that are needed to keep it going. So I think there's been a little bit of attention there which I think now is able to sort of move up a gear because the Mayor's been re-elected but with a strong manifesto committed to climate change; to do some things that fit into this field which sort of wasn't there before which means now we will start unlocking resources from other sources.

The views of a small number of stakeholders involved in the LHP, in terms of its role and 'usefulness' from their perspectives, was mixed. There was a view from one key

stakeholder that ‘we are able to offer advice about what is doable’. Whilst the flipside of this engagement was that another stakeholder claimed that the LHP was a ‘talking shop’. This stakeholder blamed the ‘inclusivity’ and ‘lack of financial resources’ of the initiative and suggested that the hydrogen economy was a ‘big boys’ game. A big boys’ game’.

### **3.5 Playing the Big Boys’ Game: Dropping-In to the Test-Bed**

The key issue of the CUTE demonstration is that rather than offer the ‘bottom-up’ political pressures for developing a London hydrogen economy it can be understood as a public-private partnership of European-wide fuel cell bus demonstration projects. Important here was the funding role of the European Commission’s DG TREN, the role of networks of multinational capital in shaping more local concerns 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.

The underpinnings of this are with the ‘big boys’ of multinational capital in that: ‘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:

When we talk about replacing the heaviest infrastructure that moves our world, which is the energy infrastructure, and one of the most important industries, which is the automobile industry, from one way of doing things to something radically different it is unthinkable that one would move from one thing to the other. We have the car industry which is not only one century old but in permanent progress. So it’s a mature technology that keeps evolving very fast and you try to catch up from one to another then you need to start use these kind of big projects to understand better how can we shift from one model to something that is dramatically different.

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’. There was some acknowledgement, in the context of the

European Commission, of the complexities of the interrelationships underpinning such ‘experiments’:

The system in the broadest sense of the word is not that you have a technology that does something, it is that by introducing that technology you are changing the whole thing and to see how this change occurs you need to do it at sufficient scale...having tests in several cities in Europe...In addition to having to establish a supply chain for such a system - and I am talking about the industry and supply chain - not only supplying the hydrogen but supplying the spare parts, supplying knowledge, supplying maintenance. That can only be done if you have a sufficiently important system. If you are only testing one prototype what kind of information do you get that is actually telling you what is going to happen in a real market situation?

The notion of test-bed is interesting in that it also appeals to the competition amongst ‘world’ and ‘European’ cities in attracting such demonstrations. In this respect: ‘[Daimler Chrysler] invited all the cities to explain to them what they intended to do’. The cities presented themselves in terms of the agenda of real life experimentation where Daimler-Chrysler’s role as one of the big boys was important in terms of their request for funding to the European Commission’s DG TREN in that:

[DGTREN] won’t embark ourself if we don’t see that everything is well organised and in place. So, once they have managed to find the consortium, they have managed to set clear objectives, they have somehow organised all the supply chain of the project. Once they have a clear work plan for what they are going to do and how they are going to learn with the project then we analyse all that and we go in.

Yet, despite talking about the social world and attempts to understand more than technological ‘drop-in’, the laboratory metaphor was frequently used by players close to this project:

I mean, we don’t want a fleet of hydrogen buses for the sake of running them. We run them because it is a learning experiment and we learn through these experiments. We have studies, what we call an assessment framework for the project which is like in a laboratory. You don’t start messing around with elements and liquids and things in the laboratory. You first find an experiment, you define how you are going to measure all the reactions that are going to happen in this place that you are doing the experiment and how you are going to monitor all that.

The claimed value for the cities, from a number of those involved in the project from the 'outside' was that 'these ten cities knew nothing about hydrogen and now they are probably *the* guys on hydrogen fuelled transport that one could find around the world and they have become world experts. They know more than anyone and they are invited to conferences all around the world to explain how it works because now hydrogen happens to be very popular in these circles'. At the level of one Commission perspective the claim is that there is the strategic issue and 'the discussion is what is next'? One view is 'we've got larger demonstration activities that may combine transport and non-transport applications that may really lead us to a new type of project that would not be a market project or a commercial project but still a demonstration project. But in size and scale, in some precedent one could invent, kind of, hydrogen communities that - of course they are not going to be 100 per cent hydrogen powered - but in which hydrogen, as energy, will play a very important role'.

One key Commission position is, thus, that:

I can tell you that one of the key things in which we will expand, a very important part of whatever project is eventually decided, would be the learning of the processes. Not that we are going to subsidise a lot of homes with fuel cells for generation or a fleet of vehicles or so on. We will probably subsidise some hardware but we will certainly invest on learning how the implementation of the deployment of all that hardware in this stage for CUTE and all the safety implications, all the market implications, all the competitiveness implications and all that we will want to learn if hydrogen, one day, proves to be a solution, such learnings would be more than necessary to move from where we are today to a different way of organising, I would say, the energy market. But maybe this may never happen.

### **3.6 The 'Big Boys' Game and the London 'Test-Bed'**

The case of London CUTE has seen a two-year trial of a partnership involving BP (providing the refuelling site and station), London Buses (as part of Transport for London) and more specifically First London as bus operator.

A key difference between this approach and the 'bottom-up' approach is the role of the 'big boys' in that

The [CUTE] project 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.

Working closely with the bus operator First London and also energy provider BP, Transport for London and in particular London Buses Ltd had a key role in the development of the CUTE project in London. London Buses, as part of TfL, have responsibility for infrastructure in terms of bus stations, bus shelters and stops, and also for the actual bus fleet mainly in terms of the environmental management of that fleet. Most of the fleet is owned by contractors and contracted back to Transport for London. London Buses, however, specify the routes, what type of vehicles should be used and what the environmental standards of vehicles should be.

The pressures on TfL, more recently, in relation to environmental standards have been, the Mayor getting elected in May 2000, with a strong commitment to the environment, and the Mayor's Air Quality Strategy, which, according to a player with a keen understanding of TfL, 'places very specific targets on London Buses in terms of trying to get it's fleet to a certain standard by the short term', within a threefold approach of short, medium and long-term.

The short-term target was that the whole bus fleet of just under eight thousand vehicles achieved the minimum of Euro 2 by 2005. By the end of 2005 everything in the fleet will be nine years old or less.

The medium term involved looking at various projects, for example diesel hybrid electric type vehicles, to achieve the government's 30 per cent CO<sub>2</sub> reductions, as part of its Powering Future Vehicles strategy. Then, 'looking at the longer term technology, and the hydrogen fuel cell is obviously *one of them*'. Within this view of the longer term representation of London Buses' activities an approach came from Daimler-Chrysler in early 2000 asking TfL whether they wished to be involved in the CUTE project. The positive response was 'I suppose...just a reflection of the commitment in the organisation to the environmental management of the fleet'.

This involved Daimler-Chrysler pulling together a series of networks in different cities where it was the type of interests involved and the scale of the demonstrations which was appealing to TfL/London Buses in that:

We've always tried to shy away from some small technology companies who come to me and say "We can convert one of your existing buses to run like this or run like that", because we don't really believe it's...not sustainable. You need the major manufacturers involved to bring this new technology forward or to drive this technology forward.

There was some competition around the demonstrations, according to one stakeholder who suggested that nine cities were picked from around 30 who were interested. London being one of these for one stakeholder was 'inevitable' in that: 'I suppose given London had expressed they're interested, it's probably not surprising London was picked'. The interesting point was the eye to the long term in terms of TfL:

Because I think we're quite realistic, and this is not technology for this decade, not in large numbers...But in a way, if the people aren't willing to try and demonstrate these things then the whole interest doesn't get going does it?

The demonstration that was planned involved using three fuel cell buses. This addressed not only the functioning of the buses but also the development of a fuelling infrastructure for the buses. The involvement of First London as the contracted bus company and also BP as the provider of the fuelling infrastructure led to the identification of a site at Hornchurch for the station. The nearest 'super garage was Hackney and then from there the nearest suitable routes are bus route 25. But also the route came right into the centre of London and we were quite keen that the vehicles came right into the centre and it was also profiled that this be put in view'.

The hope for one stakeholder close to this project was that by 2010 the CUTE demonstration and the provision of an infrastructure has had the result that:

Maybe somebody else has come along and done some more fuel cell projects, buses or other vehicles. I think BP having the permanent site in Hornchurch will encourage that cause you'll get car providers who want to demonstrate that product and we'll see what cities could we go to where we haven't got a fuelling problem, and if you're looking in Europe, where do you want to be, you want to be in London don't you? So I think

that...one thing this project might bring once the buses stop running is a permanent piece of infrastructure in east London.

Yet this needs to be seen in the view that:

I think in ten years time a high proportion of the new vehicles will be hybrid vehicles of some description, with batteries. What the power source is might still be conventional diesel, might be something else and I think the government have set that 20 per cent of new vehicles being low carbon by 2012. I think we're confident the industry will be comfortably achieving that by 2012 – 2014 or whatever, comfortably. And I think London will be comfortably leading the way on that. And I suspect...we'll be discussing with Mercedes or MAN or somebody about possibly taking fifty fuel cell buses in four or five years time.

### **3.7 The 'Test-Bed' as Managing Multinational Corporation Uncertainty**

The key player in addressing fuel station development in London was BP as part of the CUTE bus project. BP started thinking about hydrogen relatively recently, 'probably about 5 or 6 years ago' and is based on 'managing uncertainty for BP as a company'. At this point two people were involved which grew to four in the UK and one other in Chicago. Hydrogen activities are part of BP's Gas Power Renewables business sitting alongside, for example, solar and wind.

BP draws on its own array of expertise in hydrogen production, distribution and retailing in '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 H2 Promo Document).

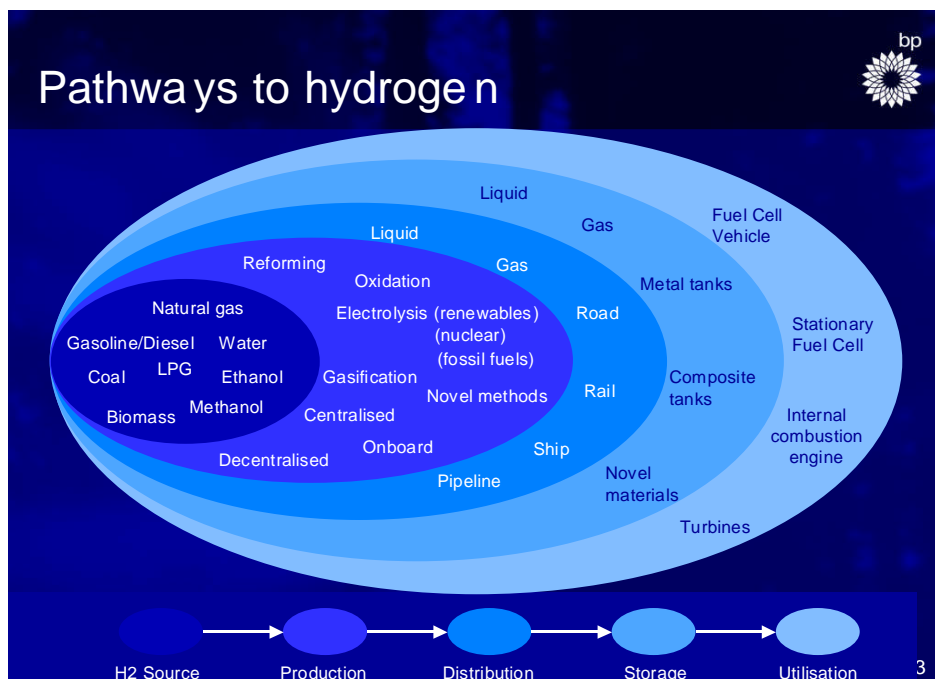
This is part of BP's 'evolving strategy' of identifying pathways and then modifying these pathways through feedback from local demonstration projects:

We're trying to see if we can rule pathways in and we can rule pathways out by what we know from doing the demonstration projects. Trying to get an idea of what the costs are what the technical barriers are, what the social barriers are if you like.



This involved ‘trying to learn through real world experience about this range of different pathways that we can use’. The pathways emanated from discussions within BP and initially ‘we came out with probably 20, 25 different so-called pathways that we thought were worth looking at in more detail’. The notion of pathways, in BP, drew on the metaphor of the ‘supply chain’ but is ‘not as linear as that’. Using an ‘egg diagram’ different ‘steps’ in pathways offer different pathway options.

BP’s ‘Pathways to the Hydrogen Economy’



The options are interesting as they become a series of hydrogen source, production, distribution, storage and utilisation issues predicated around the notion of testing these out in different places – i.e. in trying out particular pathways in different contexts and seeing what lessons are transferable.

But as this was one of the earliest demonstrations of such buses ‘you’re ten or fifteen years away from seeing like a mass roll out’. Thus the claim was that:

So, an entirely plausible scenario [is] where you have an initial burst of activity around these demonstration projects, and then there’s a bit of a lull for a few years as people absorb from what they’ve learned from these projects and think about the next generation of vehicles, the next generation of infrastructure and what that’s all going to look like. It has to go through a

fairly sort of classic technology development cycle of sort of build and test and learn and build and test and learn before you get to something which you could really offer to a sort of public fleet owner as a commercial proposition. I think we're some way away from that.

Through strategic partnerships with automotive and other large 'global' interests this was part of a broad technology development cycle of build-test-build before offering something as a commercial proposition. The claim was that there will not be a mass 'roll-out' of hydrogen-powered vehicles in the next two or three years. An estimate was that this may be 10 to 15 years away as there are a series of 'lulls' between 'generations' of automobile technologies to absorb learning from demonstration projects:

That's one of the key aims that we've got in running the demonstration projects; to make sure that we try something different in each one...And each one of these different pathways we don't even know the simple things like, really how much does it cost to produce a kilogram of hydrogen in each of these different pathways? We've got a reasonable idea, from the sort of economic modelling that we've done but until you start running the sites, until you start really understanding how efficient the buses are and how reliable the equipment is on the site, how often it's running, how much maintenance it needs and all of that stuff, you don't really get a good idea of how much it's actually costing...But the other thing is learning about public acceptance, learning about how difficult it is to permit a site, to get the permission to build. And, again, that varies wildly depending on what you want to achieve and where you site the facility.

Strategically the key underpinning of this for BP was 'focused around managing uncertainty for BP as a company'. That is to say that 'as an energy company hydrogen presents both a massive opportunity and potentially a massive threat to our business if we don't play it in the right way. So a lot of what we do...is to manage risk for BP'. The key underlying issue is the series of interrelationships and strategic link-ups between large multinational concerns who can see 'significant investments being made both by energy companies, by industrial gas companies and by auto manufacturers as well'.

It is interesting from this foregoing analysis to look at how the demonstration developed on the ground and what lessons were learned.

#### **4. Performing the Hydrogen Economy in London**

In this section we wish to focus on the CUTE demonstration project to highlight aspects related to the adaptability of technologies and design, the role of government in the project, how meaning was negotiated around the project and in particular in relation to the provision of a fuelling station, but also other infrastructure related issues, before finally examining some of the lessons which can be drawn from this. Key aspects of the demonstration were that BP made the decision that a publicly accessible hydrogen fuelling station forecourt, next to an existing fuel station at Hornchurch. This was one of five CUTE fuelling stations designed to test out different pathways. The fuelling station in London was the only one of the five which was publicly accessible.

##### **4.1 Issues of Maintenance and Vehicle Range**

The number of public buses in London totals nearly 8,000. This compares with three fuel cell demonstration buses running on the number 25 route. This may be seen in that the peak vehicle requirement on route 25 is something like 35 buses:

I mean if you were a regular traveller on route 25 then I suspect over the course of two or three weeks, you'd see one or two but yeah, you wouldn't just go and wait. It's not recommended.

One long-term challenge that the demonstration project threw up was that the fuel cell buses were single deck buses and with 4,500 double-deck buses how might this be approached given that 'the best place for all this equipment and the fuel is on the roof'. Another issue related to maintenance of the buses where: 'it is clearly more sophisticated'. At the time of the demonstration the vehicles were being jointly maintained between the operator, First Group and 'somebody from Ballard' fuel cells. There were three people responsible for this, for 'jointly looking after them, and maintaining them'.

This relates to an issue with vehicle range. Whereas conventional buses can leave the garage at 5am and go without refuelling until they return up to 18 hours later with the fuel cell buses this averaged eight hours. This makes issues of refuelling particularly pertinent:

One of the aims of the project is to understand actually what the impact of various operating conditions is on range. But that's clearly an operational challenge because it doesn't make the vehicles that operationally practical.

#### **4.2 When the 'Test Bed' Forgot to be Passive**

The difficulty for BP despite gaining Health and Safety Executive approval for the development of a fuelling station at Hornchurch, also the granting of local council consent for hazardous substances and the provision of a favourable report to the council produced by a third-party safety consultant was that the development was challenged on planning grounds. There were, according to a stakeholder in favour of the development, a 'relatively small number of vocal local residents' who were opposed to any further development of the BP site 'on grounds not particularly to do with hydrogen and more to do with its association with development activities at that facility'. One aspect of the argument, it was claimed, was that BP had an existing facility which a number of local residents did not wish to see developed further on a site which was actually on green belt land.

An alternative view was provided by the chairman of Havering borough council's planning committee, who claimed that: 'The local residents were not just concerned about this, they were petrified by it'. Another local councillor highlighted the mix of 'European' funding and perceptions of the technology: 'What I resent is the pressure from Europe to force our country to adopt this very dangerous technology'. He went on to claim: 'The HSE is living in a fool's paradise if they think this is safe. When we were in grammar school labs, we were taught to treat hydrogen with respect' (Financial Times, 2003, p.3)

This raises an interesting issue between a London hydrogen economy at the level of 'London' as a whole and the relationship between the clear aspirations of the Mayor – even if this was not an LHP project – and the actions of a borough. A key point of this is in acknowledging that the Mayor:

Can't force boroughs to do something they don't want to do where it's beyond the power of the Mayor to intervene. Well what we'll do is we'll you know, just use whatever facilities are available to the Mayor to get round [this].

The claim was, however, made by someone with an understanding of the Mayor's position that:

The Mayor's energy strategy was quoted at length and the London Plan at the public inquiry and it made an enormous difference to the Secretary of State's ability to say this is something that is of *national significance*.

It also asks the questions of, and raises the dangers of seeing 'public acceptability' in terms of a deficit model rather than understanding a complexity of social and institutional relations involved in its production. One perceived problem was that London becomes an 'awkward' place for industry to locate, although there was some doubt about the ability of this to persist:

I've certainly had it said to me by guys at Toyota, Ford motor companies that they were worried about bringing industry to London because London is a very difficult place to get things through. And it's unfortunate that it happened there ... Whether that will last, I don't know. I doubt it.

In this respect, in terms of the political arrangements between the GLA and the boroughs there was an acknowledgement from a GLA perspective that engagement was needed and a 'new urgency about concerted effort to co-ordinate with boroughs at a senior level...with members and senior officers of boroughs and do presentations and get a much better understanding there so that some of these things can be headed off much earlier when applications comes through'.

There was also an issue about the specific circumstances of London, according to one well-informed observer who claimed that the hydrogen economy in London was

Partly [a] political commitment, that's certainly a big potential factor in London. Local acceptability is certainly a significant factor in Teeside. I would now think if the...London buses had been based up there, there wouldn't have been a problem in the first place.

The flipside of this was that London's proximity to politicians and the mass media meant that:

Yeah...the minister then came and sort of saw the bus, and...part of the objectives of this is to make people more aware and educate people as

much as is possible. It's partly about operating the bus in service to get experience but it's also trying to raise the profile of the technology. So...we've just had an approach from Blue Peter, because they want to... take it to the Television Centre and have it in the show... We [are] actively trying to use it for those sorts of purposes throughout the two years.

The planning application for the fuelling station was finally successful in 2004 with the station due to commence operation early in 2005.

### **4.3 The Importance of Visibility and Symbolism**

The delays in the planning process meant that the hydrogen was provided by BOC who have a gas distribution centre in close proximity to the bus garage. In doing this they set up a temporary compressor and fuelling station 'where they just truck hydrogen in and then dispense it to the buses. And that's working fine although it's not particularly glamorous'.

The issue here is that the buses could obviously function without the fuelling station but that the demonstration project was about more than functionality it was also about symbolism and visibility. It was, also, however an acknowledgment that – contrary to BP's earlier perceptions – developing a fuelling station cannot just follow the well-established processes of siting a new petrol station.

### **4.4 Lessons from the Fuel Station Controversy**

This was part of a key lesson learned from the demonstration projects:

One of the key things that we are in the projects for is to get the lessons learnt so the next generations of stations that we build will incorporate all of those learnings. And the learnings themselves are really there to tell us whether or not we can rule some of these pathways out.

Taking this further:

I mean the kind of process we used was a typical BP retail process of planning and permitting a site. And I think that what I'm saying is that one of the key learnings is it isn't appropriate for this kind of development. It may become more appropriate as you get more and more sites up and running.

The controversy around the fuel station offers an interesting lesson from BP's use of pathways in local contexts:

I think there's a big dichotomy between the global, societal benefits that you can get from transitioning to hydrogen versus what does it give to the public in the street. The first hydrogen station that you build somewhere or the first project that you implement locally often I don't think these issues play nearly as strongly.

The lessons learned from the controversy are that:

To be successful in these kinds of applications you need to be able to get out and get contact with that local community and communicate the direct benefits of what we're doing. It's not always true, as I was saying earlier, that the societal benefits really play all that well at a local level. So there has to be a different set of messages I think.

This would involve:

At a very early stage in the process, before you put the planning application in, I think in the future we would be doing things like turning up at town hall meetings, either through local bodies such as Community Councils that kind of thing. Taking the opportunity to be available to answer questions and concerns that come up.

This was part of a process of trying to clarify not only pathways through local demonstration projects but also relates to getting the demonstration 'to work' in the absence of a well-developed understanding of local 'drivers':

When you go down to the local level and say what is driving it there then I think you struggle a little bit more. It's something which is going to become easier the more you do paradoxically...The first thing that you do, the first station that you build somewhere you are going to struggle to articulate what the benefits really are to that local community or to that area because you know you're not really making a significant dent in local air quality. You can offer that people can experience this new technology; those people that ride on the buses in London will get a benefit just from the increased comfort, the reduced noise and the fact that they're sitting on a clean form of transport. But beyond that it's difficult to demonstrate the very immediate local benefit because you have to speak to these more global concerns all the time. So I think there is an issue to be resolved there in the sense of implementing the first wave of projects you've got to be able to articulate. If you can't tap into a sort of feelgood factor within the community, that they're doing something for

the wider benefit of society...in the future there's got to be a different set of messages. And I think that's something that we're starting to get to grips with our experience of doing sites'.

This issue by definition is context-specific:

Again it depends where you go in the world. When we've been to Spain or Portugal the people there, the local authorities are falling over themselves to be the first people to do it because it's a sort of culture of innovation....

Likewise, in the context of London this may vary from borough to borough council to council and the idea is that you have 'got to be able to tap into a person or group of people with a certain vision who can sell that internally'.

This would be informed by processes of producing leaflets and literature which outline 'what the benefits are, a track record in doing these projects, why in their neighbourhood, why now'. The importance of this was in selling a story which highlights local community benefits of the fuel cell bus in terms of, for example, aligning it with educational visits and school trips: 'So you can start to build a package of local benefits tied to the wider societal benefits' which has to be addressed early in the process.

## **5. Conclusion**

In this paper we have highlighted two separate, but overlapping, visions of the London hydrogen economy. One of these centred around the development of new political arrangements in London and in particular the creation of the office of Mayor and the GLA. The keen personal interests of the Mayor led to the shaping of a broad and 'inclusive' view of the hydrogen economy encompassing aspects of environmental concern, economic regeneration and social equity. There was a clear focus on London as a 'leader' and as 'first mover' and of comparisons with similar 'world cities' as well as the goldfish bowl and approximation to departments of national government – most notably the DTI. Within this context the specific development of an action plan for hydrogen in London emerged with and through the development of the structures of the LHP. The creation of the LHP, through its Task



Groups, resulted in a number of proposed and ‘implemented’ small-scale demonstration projects.

The second representation was one of seeing a London hydrogen economy as being ‘dropped-in’ to London as part of a process of the alignment of interests of a number of private, large corporations with the agenda of the European Commission’s DG TREN. The key issue here is that projects of technological development through the hydrogen economy were passed down for demonstration and testing in specific places, or ‘test-beds’. A key issue is an implicit understanding that technologies are transferable and that processes of testing in high-profile cities will not only outline what is to be learned but also create visibility through the proximity of politicians, the mass media and concentrations of local populations.

In the case of the CUTE demonstration project in London a series of issues were raised as problematic, seemingly more related to contexts of attempts to develop technologies rather than with technical aspects of the technologies. In particular a number of issues were raised around aspects of communication between the agendas of – those above – in finding replicability and an appreciation of local concerns and agendas. A series of issues were raised about how this may be approached in the future but also raises a problematic about seeing the notion of ‘replicability’ as divorced from particular contexts.

With this in mind, and with the issues raised in two previous working papers looking at hydrogen economy developments in Teesside and Wales, the key question is: how can we understand the specific and general issues which inform ‘regional’ hydrogen economy development?

## **References**

BP H2 Promotional Document.

European Commission, (undated), *Clean Urban Transport for Europe General Introduction Brochure*, European Commission: Brussels.

Financial Times, (2003), ‘Clean fuel initiative stalled by safety fears hydrogen project’, September 27<sup>th</sup>, London edition.

- Gavron, N., (2002), Address to 'Generation H' Conference, 19 April.
- Hodson, M. and Marvin, S., 'Reconnecting the Technology Characterisation of the Hydrogen Economy to Contexts of Consumption'. *Energy Policy*. (forthcoming).
- Hodson, M., and Marvin, S., (2005a), *Re-Imagining Tees Valley in the Post-Industrial*, Working Paper 4, SURF Centre, University of Salford, May.
- Hodson, M., and Marvin, S., (2005b), *The 'Journey' to Wales' Hydrogen Economy*, Working Paper 5, SURF Centre, University of Salford, May.
- Hodson, M., and Marvin, S., (2004), *Understanding Transitions to a Hydrogen Economy(-ies) with and through 'Regions'*, Working Paper 3, SURF Centre, University of Salford, October.
- LDA, (2003), *Green Alchemy Turning Green to Gold: Powering London's future – a study of the sustainable energy sector*, LDA: London.
- LHP, (2003), 'London Hydrogen Partnership: An Introduction', July.
- LHP, (2002), *London Hydrogen Partnership Action Plan*, GLA: London. 2<sup>nd</sup> Draft, July.
- Mayor of London, (2004a), *Green Light to Clean Power: Highlights of the Mayor's Energy Strategy*. GLA: London.
- Mayor of London, (2004b), *Green Light to Clean Power: The Mayor's Energy Strategy*. GLA: London.
- Mayor of London, (2002), *Cleaning London's Air*, The Mayor's Air Quality Strategy. GLA: London.