

# Defining outstanding challenges for the UK fuel cell and hydrogen industry

## ***Outcomes of the Fuel Cells UK and Energy Generation and Supply KTN workshop 25<sup>th</sup> March 2010, Birmingham***

### **Workshop overview**

On the 25<sup>th</sup> March 2010, Fuel Cells UK and Energy Generation and Supply Knowledge Transfer Network held a joint workshop as part of the 'Hydrogen and Fuel Cells for Clean Cities' Conference and Exhibition in Birmingham.

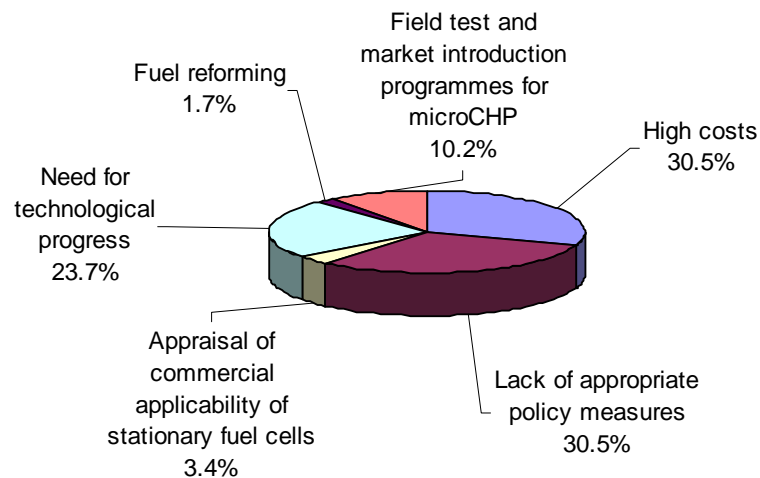
The workshop focused on identifying the outstanding challenges facing the UK fuel cell and hydrogen industry, and provided an opportunity for participants to share perspectives on the measures required to deliver optimum outcomes for fuel cells and hydrogen in the UK, both in terms of development of the industry and alignment with policy goals.

Approximately 40 individuals took part in the workshop. In the first part of the session, they were invited to suggest up to 3 challenges facing the fuel cell and hydrogen industry in the four areas: *Stationary Applications*, *Transport Applications*, *Infrastructure* and *Other*. Following this process, and a review and consolidation of closely aligned challenges, each participant was invited to allocate 10 'votes' across their key priorities. There was flexibility to distribute the votes equally across 10 themes, to attach all 10 votes to one individual theme, or to spread the votes across several themes with different weightings given to each. In articulating challenges, a number of delegates also provided thoughts on possible recommendations; these have been listed appropriately under each area below.

### **Key Outcomes**

#### Stationary Applications

The key challenges to commercialization and wider deployment of fuel cell and hydrogen energy in the stationary sector were identified as being cost, lack of appropriate policy measures, the need for technological improvements (e.g. greater durability) and barriers across the supply chain (membranes, electrodes and catalysts supply). The relative weightings are shown in Figure 1.



**Figure 1 Challenges for stationary fuel cell applications**

High costs and lack of appropriate policy measures scored 18 points each. The following points of concern were noted:

- lack of incentives for electrical utilities to invest in future / emerging technologies,
- ineffective emissions trading,
- insufficiently high financial disincentives (i.e. taxes) for the burning of hydrocarbons for stationary applications, and
- poor Government's focus on the benefits of fuel cells and how these can be realised through integration with renewable electricity generation.

A need for technological progress (allocated 14 points) was highlighted across the following areas:

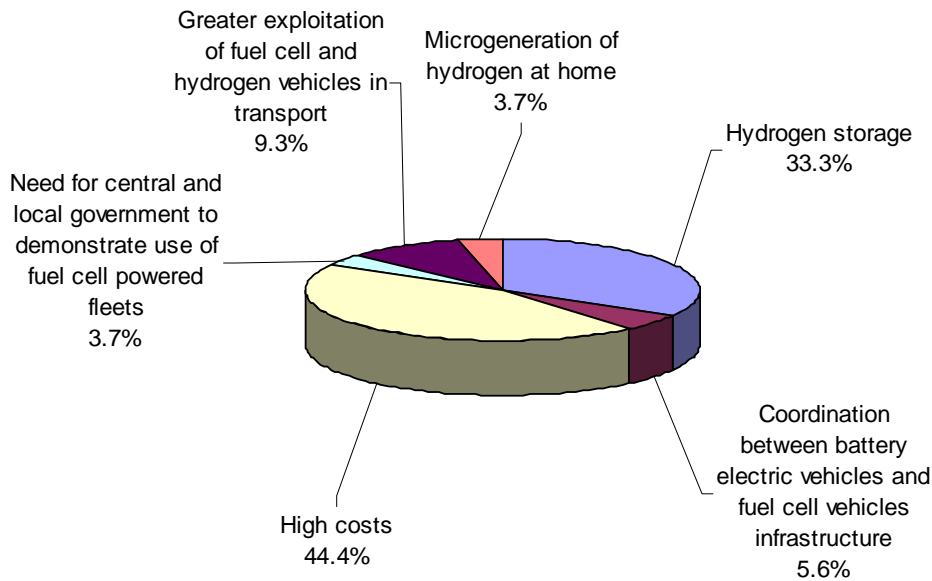
- stack life
- membrane durability
- degradation of materials and components in Solid Oxide Fuel Cells (SOFC)
- sealing materials
- larger volume hydrogen storage (e.g. for standby power)

*Recommendations suggested by participants included:*

- *Full appraisal of the commercial applicability of stationary fuel cells*
- *Government funding for microCHP field test programme and market introduction programme*

### Transport applications

The main challenges identified for transport applications are presented in Figure 2 below.



**Figure 2 Challenges for fuel cell and hydrogen applications in transport**

It can be seen that workshop participants highlighted the largest challenge for fuel cells and hydrogen in transport as being cost (allocated 24 points). This included:

- Fuel cell costs
- Hydrogen storage costs
- Vehicle price for the customer
- Cost and lack of hydrogen infrastructure

The second priority challenge was hydrogen storage (allocated 18 points), which encompassed energy density, liquid storage and storage that will enable extension of the driving range of a fuel cell car to 500 miles.

The following technological and design challenges were also highlighted, albeit with lower priority:

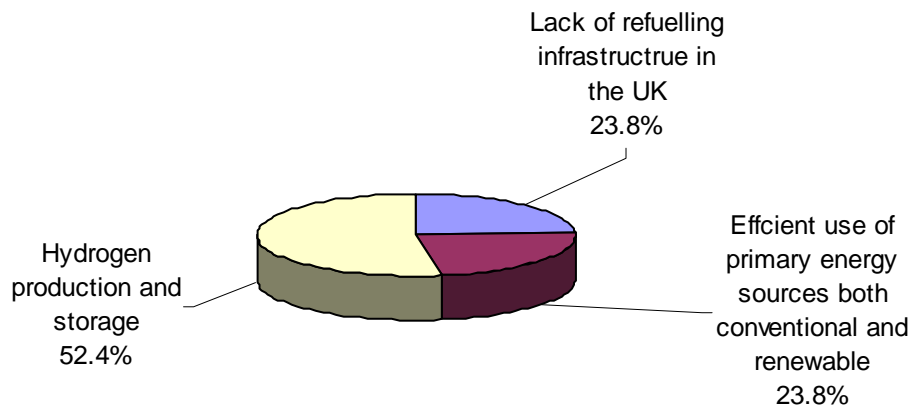
- Fuel cell and power control in a dynamic load system
- Scalable and modular design
- High altitude operation
- Low temperature operation.

*Workshop participant recommended the following:*

- *The use of hydrogen powered fleets by the local and central Government*
- *Coordination between infrastructure development for battery electric vehicles and that needed for fuel cell vehicles*
- *Popularisation of domestic microgeneration of hydrogen via small scale renewables and electrolysis for home vehicle refuelling*
- *Support for hydrogen internal combustion engines as a bridge from regular combustion engines to fuel cell vehicles*

Infrastructure

Hydrogen production, including the availability of green hydrogen (from organic material or other renewable resource – allocated 10 points) was identified as the main challenge associated with building a hydrogen infrastructure (total allocation of 22 points). Challenges around storage and delivery, both geographical and political, were also highlighted. The relative weightings are shown in Figure 3 below.

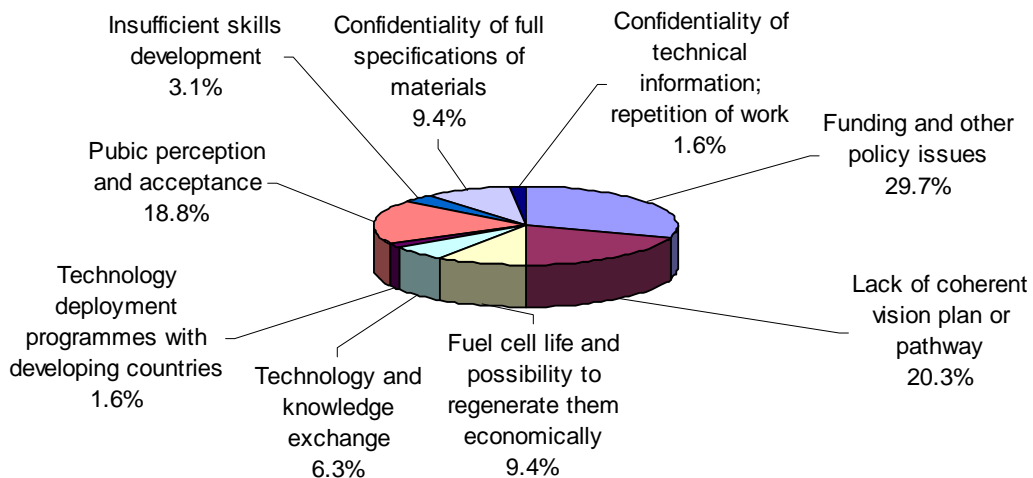


**Figure 3 Challenges for hydrogen infrastructure in the UK**

*Workshop participants recommended the efficient use of both conventional and renewable primary energy sources.*

Other

This topic covered challenges that did not fall into any of the above topic areas, or could be considered as applicable to all. The main challenges are shown in Figure 4.



**Figure 4 Other challenges for the UK fuel cell and hydrogen sector**

It can be seen that funding and other policy issues received the highest priority (allocated 19 points). The main challenges identified included:

- Lack of government and public funding support for hydrogen, electric vehicles and power generation
- Lack of coherent policy / vision / plan or pathway that can be readily understood
- No centrally supported initial demonstration capability or facilities to assist progress across *'the valley of death'*
- Insufficient skills development: no policy emphasis on relevant areas (e.g. chemical, process and system engineering)

The second most important challenge identified in this group (score 12) was public perception, including:

- Lack of public awareness and acceptance
- Need for education and promotion to a wider audience
- The perception that hydrogen is a *'long way off'* solution

The need for technology and knowledge exchange, collaboration and the sharing of expertise within the sector were the third highest priority (11 in total). It has been highlighted that the confidentiality of technical information often causes the same work being repeated by different institutions.

*Workshop participants recommended the following:*

- *Increasing public knowledge and acceptance of hydrogen and fuel cells through e.g. free-access fuel cell and hydrogen visitor centre, where the public could learn how these systems fit into the spectrum of energy supply*
- *Harmonisation of EU Regulations for hydrogen supply, storage and use (e.g. for retail use)*
- *More collaboration especially in areas such as transport technology, energy storage and hydrogen production*
- *Freedom of IP and information exchange*

## Summary and next steps

The outputs from the workshop will be used as a basis for supporting strategic planning on advocacy and other priorities within Fuel Cells UK, and will inform the programme of knowledge sharing and innovation stimulating activities within the Energy Generation and Supply KTN.

Appropriate actions for Fuel Cells UK could be to:

- address the lack of sufficient funding incentives,
- help to overcome the policy failure, e.g. lack of coherent policy / vision / plan or pathway that can be readily understood
- improve public awareness through interaction with media.

Simultaneously, the Energy Generation and Supply KTN is well placed to help address:

- technological challenges – perhaps by facilitating collaboration to identify / develop solutions or raising awareness across a wider stakeholder group which might be able to offer solutions.

- high costs of the systems – perhaps by stimulating new partnerships and collaborations within the industry and with players outside (e.g. those with manufacturing experience)