

# **HYDROGEN ENERGY STRATEGIC FRAMEWORK FOR THE UK THE GOVERNMENT'S RESPONSE**

## Introduction

In mid 2004 the Department for Trade and Industry commissioned a team of consultants to develop a strategic framework for hydrogen energy activities in the UK. The study, by E4tech, Element Energy and Eoin Lees Energy involved discussions with a number of key people in Government, industry and academia. The work was completed in December 2004 and a report was published on the Sustainable Energy Policy Network website<sup>1</sup>. The consultants also made a number of specific recommendations to Government, which were not published at the time. The Government has been considering these carefully. This document details those recommendations together with the Government's response. It is also being published on the Sustainable Energy Policy Network website.

## The Government's response - preamble

The Government welcomes the development of a Strategic Framework for Hydrogen Energy in the UK.

Hydrogen as an energy carrier is an exciting prospect offering a number of advantages. It offers zero emissions at the point of use – important particularly for tackling surface transport where emissions from individual vehicles contribute significantly to local and global totals. Depending on how it is made, hydrogen also has the potential to provide a complete carbon-free energy chain – the so-called “hydrogen economy” where hydrogen is produced from renewable sources of energy. And hydrogen can be produced via a number of routes, thereby contributing to up-stream energy security.

There has been a huge growth of interest throughout the world in the potential for hydrogen to become a significant alternative energy carrier which may eventually allow us to end our dependence on fossil fuels. Against that, hydrogen faces very significant techno-economic barriers, and the transition to a hydrogen economy will inevitably take decades.

The report (by E4tech, Element Energy and Eoin Lees Energy) provides an objective analysis and recommendations for Government, starting from the UK's long-term energy objectives. These are the need for cost-competitive CO<sub>2</sub> reductions and increased energy security. The report looks to 2030 because there is a reasonable prospect that by that date most of the techno-economic barriers will have been addressed, and that hydrogen may be beginning to play a significant role in the UK's energy mix. The report concludes that for the UK by 2030 hydrogen energy could provide competitive CO<sub>2</sub> reductions in six types of road transport energy chains using

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<sup>1</sup> UK Hydrogen Energy Strategic Framework – Analysis (December 2004),  
[www.dti.gov.uk/energy/sepn/hydrogen/shtml](http://www.dti.gov.uk/energy/sepn/hydrogen/shtml)

fuel cell vehicles. These chains also offer improved energy security. The chains are defined by their primary energy source: renewable electricity, nuclear electricity, natural gas with carbon capture and storage (CCS), coal with CCS, biomass with optional CCS and novel hydrogen production technologies. None of these energy chains are readily available today and all require significant changes to the energy system. However, they are sufficiently promising to be worth pursuing as options for the UK.

### Specific recommendations and the Government's response

## **1. A co-ordination body is needed for UK hydrogen energy activities**

**A dedicated Hydrogen Coordination Unit (HCU) should be created, with links across Government. The primary focus of the HCU would be to enable the development and deployment of low carbon, secure, low cost options for hydrogen for transport in line with national policy objectives. A separate organisation is required since its goals are different from those of an industry association or those of the Low Carbon Vehicle Partnership. A large organisation is not needed and it may be practical for the HCU to be hosted in one of the Trusts (e.g. Energy Saving Trust has hosted the Low Carbon Vehicle Partnership). The HCU would conduct tasks internally and work with a range of organisations to achieve its goals, including DTI, DfT, Energy Saving Trust, The Carbon Trust, Energy Research Centre, Low Carbon Vehicle Centre of Excellence, a UK Hydrogen energy industry body, Devolved Administrations and the RDAs. The HCU would have a small core staff and budget, plus funds to add to those of the above organisations.**

### Government response

The Government is sympathetic to the establishment of a dedicated Hydrogen Coordination Unit. The long timescales, the severe techno-economic challenges and the cross-cutting nature of the problem justify the creation of a dedicated body. The hydrogen future envisaged in the report represents not just the introduction of new and improved technology but also a fundamental shift in the complete system of production, distribution and use of transport fuel. To drive forward such a major programme of transformation requires forging effective links across Government, academia, industry, the UK regions and internationally.

The Government agrees that a large organisation is not needed and that light touch organisational arrangements are required. It will look at various options, including those for hosting the HCU within another organisation, before taking a decision on the way forward. The Government has recently established the Low Carbon Vehicle and Fuel Cell Technologies Centre of Excellence; one option would be to co-locate the HCU with the Centre of Excellence, which would certainly be expected to play a key role in any vehicle demonstrations. The new Centre will also be the host for a Low Carbon and Fuel Cells Knowledge Transfer Network under the DTI's Technology Programme.

The Government notes the recommendation that the HCU should have budgets to allocate to other organisations. There are however existing potential funding mechanisms via the Research Councils, Government Departments, the Carbon Trust and others. At this stage the Government is not convinced of the advantages of delivering funding via the HCU the focus of which is intended to be coordination between the various players, driving them to deliver, rather than execution by the organisation itself.

The Government recognises also that co-ordination across Government is crucial to delivering an effective policy framework that encourages investor confidence. Co-ordination will be driven through the Sustainable Energy Policy Network which brings together relevant Government players, Ministerial and official.

## **2. A UK hydrogen energy industry association is required to represent the commercial interests of the sector.**

**A UK Hydrogen Energy Industry Association is needed to bring forward the commercialisation of hydrogen energy in the UK. It would be a forum and contact point for its members, build a consensus around priorities and influence policy and programmes working with the HCU. Potential members should be invited to reach their favoured solution, whether of a common association with fuel cells or separate associations managed by the same entity. Initial Government support should be provided to catalyse the formation of the association.**

### Government response

The Government notes the desire by some for a hydrogen energy industry association, and agrees that the functions of such a body would be separate and distinct from those of the proposed Hydrogen Coordination Unit. The exact form which such an association should take is best determined by its prospective members. Clearly, any such industry association would need to work closely with the HCU.

## **3. The measures imply a significant public funding requirement.**

**Government action is required in support of hydrogen R&D, demonstration, commercialisation, and demand stimulation.**

### Government response

The Government recognises that all these measures will be required in order to bring about a transition to a hydrogen economy over the coming decades and will give further consideration to specific needs.

## **4. Research and development activities need to be coordinated by the HCU**

**R&D measures should be co-ordinated by the HCU and funded by dedicated funds and more modest support, depending on the strategic importance and the strength of UK organisations. International collaboration will be very important in most areas.**

Government response:

Hydrogen faces significant techno-economic barriers, and R&D is essential. Research leading to a step change in performance, for example in hydrogen storage, could greatly improve the prospects for early deployment. The study provides useful pointers to the focus of future UK research, building on existing academic and industry strengths.

The Government agrees that there should be a role for the HCU to coordinate hydrogen-related R&D, particularly in view of the wide international framework in which hydrogen is developing. It will clearly be important to take account of the input from others, in particular the UK Energy Research Centre. The Government does not consider that the HCU should be used to channel R&D funding and the number of existing funding sources would make this difficult. Rather, the role for the HCU would be to identify the strategic direction for UK hydrogen R&D and work with funding organisations and stakeholders to ensure that the necessary R&D goes ahead.

Currently around £4m/year is dedicated to hydrogen R&D across the public sector. Of this some £2.5m is funded by the EPSRC, including the Sustainable Hydrogen Energy Consortium funded under the EPSRC's Supergen programme. Additional funding for applied R&D will come from the Collaborative R&D product under the DTI Technology Programme where £20m/annum is earmarked for industry-led research into clean energy technologies. Proposals are being invited for hydrogen projects for the first time in the April 2005 call.

In addition the Government will encourage participation in international R&D collaboration into hydrogen which is key to solving the technical and economic challenges. There are several routes to international collaboration: bilaterally, for example through the US via the UK-US Memorandum of Understanding, and internationally through the EU, the International Energy Agency and the International Partnership for the Hydrogen Economy.

The Director General of the Research Councils announced on 7 March the detailed allocations for the Science Budget including an increase in funding for energy R&D from £40m per year to £70m per year by 2007-08, with additional support for business via the DTI Technology Programme and The Carbon Trust. Underpinning this investment the Government is establishing a UK Energy Research Partnership bringing together public and private funders of energy research to enhance opportunities for collaboration and identify shared priorities for research.

**5. The HCU should actively coordinate demonstration measures.**

**Demonstration measures should be coordinated by the HCU which would also identify funding sources and broker partnerships to ensure that the UK gains the necessary experience of hydrogen deployment.**

#### Government response

The Government agrees that a framework for UK hydrogen demonstrations is needed and welcomes the prioritisation matrix presented in the report. The HCU, once established, should take this area forward as a priority, setting a framework for numbers and types of demonstrations and bringing together project consortia.

The Government will support demonstrations with a funding package of £40m over 4 years for demonstrations across Carbon Abatement, hydrogen and fuel cell technologies. The presumption is that funding will be made available in the form of Capital Grants. It will be subject to State Aid rules and approval. Of the total around £15m is expected to be dedicated to hydrogen and fuel cells projects split approximately 50/50. This provisional split is intended to ensure that there is sufficient coverage of non-hydrogen fuel cell projects, for example those using natural gas in stationary power generation, and for projects relating to hydrogen which do not involve fuel cells. Projects that combine technologies – for example hydrogen and fuel cells or carbon abatement technologies and hydrogen - will be able to seek funding for both elements. The funding is thus intended to be sufficiently flexible to support a range of projects, some demonstrating a single technology and some a combination.

The Government expects to select demonstration projects on a competitive basis. It will discuss how best to take forward selection, and the criteria against which projects should be assessed with stakeholders including the industries concerned. Crucial factors will be to use DTI funding both to lever funding from others in the UK and to participate in EU and international projects. It will be important to select demonstrations for participation that address a representative sample of technology and systems issues, that build on UK expertise and that encourage location of international projects in the UK.

The HCU will act as a facilitator in putting potential projects together. The decision on funding will remain with Government

**6. Support for product commercialisation will be increasingly important and the HCU should enable finance providers such as the Carbon Trust to build on UK opportunities.**

#### Government response

The Government recognises that a range of measures, involving both public and private sector bodies will be needed to enable fuel cell and hydrogen technologies to be commercialised, and for the UK to be seen as an attractive location for such businesses. The Government working in partnership with the HCU, The Carbon Trust, industry and other organisations, the Devolved Administrations and the Regional Development Agencies will take forward the initial analysis in the study on the

appropriate comprehensive support framework to encourage the development of hydrogen.

**7. Policy measures will be needed to create demand for hydrogen. Mass markets will be needed to achieve the UK's objectives which may require longer term Government support.**

**Policy and fiscal changes to help create demand for hydrogen will be vital and HCU should work with DfT, DTI and Treasury to ensure that low carbon, secure energy chains are strongly favoured.**

Government response

This is an issue for the stage when the market is ready for the technology and fiscal changes may have a significant effect on demand. The UK has had some experience of this, for example in encouraging the transition from leaded to unleaded petrol, or the up take of LPG. The Department for Transport through the Energy Saving Trust provides incentives for the uptake of low carbon vehicle technologies. However the costs of fuel cell powered vehicles would have to fall very significantly before such incentives would have any significant effect on hydrogen demand. The HCU could play a useful role in ensuring that this issue is on the agenda of the responsible Government Departments and that the intention to establish such a support framework at the appropriate time is signalled as early as possible. Since the introduction of hydrogen on a large scale is medium to long term, the timing of any interventions by Government to encourage development will be as important as the design of the interventions themselves. But there is much preparatory and analytical work that can be started now.

**Additional measures**

**Low carbon fuel obligation**

The UK Government has recently commenced a feasibility study and consultative process on a possible renewable transport fuels obligation. An obligation would require fuel suppliers to ensure that a set percentage of their aggregate sales was from biofuels or other renewable sources. Although the obligation would initially be aimed at encouraging the uptake of biofuels, the same framework could also be used to encourage the use of renewably produced hydrogen.

**Fuel duty variation based on CO<sub>2</sub> emissions**

Government already has fuel duty incentives to support lead-free petrol and lower sulphur forms of petrol and diesel, as well as road fuel gases (LPG and CNG) and biofuels. We remain committed to using fuel duty incentives to support cleaner fuels, as set out in the Chancellor's Alternative Fuels Framework published in December 2003.

The Chancellor keeps all rates of duty under review and takes decisions in the context of the Budget Statement. The Chancellor takes into consideration all relevant economic, social and environmental factors when determining the rates of duty. The

Government will continue to evaluate the existing suite of measures, and keep under review the possibility of new measures in the future, as part of the normal Budget process.

### **Inclusion of transport within the EU Emissions Trading Scheme (ETS)**

The consultation paper on the Review of the Climate Change Programme (December 2004) said that ‘DfT and Defra intend to commission a joint study that will consider the practical feasibility, alternative options, and advantages and disadvantages of including surface transport in the second (or later) phase of the EU ETS’.

DfT and Defra are in the process of getting this study underway as a research project. It is intended that the results of the study will inform the new Climate Change Programme to be published later in the year.