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Dear Fraser

### **Fuel cells: realising the potential**

It was a pleasure to meet you and Emma recently, and to have the chance to explore what fuel cells can bring to the twin challenges of energy security and climate change, as well as wealth creation, job development and economic growth. We agreed to provide follow-up information focused specifically on how these benefits can be realised, and are pleased to present this material here.

Commercialisation of fuel cells in early markets is well underway, and mainstream applications will become accessible within five years. With the right level of Government support, this will deliver rapid growth for the UK fuel cell industry, while at the same time providing material benefits to UK environmental and energy policy goals (see Annex A).

There is however, a disconnect between policy and fiscal support. Expansion and modification of this support is required in order for it to help fuel cells deliver their potential, especially during the critical and costly product introduction phase.

Fuel Cells UK strongly believes that:

1. A robust, clear and comprehensive support framework is critical in helping fuel cells to achieve their potential to address policy goals around carbon reduction, energy security, fuel poverty and economic growth;
2. Timescales for support should be sufficient to ensure continuity and, thus, help manage risk during the product introduction phase;
3. Government needs to commit funding of £75 - £100 million over five years for product development to ensure that fuel cells realise their potential contribution to policy objectives;
4. Government needs to commit funding of £100 - £150 million over five years for demonstration to ensure that fuel cells realise their potential contribution to policy objectives and;;
5. Over time, and as the need for support diminishes, fuel cell technology and the associated infrastructure will provide substantial benefits for UK environmental and socio-economic development.

At present, as well as an ongoing need for direct funding for research and development and demonstration, a supportive policy regime is also required to accelerate the deployment of products into mainstream applications. This regime needs to encompass both regulatory elements, to drive deployment and to foster confidence within the market for investors, and fiscal elements, to incentivise deployment and continued improvements. We recommend a strategy which encompasses:

- Focused support for development
- On-going support for demonstration activity
- Capital grants
- Fiscal support which encompasses all low carbon technologies
- Feed-in tariffs
- Forward commitment procurement
- Enhanced capital allowances.

Whilst all measures are important for success, priorities will change over time. As commercial sales develop, research, development and demonstration will become less critical and deployment support, both regulatory and fiscal will play an ever increasing role in the development of the industry. Figure 1 outlines how Fuel Cells UK believes that the priorities for funding and regulatory support should evolve over the next five years, to support UK industry towards full commercialisation. (1 is the higher order of priority).

	Today	2 Years	5 Years
<b>Focused support for development</b>	1	1	2
<b>Forward commitment procurement</b>	1	1	1
<b>Feed-in tariffs</b>	2	1	2
<b>On-going support for demonstration activity</b>	2	1	2
<b>Capital Grants</b>	2	1	2

Figure 1: Priority Funding Areas, 1 = high order priority

Preliminary information on these mechanisms is provided below. More details can be found in Annex B.

### 1. **Focused support for development**

- 1.1 Whilst the Technology Strategy Board and Carbon Trust provide established mechanisms to support research and technology development, we believe that there is a growing need for focused support (e.g. in the form of grants and / or rolled up tax breaks) for product development as well.
- 1.2 In the product development process, the final phase (taking a prototype from the laboratory and turning it into a cost-competitive, engineered and quality assured product) is typically the most costly point on the curve. In established businesses this phase is usually funded internally via retained profits from other products. Given the new-to-world status of many fuel cell technologies these internal sources are not available at the levels required to achieve timely product development. External assistance is required to accelerate this phase and to avoid UK companies losing their competitive advantage or relocating to more supportive countries.
- 1.3 Assistance of this sort (at a materials and components as well as at a system level) would play a key role in bridging the gap between research and demonstration, and facilitate longer-term cost reduction through manufacturing volume increases. Making such support available not only through cooperative / consortium programmes but also to single companies to efficiently pursue their development would also accelerate this process.
- 1.4 Paragraph 2.6 below highlights the scale of Government funding for fuel cell development in Germany.
- 1.5 We recommend total funding of £75 – £100 million over five years for fuel cell development.
- 1.6 In addition we recommend that the Government considers supporting product development through the existing corporation tax system. This could include measures such as an extension of the current R&D tax credit system to enable claims to be made against a wider range of expenditure and against part-funded development programmes, or additional tax credits against product development expenditure payable in cash rather than offset against future taxable profits.

### 2. **Ongoing support for demonstration**

- 2.1 Demonstration programmes are a vital element in bringing high value, high cost new energy systems to market.
- 2.2 Unlike in the USA, there is extremely limited late-stage venture capital funding available for demonstration (and product development – see above) in the UK; consequently, most fuel cell companies are reliant upon State support to assist with this element of the innovation chain.

- 2.3 The prime UK support mechanism for fuel cell demonstration was the Hydrogen and Fuel Cell Carbon Abatement Technology (HFCCAT) programme, funded under the Environmental Transformation Fund (ETF). When the Programme was originally launched, £15 million was set aside for hydrogen and fuel cells over three years.
- 2.4 Despite a successful first Call in year one, we now understand that the future prospects for HFCCAT are poor. This is a considerable concern to the UK fuel cell industry, and we would welcome reassurance that the Programme will continue without any loss of funds or further delay.
- 2.5 The current HFCCAT programme requires an additionality test to be applied to projects (i.e. they would not take place without funding) but caps the maximum funding contribution to 25% (i.e. a company will be required to fund 75% of the project costs). This perverse combination risks limiting eligible projects to a narrow range for any organisation – neither helping the leading contender for deployment (as these will be funded internally anyway and would miss the additionality criterion) nor enabling the demonstration of those step-out or longer term projects that cannot be justified internally (since the company still has to fund 75%). Other national programmes in other European countries have avoided this problem.
- 2.6 As an example of activity overseas, Germany has recently developed the National Program for Hydrogen and Fuel Cell Technology (NPHFCT). Under this programme, the German Government will make €700 million available, €500 million of which are earmarked for applied research and development and demonstration, such as the Clean Energy Partnership (CEP) project in Berlin, which is the largest project for hydrogen powered transport applications in the world. Annex B contains further examples.
- 2.7 Whilst Fuel Cells UK welcomed the HFCCAT Programme as a first step in supporting demonstration in the UK, it needs to be part of an ongoing strategy of support. In order for the UK to compete effectively, we believe a minimum figure of £100 – £150 million over five years from 2011 is required.

### **3. Capital Grants**

- 3.1 To help the deployment of fuel cells in the energy market at a faster rate than would otherwise be the case, we recommend that the Government commits to the extension of capital grants. The level of grant available for a particular technology, whether it be fuel cells or other low carbon technology, should reflect the potential contribution of that technology to the realisation of policy objectives such as the reduction of CO<sub>2</sub>, but also other environmental and social objectives, such as alleviation of fuel poverty, improved energy security and minimisation of other pollutants. This will help to ensure that technologies that offer considerable energy and carbon saving potential, but which, due to low production volumes at present, are less commercially developed and consequently more expensive, receive the necessary support to bring them to market.
- 3.2 Support should be analogous to that already adopted under the Low Carbon Buildings Programme. For instance, a purchaser of a fuel cell system could receive a capital grant of £1,000 for each kW of electrical capacity installed. Such a scheme was initiated by the US Department of Defence under their Climate Change Rebate Project, which provides \$1,000 / kW installed capacity. This support also applies to US operations outside of the USA (such as in Woking, Surrey, where the first stationary fuel cell was installed in the UK). Support under this scheme must not exceed one third of the overall project costs.
- 3.3 Other examples of capital grant schemes include support under the US Department of the Environment's Market Transformation Programme. This highly successful programme provides support through a fuel cell tax credit to the tune of \$3,000 / kW, or 30% of the unit cost, whichever is the least. These tax credits have been guaranteed to 2016 and will provide support to materials handling equipment (such as forklift vehicles), back-up power and critical prime power applications.
- 3.4 This approach has also proved successful in the US State of Massachusetts. Here, a Fuel Cell Grant covers up to 25 percent of the total capital costs of the purchase and installation of fuel cells as part of systems to provide high quality power. Businesses, non-profit organisations, and state and local government agencies are eligible. The maximum award is \$2,000,000

### **4. Fiscal support which encompasses all low carbon technologies**

- 4.1 Details of the potential carbon abatement benefits of fuel cells can be found in Annex A.

- 4.2 If the UK is to realise its ambitious carbon reduction targets, support will need to be given to the whole range of low carbon technologies, including those which run on traditional fossil fuels. This will have the advantage of maximising the benefit from existing fuel infrastructures in the interim period, allowing renewable energy technologies to develop sufficiently to offer cost effective solutions. At the same time this will also drive down carbon emissions and ensure the advancement of fuel cell technologies that can then be operated with zero carbon renewable fuels, or used to manage the delivery of intermittent renewable energy
- 4.3 To illustrate the potential CO<sub>2</sub> savings, consider the case of fuel cell CHP systems and data published by major UK utilities. Based on 5.6million homes having micro-CHP installed by 2020, the CO<sub>2</sub> saved would be equivalent to the emissions from eight new 750MW Combined Cycle Gas Turbine power stations.
- 4.4 Another comparison would be that, assuming constant operation, several thousand CHP units rated at 400kWe (sufficient to power a supermarket or school) would be able provide similar CO<sub>2</sub> reductions to the proposed Cardiff- Weston installation of the Severn Barrage<sup>1</sup>. Fuel Cells UK strongly believes that both a continued expansion of renewables and deployment of low carbon energy solutions are required to achieve UK climate change mitigation targets.

## **5. Feed-in Tariffs**

- 5.1 Fuel Cells UK welcomes the Government's efforts to introduce feed-in tariffs.
- 5.2 More specifically, we believe that the most suitable and cost effective approach to promoting the uptake of the full range of low carbon technologies (see above) would be to set a generation capacity limit on feed-in tariffs, such that all low carbon generating capacities below this would be eligible for support under a feed-in tariff scheme. Devices rated above this limit would be covered by the existing Renewables Obligation (RO). This would represent a similar approach to that adopted elsewhere in Europe, particularly in Germany.
- 5.3 It is critical that, irrespective of the limit that is chosen to differentiate between different support mechanisms, low carbon energy technologies should be eligible for support under either feed-in tariffs or the RO not both.

## **6. Forward Commitment Procurement**

- 6.1 Forward Commitment Procurement (FCP) is a valuable tool for underwriting the investment required in scaling up production, and in placing the risks of new technology introduction with those parties best placed to manage them (technology risk with the supplier and market risk with the purchaser). An FCP process helps to set clear objectives for the technology and create the market confidence that is required to attract further investment and development.
- 6.2 Forward orders under forward procurement deals have a proven track record of stimulating growth and development. Recent FCP examples include deals for tens of thousands of products between fuel cell CHP companies and utilities. (See Annex B for more details).
- 6.3 There are clear benefits to the public sector utilising its significant buying power to stimulate investment through FCP initiatives, as set out in the Government's Sustainable Procurement Action Plan<sup>2</sup>.
- 6.4 We recommend that the Government build on the work of the Environmental Innovation Advisory Group (EIAG) and the Commission for Environmental Markets and Economic Performance (CEMEP) and facilitate the development of a suite of Forward Commitment Procurement programmes to support fuel cells in stationary and transport applications, thus helping to accelerate commercialisation and bring forward the associated policy benefits.

## **7. Enhanced Capital Allowances**

- 7.1 Enhanced Capital Allowances (ECAs) (which allow businesses to write off the whole of the capital cost of their investment in eligible technologies against their taxable profits of the period during which they make the investment), for installed capacity are a strong incentive for utilities. Under

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<sup>1</sup> Calculation compares the total power output from a 400kWe rated CHP fuel cell unit, operating at 80% efficiency, with 40% electrical efficiency, assuming a 40% efficiency saving over fossil fuel grid power. Cardiff-Weston crossing of the Severn Barrage is estimated at 17TWh, as determined by Parsons and Brinckerhoff and DECC, see <http://www.pbworld.co.uk/index.php?doc=627>

<sup>2</sup> <http://www.defra.gov.uk/sustainable/government/publications/pdf/SustainableProcurementActionPlan.pdf>

current rules, whereas 1GW centralised capacity would qualify for ECAs, 1GW decentralised capacity would not.

7.2 There is a need for a level playing field and the introduction of such an incentive would effectively be cost neutral for the Treasury and go a long way to incentivising development of sustainable, low carbon energy network.

We would be delighted to work with you to help ensure that fuel cells deliver their potential to help grow the UK economy and address energy and environmental policy goals. We will be in touch shortly to explore next steps.

Yours sincerely

Kind regards

Peter Bance

Chairman  
Fuel Cells UK

cc Emma Squires