CERAMIC FUEL CELLS LIMITED

13 August 2009

Mr Rob Hansen
Research Director
Environment and Resources Committee
Parliament House
BRISBANE QLD 4000

BY EMAIL to erc@parliament.qld.gov.au

Dear Mr Hansen

Environment and Resources Committee of the Queensland Parliament
Inquiry into Energy Efficiency Improvements ("Inquiry")

Ceramic Fuel Cells Limited appreciates the opportunity to provide a submission to the Inquiry.

This letter introduces Ceramic Fuel Cells and then sets out our high level comments on the opportunities for more efficient, lower emission power generation for Queensland.

About Ceramic Fuel Cells

Ceramic Fuel Cells is a global leader in fuel cell development. We are developing electricity generation units to be installed into homes and other buildings. The units convert natural gas into electricity and heat, through ceramic fuel cells.

In May 2009 Ceramic Fuel Cells launched its "BlueGen" product, a modular co-generation system to produce low emission power and hot water.

The process is highly efficient, cutting carbon dioxide emissions by up to 65 percent compared to current black coal power stations, saving up to 11 tonnes of carbon per year. The company has achieved electrical efficiency of 60 percent whilst exporting power to the grid – higher than any other technology in the world using hydrocarbon fuel, and more than twice as efficient as Queensland's current power grid.

The BlueGen unit also uses up to 80 percent less water than black coal power stations to generate the same amount of electricity.

BlueGen is designed to operate constantly. It can provide baseload as well as peak power. The power output can be modulated between 500W and 2kW in approximately 10 minutes. The units are monitored and controlled remotely via the internet.

The BlueGen product will be installed in homes and other buildings, connecting directly into the existing gas, power and water infrastructure. Unlike some other low emission technologies the product does not need expensive and extensive infrastructure upgrades and creates no adverse local amenity issues. There should also be no need for any local planning or building approvals.

Head Office and Factory 170 Browns Road | Noble Park | Victoria | 3174 | Australia P +61 (0)3 9554 2300 F +61 (0)3 9790 5600
UK Office Unit 8 | Candy Park | Hardknott Road | Bromborough | Wirral | CH62 3QB | United Kingdom P +44 (0)1513 34 8880 F +44 (0)1513 34 8804
German Office Industriepark Oberbruch | Boos-Fremery-Straße 62 | D-52525 | Heinsberg | Germany P +49 (0)2452 15 3752 F +49 (0)2452 15 3755
Website www.cfcl.com.au

Since the launch the Company has received expressions of interest from many potential partners and purchasers of BlueGen – including from Queensland. Our first BlueGen unit will be installed in November 2009 in a showcase home by VicUrban, the Victorian Government's land development agency.

We are continuing our positive discussions with local manufacturing and sales partners for the product, which will be available for sale from early 2010. More details about the BlueGen product are available at www.cfcl.com.au/BlueGen.

Ceramic Fuel Cells was formed in 1992 and has invested more than $230 million in developing its technology. Headquartered in Melbourne, the Company employs 90 people and is listed on the ASX and London's AIM market (code: CFU).

Queensland based Energex Limited has been a significant and supportive shareholder of the Company since the late 1990s. The Chairman of Energex Limited, Mr John Dempsey, is a non-executive director of Ceramic Fuel Cells.

The Company is also developing products with leading utility and appliance companies in Germany, France, the United Kingdom and Japan. More details are available at www.cfcl.com.au/partners. Through these partnerships the Company has developed significant experience of the forces driving the uptake of 'distributed generation' and clean energy products – including supportive policies in international markets.

Whilst the Company's first product uses natural gas, the technology can be adapted to use many other fuels, including bottled gas such as LPG and renewable fuels like biogas, biodiesel and ethanol, and coal seam methane.

Current situation

It is now well recognised that our energy system requires a transformation. Energy use is rising, particularly summer peak demand for electricity, and the monopoly electricity network companies are spending billions to upgrade ageing infrastructure, which is passed on to the consumer through increased power bills.

Queensland generates 88 percent of its electricity from black coal and 10 percent from gas. The Government has recognised the benefits of natural gas and has set a target of 15 percent of power generation by 2010 and 18 percent by 2020.

Ceramic Fuel Cells supports this target in order to move to a lower emissions electricity sector. We would suggest that to meet this target the Government should actively encourage a broad range of technologies which can use natural gas to generate efficient power – including small scale co-generation products.

Queensland is also facing rising demand for power. From 1999 to 2008, Queensland's annual electricity consumption increased by 29 percent. In particular, peak demand during summer is increasing at 6 percent per year.

This rising demand requires massive investment in new power infrastructure. Recent reports indicate that Queensland's electricity distribution companies Ergon and Energex will each have to spend more than $1 billion a year on network infrastructure to meet growing demand for power.[1]

[1] Courier Mail, 8 August 2009: http://www.news.com.au/couriermail/story/0,23739,25898497-3102,00.html

According to Energex's current Network Management Plan, approximately ten percent of this investment will be used to deliver electricity for only three days per year – or one percent of the year. We would suggest that there are more efficient ways for the public to allocate these resources, including through supporting low emissions technologies.

Both the Queensland and Federal governments have set targets to reduce greenhouse gas emissions. The Queensland Government has a target of reducing emissions by at least 80 per cent by 2050, however according to the Climate Group, Queensland's 2008 emissions from energy were 34 percent ***above*** 2000 levels. Queensland's per capita greenhouse gas emissions are 41 tonnes per person per year – more than six times the world average.

Distributed Generation

Put simply, distributed generation means generating electricity close to where it is used.

It is widely recognised that distributed generation offers many benefits over the current model of large power stations located far away from where power is used. Benefits include higher efficiency, lower emissions, reduced environmental impact, and significant savings for the electricity grid.[2]

The recent draft report on *Demand-Side Participation in the National Electricity Market* by the Australian Energy Market Commission (**AEMC Report**) noted that[3]:

> [W]hen the use of the network is reduced at peak times through [demand side participation], the cost of providing network services will also reduce. This is because the costs of providing the network are driven by electricity use at peak times, so any action that reduces network peaks will also reduce costs.
>
> The location of an embedded generator can influence the extent the transmission network is used to meet peak demand. This is because electricity from an embedded generator can be used to serve customer load rather than using transmission generated electricity. Consequently the costs of meeting peak demand on the transmission network can be reduced, which is beneficial as it can reduce the costs to society of delivering electricity.

More generally, the Garnaut Review *Issues Paper 4, Research and Development: Low Emissions Energy Technologies* (**Garnaut Issues Paper**) noted that*:*

> **The stationary energy sector is expected to provide the greatest and the earliest reductions in emissions through a dramatic technological transition**. The decarbonisation of electricity supply through technological change will be central to a successful mitigation story. The development and commercialisation of new energy technologies could have the added effect of spurring technological progress in other sectors.[4]

Solar, wind and geothermal are necessary but cannot provide the whole answer.

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[2] There are many studies on the benefits of distributed generation. Good starting points are the World Alliance for Decentralized Energy (http://www.localpower.org) and the IEA *International Combined Heat and Power (CHP) Collaborative* (http://www.iea.org/G8/CHP/chp.asp).

[3] Draft report dated 29 April 2009, page 53. Available at http://www.aemc.gov.au/Market-Reviews/Open/Review-of-Demand-Side-Participation-in-the-National-Electricity-Market.html.

[4] Available at http://www.garnautreview.org.au/CA25734E0016A131/pages/all-reports--resources. Quote from page 3.

It will be many years before we know if "clean coal" works – and even if it does the costs will be enormous. A study from Harvard University's Belfer Centre for Science and International Affairs released in July 2009 calculates that an early carbon capture and storage (CCS) plant would operate at a cost of about A$183 per tonne of carbon dioxide emissions avoided.[5]

Fuel cells using natural gas can provide low emission **baseload** power to reduce our reliance on coal. And the power output can be controlled and modulated – complementing solar and wind which are intermittent and not controllable. Fuel cell units can be installed in homes and other buildings without additional infrastructure costs.

Emissions Reductions

With very high electrical efficiency, a home with a fuel cell co-generation unit can actually deliver **greater carbon savings** than a home with a similar sized solar PV installation:

- The average home in Brisbane uses about 10,000 kWh of electricity a year[6]. CFCL's 2kW BlueGen product can produce up to 17,000 kWh of power a year – ie almost double what the average home needs.
- In Brisbane an entry level solar PV system (1 kW) will generate about 1,500 kilowatt hours of electricity a year[7], ie less than a quarter of what the average home needs. Even a 2kW PV system will produce less than half of what the average home needs. The rest of the home's power has to come from the grid – which in Queensland means black coal.
- The entry level solar system will save about 1.6 tonnes of carbon a year. The 2kW version will save about **3 tonnes**[8].
- If the same home in Brisbane installed a 2kW BlueGen unit then it could save over **11 tonnes** of carbon each year.[9]
- Even though the BlueGen uses natural gas, the carbon savings are much higher because it provides all the power the home needs (and more). There are also no nitrous oxide or sulphur dioxide emissions.

Barriers / Policy Gaps

Some elements of the current Queensland market structure can make it difficult to value and monetise all the benefits of distributed or embedded generation.

The most obvious barrier is that currently electricity providers are only required to pay building owners for power exported to the grid from a small solar PV system.[10] Retailers are not obliged to pay anything for power exported from other low emissions technologies. This regime under-values and fails to capture the many "public benefits" of low emission distributed generation.

The AEMC Report also finds that connecting to the grid can be a barrier to distributed generation. The Report notes that the Ministerial Council on Energy Standing Committee of Officials has recommended a national framework for distributed connection arrangements

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[5] http://climateprogress.org/2009/07/22/harvard-stunner-realistic-first-generation-ccs-carbon-capture-storage-costs/

[6] Source http://www.cleanenergy.qld.gov.au/solar_bonus_scheme.cfm

[7] Source http://www.brisbane.qld.gov.au/BCC:CITY_SMART::pc=PC_5018

[8] Average emissions from QLD electricity generation = 1.01 kg/kWh (http://climatechange.gov.au/workbook/index.html). 1kW PV saving: 1500 x 1.01 = 1.5 tonnes.

[9] CO2 emissions from BlueGen = 0.34kg/kWh. BlueGen making 10,000 kWh would save 6.7 tonnes of CO2 [(1.01-0.34)x10,000]. BlueGen running full time making 17,000 kWh would save 11.4 tonnes [(1.01-0.34)x17,000].

[10] Solar bonus scheme – see http://www.cleanenergy.qld.gov.au/solar_bonus_scheme.cfm

including for micro-generation units.[11] Ceramic Fuel Cells supports this approach provided it delivers a faster and easier way for low emission micro-generator technologies (of all kinds – not just fuel cells) to connect and export power to the grid.

Many policies which are designed to address these market failures or barriers are based on, and restricted to, specific technologies rather than the desired policy outcome. For instance: there is a premium feed in tariff only for solar PV technologies.

We would suggest that by definition innovative and emerging technologies will not have the political or market power to get on the 'favoured' list of technologies in the face of strong incumbents and competing political interests. Policies that prescribe a closed list of technologies will not maximise the benefits of innovation.

In this respect the Garnaut Issues Paper noted that:

> Lock-in results in persistent market barriers where existing technologies benefit from incumbency advantages while new technologies face costly and inefficient barriers to entry. Barriers to entry are not by definition market failures, but in the context of climate change such barriers can reduce the important competitive pressures which stimulate and facilitate adjustment to an emissions constraint. This results in sub-optimal levels of research, development, demonstration and diffusion of carbon-saving technologies, even where environmental and economic advantages have been established.[12]

In order to maximise the benefits of innovation and encourage a broad portfolio of emerging clean energy technologies, we would suggest the best approach is a technology 'agnostic' one that rewards outcomes (e.g. a sliding scale of support or incentives to match the emissions reduction from an agreed baseline).

We acknowledge that an emissions trading scheme (if and when it is introduced) and a (meaningful) carbon price will help to overcome some of these limitations however a carbon price alone is not enough to achieve the Government's stated target of quickly reducing Queensland's greenhouse gas emissions. To quote the Garnaut Issues Paper again:

> Establishing a carbon price alone will be an incomplete approach to mitigating climate change; additional measures will be required. An emissions trading scheme will address the primary market failure of uncapped greenhouse gas emissions and will encourage some research and development (R&D) activity in lower-emissions technology. However, the existence of other market failures in the innovation system means that simply establishing a price on emissions will not generate optimal levels of investment in technological change.[13]

Overcoming these Barriers

Despite the significant emissions savings (and other environmental benefits) natural gas co-generation products can provide, they are currently not eligible for Queensland or Federal government grants schemes and support programs because they are not considered "renewable".

To achieve the Government's goal of producing the lowest emissions electricity then policies must be expanded from the current focus on "renewables" and "clean coal" to include other low emission distributed generation programs. A distinct advantage of these products is that they are market ready and can be installed and carbon emissions reductions initiated immediately, unlike other options that still require significant development.

[11] AEMC Report page 45+.
[12] Garnaut Issues Paper, page 6
[13] Garnaut Issues Paper, page 2

There are several steps the Government can take to achieve these goals and encourage deployment of these products, including:

1. Retailer Buy-Back

Require electricity retailers to buy back power exported to the grid from small, low emission fuel cell generators such as BlueGen. Retailers are currently obliged to buy back power only from solar PV systems.

2. Broaden the feed-in tariff regime

Establish a broader feed-in tariff regime to recognise the benefits of low-emission distributed generation, including fuel cell generators.

Feed-in tariffs have been used in many countries around the world as an effective policy to encourage low emission electricity generation at efficient cost. All Australian States (except Tasmania) have introduced or are planning a feed-in tariff for small generators. These tariffs are restricted to a few technologies (mainly solar PV) and require electricity retailers to pay a premium above the existing electricity price.

The logic of a feed-in tariff applies to *low emission* small generators, whether or not they are 'renewable'. Other countries have recognised the need to support small scale fuel cell generators including:

- Germany - fuel cell power and heat generators receive a feed-in tariff of about 5 Euro cents per kWh (about 9 Australian cents) plus a capital subsidy of up to 3,300 Euros for a 2kW unit (about $5,800).
- California, USA, is currently consulting on an appropriate design for a feed in tariff scheme for small combined heat and power generators.
- In the UK the Government is introducing a feed-in tariff from April 2010 for a range of low emission technologies, ***including gas-fired micro combined heat and power***, such as CFCL's BlueGen product.

A consultation paper released by the UK Government in July 2009[14] sets out the key aspects of the proposed feed-in tariff. The tariff comprises a fixed payment from the electricity supplier for every kilowatt hour (kWh) generated plus another payment for every kWh exported to the power grid. The generation tariff will be set at different levels for different technologies and installation sizes. The proposed generation tariffs range from 4.5 pence per kWh (larger hydro and wind) up to 36.5 pence per kWh (small solar PV) – ie from 9 to 73 cents per kWh. The fixed export tariff is currently proposed to be 5 pence / kWh (10 cents) for all technologies. The rates for gas-fired mCHP are being developed along with the Government's heat and energy saving strategy and renewable heat incentive and will be announced later in 2009 – but still with the objective of starting in April 2010.

It is important to note that Ceramic Fuel Cells is not seeking the same tariff as solar PV (44 cents per kWh) or even a premium tariff (although of course that would help to deploy the products, and therefore reduce emissions, faster).

Simply receiving a 'one for one' tariff equal to the Queensland retail price for electricity (about 18 cents per kWh) would provide a meaningful recognition of the significant public benefits provided by low emission distributed generation units.

[14] http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

3. Regulation

The Queensland Government should continue to press the energy regulators to properly recognise the public benefits of distributed or embedded generation, by creating appropriate incentives for the network companies (and at the least removing incentives which can encourage investment in more network upgrades at the expense of non-network or embedded generation alternatives).

We appreciate the opportunity of introducing Ceramic Fuel Cells and making a submission to the Inquiry. We would be happy to discuss our submission further and to appear before the Committee. The Committee members are also welcome to attend our factory in Melbourne to see our fuel cell units in operation, exporting low-emission power to the local grid.

Yours Sincerely

Brendan Dow
Managing Director
Ceramic Fuel Cells Limited