CERAMIC FUEL CELLS LIMITED

Power of choice – giving consumers options in the way they use electricity

Submission to the Australian Energy Market Commission

August 2011

1. Introduction

Ceramic Fuel Cells Limited welcomes the opportunity to make a submission to the AEMC's ongoing review into the efficient investment in, operation and use of demand side participation (DSP) in the national electricity market.

This submission begins with an introduction to Ceramic Fuel Cells and our BlueGen® product, and then looks at how low emission distributed generation can help achieve the policy objectives of encouraging DSP. We then provide comments on some of the specific questions raised in the AEMC issues paper, and the benefits of a national feed-in tariff for all small scale low emissions generating technologies.

We make a few introductory comments:

- We welcome the move by the Ministerial Council on Energy to direct AEMC to conduct this review. We do note that there have been many similar reviews, over many years, into demand side participation and energy efficiency more generally. We look forward to these reviews being converted into concrete regulatory reforms.

- We also welcome the AEMC's statement that this review will have a broad focus and will consider all market and regulatory arrangements that impact on the electricity market supply chain – presumably including State and Federal Government laws and regulations.

- At the outset we would like to emphasise that a broad review of consumer choice in the electricity market must extend beyond *using* electricity, to *generating* electricity. The Issues Paper assumes that consumers' choices are only about how to *use* electricity; for example, on page ii of the Issues Paper, "*we consider that DSP is defined as the ability of consumers to make informed decisions about the quantity and timing of their electricity use*…". However consumers have another, and more far-reaching choice: about how to *generate* electricity. Rightly, the Issues Paper (page iii) lists *distributed generation* as an example of DSP – and this is the wider definition that we use. .

- We are not experts in electricity market economics or regulation. We make our comments based on our experience of commercialising a clean energy technology in several global markets. We make comments on areas of the Issues Paper where we believe our experience is relevant and informative. For other areas of the Issues Paper we do not have specific comments.

We appreciate the opportunity to make a submission. If you would like any further information please contact us.

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2. About Ceramic Fuel Cells Limited

Ceramic Fuel Cells Limited is an Australian company which has developed a world leading clean energy technology. The Company was founded in 1992 by a consortium of the CSIRO, leading industrial companies and Government bodies. The Company employs 100 staff at its headquarters and research facility in Noble Park, Melbourne. All the Company's technology has been developed in Australia and all intellectual property is wholly-owned.

Since 1992 the Company has invested more than $250 million in developing its technology and products. Ceramic Fuel Cells is listed on the Australian Securities Exchange and the London Stock Exchange AIM market (code: CFU).

An introductory video about the Company and our BlueGen product is available at http://www.brr.com.au/event/65389.

BlueGen® – clean on-site power, controllable distributed generation

The Company's first product is called BlueGen. About the size of a dishwasher, BlueGen units use patented solid oxide fuel cell technology to convert natural gas into electricity with very high efficiency.

Each BlueGen operates constantly, all-year round. Each unit generates 1.5kW – or about 13,000 kilowatt hours of electricity per year, about twice the annual requirement of the average Australian home. The excess can be exported back to the power grid.

BlueGen also produces enough heat to make 200 litres of hot water per day, which matches the average home's daily needs for hot water.[1]

BlueGen products are installed in homes and other buildings, connecting directly into the existing gas, power and water infrastructure. BlueGen does not need expensive infrastructure upgrades and creates no adverse local amenity issues. There is no adverse impact on neighbours or local wildlife. BlueGen generates electricity through an electrochemical reaction, so there is no noise or vibration.

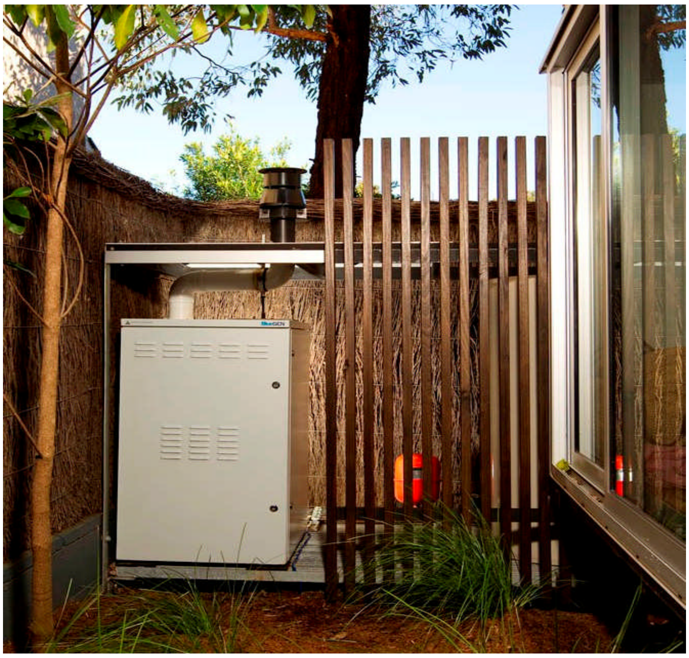

Figure 1 - BlueGen installed in a Sydney home

[1] Australian Standards; Sustainable Energy Authority Victoria, Estimated Household Water Heater Energy Use Report 2005

A 2010 CSIRO report has confirmed the significant carbon savings from BlueGen units. Compared to the Victorian power grid, each BlueGen unit can save 14 tonnes of carbon per year (when replacing a gas hot water unit – the savings are much higher if replacing an electric hot water unit).[2] A 2 kilowatt solar PV system will save 3.2 tonnes of carbon per year.

There are no nitrogen oxide or sulphur dioxide emissions; and BlueGen uses up to 95 percent less water than current brown coal power plants[3].

Importantly, the power output can be modulated up and down remotely, because each BlueGen unit is monitored and controlled remotely over the internet.

This creates truly ***controllable distributed generation*** – as distinct from intermittent and uncontrollable generation from solar PV.

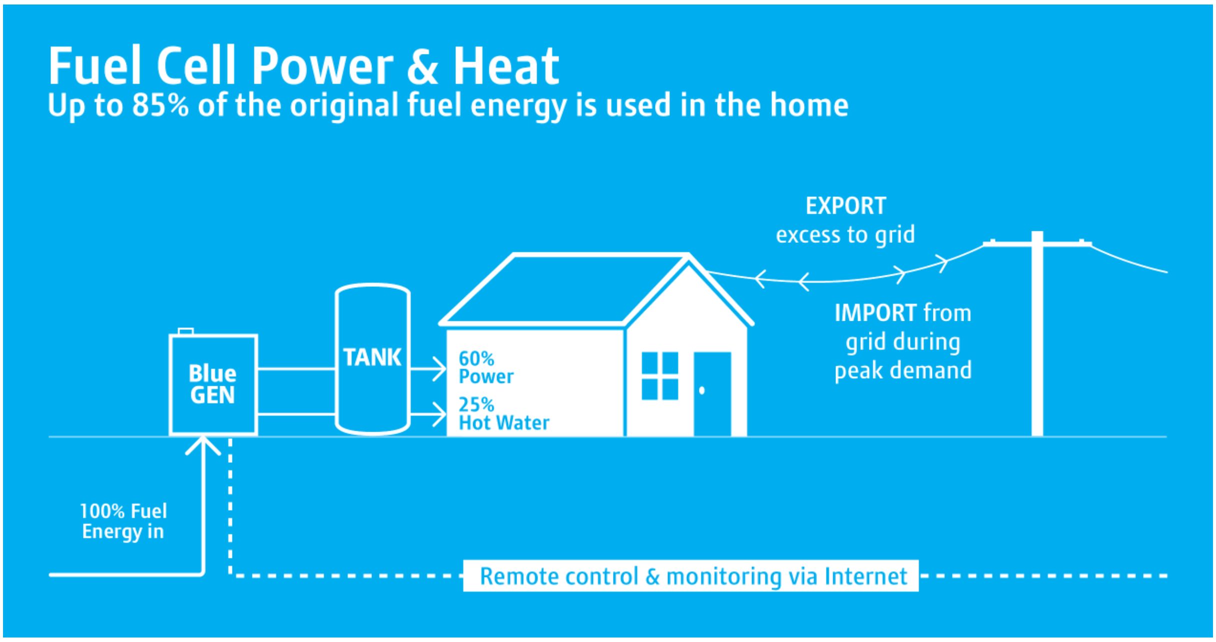

Figure 2 Controllable Distributed Generation

In April 2010 BlueGen received 'CE' safety approval, allowing units to be sold and installed throughout the European Union. In August 2011 BlueGen was certified by the Australian Gas Association for installation as an ordinary gas appliance. The connection to the power grid complies with the relevant Australian Standard (AS 4777).

Ceramic Fuel Cells has sold more than 200 BlueGen units to energy utilities and other foundation customers in nine countries: Germany, the UK, Switzerland, The Netherlands, France, Italy, Japan, USA and Australia. Our customers and partners include some of the largest energy companies in the world.

In Australia we have BlueGen units operating in Melbourne, Sydney, Canberra, Adelaide and Brisbane. BlueGen units are available now for commercial customers through our distributors, Harvey Norman Commercial division and Hills Solar.

More details about BlueGen, including case studies and a carbon savings calculator, are available at www.bluegen.info.

2 http://www.cfcl.com.au/Assets/Files/20100719_CFCL_CSIRO_Report_BlueGen_Emissions_Savings.pdf

3 Assuming heat from the BlueGen is used as hot water. Compared to brown coal using 2.2 litres of water to generate 1kWh of electricity: Loy Yang Power Sustainability Report 2007

3. Broad Policy Objectives

Given the AEMC review has rightly adopted a broad focus, the following high level policy objectives (which cross State and Federal sectors) provide some useful context:

Reduce Emissions from Power Generation

All political parties have committed to reducing Australia's emissions by at least 5 percent by 2010. This will require a significant transformation to Australia's stationary energy sector.

As the clearest example: Victoria relies on brown coal fired generators for 95 percent of its electricity.[4] These generators have an efficiency of about 28 percent. By the time the power gets to where it is used, the efficiency has dropped to less than 25 percent, meaning three quarters of the energy has been wasted[5]. By contrast, Ceramic Fuel Cells' products have a peak electrical efficiency of up to 60 percent, and recover heat for a total efficiency of up to 85 percent.

Encourage Distributed Generation

Distributed generation can provide significant benefits to the environment and the energy network – and significant cost savings. The benefits of moving away from relying only on large coal power plants towards a *distributed generation* system have been widely recognised in many studies in Australia and internationally, including:

- A 2010 CSIRO report estimates that the value of wide-scale deployment of distributed energy in Australia could be **$130 billion** by 2050[6].

- A 2010 report by Boston Consulting Group[7] says the emergence of distributed power generation is the biggest transformation to the power sector since the invention of the light bulb. The report finds that:
  - by 2020 renewable technologies and combined heat and power units could jointly provide more than 50 percent of all electricity consumed within the European Union;
  - old centralised systems that deliver a one-way supply of electricity to consumers will be increasingly displaced by localised generation, and the future power landscape will include a larger proportion of small-scale sources, such as cogeneration through combined heat and power (CHP) plants.
  - "*Some energy will be produced by consumers themselves, through a distributed network of power that incorporates everything from rooftop wind turbines and solar panels to CHP microplants (micro-CHPs) in consumers' cellars*."

- University of Technology Sydney has studied the savings on grid infrastructure from distributed generation. Its June 2009 report[8] shows that distributed generation and demand side measures can meet all New South Wales' electricity demands to 2020, with savings of $1.4 to $3.9 billion – and of course much lower greenhouse gas emissions than new coal fired power stations. The national savings would be far higher than this.

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[4] Victorian Climate Change Green Paper 2009, page 33

[5] Commonwealth Government, Generator Efficiency Standards; Loy Yang Power Sustainability Report 2007

[6] *The Intelligent Grid*: http://www.csiro.au/resources/IG-report.html

[7] *Toward a Distributed-Power World: Renewables and Smart Grids Will Reshape the Energy Sector*: http://www.bcg.com/expertise_impact/publications/PublicationDetails.aspx?id=tcm:12-51645.

[8] *Meeting NSW Electricity Needs in a Carbon Constrained World*: http://igrid.net.au/sites/igrid.net.au/files/images/Meeting%20NSW%20Electricity%20Needs%20in%20a%20Carbon%20Constrained%20World%20%28June%202009-1%29.pdf

- Several submissions to the Prime Minister's Task Group *Energy Efficiency Issues Paper*, released in May 2010,[9] highlighted the benefits of distributed generation of electricity using fuel cells.

  In its submission, The Energy Networks Association (ENA) – the peak national body for Australia's gas and electricity network providers – said:

  > *In the future, a typical active customer could potentially transform their energy profile by purchasing a 3kW combined heat and power (CHP) fuel cell, a 1.5kW solar PV system, a 5 kWh battery and a Home Area Network (HAN). They could reduce their reliance on the grid – which features 90% coal-fired generation, 60% combustion and line losses and around 10% renewable generation – and move towards a more environmentally sustainable profile based on natural gas-fired generation, 15% energy conversion losses and 30% renewable generation.*
  >
  > *Active customers are also likely to be net exporters of electricity. This example highlights the fact that greater deployment of distributed generation has the potential to significantly improve the energy efficiency of individual businesses and households, which may have consequences for energy prices and the overall efficiency of the total energy delivery chain.*

  The Gas Industry Alliance (GIA) states in its submission:

  > *The GIA has identified two key areas of great opportunity to drive a stepwise change in energy delivery and use throughout Australia. Firstly small to medium sized distributed generation including co/tri-generation and fuel cell technologies have the potential to deliver significant low cost emission intensity reductions in the stationary energy use sector. The second key opportunity is the increased use of gaseous fuels (LPG, CNG and LNG) in the transport sector*.

  The Task Group's Issues Paper itself says:

  > *Energy efficiency measures and cost-effective distributed generation (such as solar roof panels, wind turbines, co-generation and tri-generation) can help delay the need for new electricity infrastructure investment.*
  >
  > *Energy efficiency and distributed generation may play a role in increasing the security, stability and cost-effectiveness of energy markets. Distributed or embedded generation can result in lower transmission line losses because the generator is located close to the load. Distributed generators are also capable of higher overall energy efficiency if using co-generation or tri-generation, because waste heat can be used for heating and cooling. Distributed generation can help delay the need for new electricity infrastructure investment.*

- In January 2010 the Australian Academy of Science released a report on *Australia's Renewable Energy Future*[10]. The report includes a strong endorsement of the benefits of highly efficient fuel cell generators and recommends a feed-in tariff for natural gas combined heat and power (CHP) domestic generation.

- A December 2010 report by think tank Per Capita, a *Case Study on Distributed Gas Power*[11], explores the role of distributed gas-fired power generation in Australia's transition to a low carbon economy. The report identifies the large benefits of distributed generation and the market settings which need to be changed to unlock these benefits.

[9] Submissions are available at: http://www.climatechange.gov.au/government/submissions/pm-task-group/paper.aspx
[10] http://www.science.org.au/reports/documents/AusRenewableEnergyFuture.pdf
[11] http://www.percapita.org.au/_dbase_upl/Energy%20Market%20Design.pdf

4. Comments on the Issues Paper

In this section we provide comments on some of the questions asked in the Issues Paper.

Chapter 4 Consumer participation and DSP opportunities

Q7 Are there other DSP options that are currently available to consumers, but are not commonly used?

Yes, fuel cell co-generation products like BlueGen, and small scale energy storage products (like the flow battery products from Redflow[12]) are able to be installed with consumers now.

In Sydney, Ausgrid's 'Smart Home' showcases the latest in energy efficiency and demand side management. The home includes a BlueGen unit integrated with a Redflow battery system (as well as a small solar unit). The home is connected to the electricity grid but is effectively "self sufficient" in electricity, through on-site generation and storage.

In the first year of operation the BlueGen unit generated 10,753 kWh of electricity and saved 5.7 tonnes of CO2 compared to grid power.[13]

More details are available at www.smarthomefamily.com.au, and http://www.bluegen.info/Smart_Home_Family/

Ausgrid is also installing 25 BlueGen units in Newcastle as part of the $100 million *Smart Grid, Smart City* project.

The Adelaide City Council and the South Australian State Government have installed a BlueGen unit as part of an Electric Vehicle (EV) charging station at Adelaide Central Markets. The BlueGen allows city shoppers to recharge their electric vehicles from low emission electricity rather than carbon intensive power from the electricity grid.

The BlueGen unit was installed in around two hours and the entire installation completed in less than a day. The waste heat from BlueGen is recovered to provide 'free' hot water for the Council cleaning staff. More case study details are available at http://www.bluegen.info/EV_Charging/

As a final example, the Victorian Government Office of Housing has installed 30 BlueGen units in social housing in Melbourne and regional Victoria, to demonstrate how BlueGen can reduce household energy costs – as well as cutting carbon emissions.

Chapter 5 Market conditions required for efficient DSP outcomes

Q11 What market conditions are needed, that are not currently employed in the electricity market to make other DSP options available to consumers?

A national feed in tariff for all small scale low emissions technologies.

Q13 Are any changes needed to retail price regulation to facilitate and promote take up of DSP?

Retail electricity pricing should not be capped by Governments. In contestable markets retailers should be free to price their product to reflect their costs and margins. Consumers can choose between these retailers – &/or they can choose DSP. Capping retail prices masks this price signal and inhibits DSP.

[12] www.redflow.com.au
[13] http://www.smarthomefamily.com.au/smart-home-annual-stats-energy

Q20 Are retailer and distributor business models supportive of DSP?

Generally, no. The major electricity retailers are also generators. The 'gentailers' have large centralised generation assets to protect. Their business models do not support DSP. Secondly, the retailers make money by selling more electricity. They have not introduced business models which make more money by selling fewer electrons. (This is not necessarily a problem that AEMC can or should fix. If the market conditions are fixed, new business models will emerge.)

The distributor business models are certainly not supportive of DSP. As has been widely recorded in many other reviews, the distributors have a strong incentive to maximise their investment in supply-side solutions.

For example, the following extracts are from the Garnaut Review's *Update Paper 8: Transforming the electricity sector*[14]*:*

Co-generating electricity uses thermal energy which would otherwise go to waste. Gas-fired co-generation, for example, has large thermodynamic advantages over burning gas for heat alone. Electricity prices that embody the cost of carbon will allow the environmental benefit of this to be internalised. <u>However, producing downstream electricity through distributed generation has other advantages which are hard for the distributed generator proponent to capture, such as the avoidance of network expenditure if the output of the distributed generator is correlated with the demand peak</u>.

Greater commercialisation of existing demand-side technologies and practices can only come about when they are considered as a normal part of network company business.

As discussed in this section, there are numerous signs of excessive investment in regulated network infrastructure assets. Correcting any over-investment will offer not only lower, and more efficient, prices for consumers, but will also reduce the <u>current conflict between the desire to over-invest in one's own assets, and connecting and contracting with distributed generation. When the network company can profit from investing less rather than more, then it will seek ways to foster distributed generation and to set economically efficient tariffs</u>.

In relation to facilitating distributed generation, the 2008 Review stated: "The first best solution would be reform of the regulatory framework for distribution businesses (but that) the first best solution may not be achievable in the short-term." Given the rapid rise in network costs in the last three years, it seems that this first best solution should be implemented with urgency. This will also greatly assist distributed generation.

Q21 What incentives are likely to encourage R&D of other parties to promote efficient DSP?

A national feed in tariff for all small scale low emissions technologies.

Chapter 6 Market and regulatory arrangements

Q35 Are there market failures which mean regulation is needed in some areas to ensure appropriate market conditions are in place?

Yes, there is a range of market failures which hinders the uptake of DSP.

These market failures have been documented in many reviews and reports over several years, for example the Garnaut Review reports in 2008[15] and the update reports in 2011.

[14] http://www.garnautreview.org.au/update-2011/update-papers/up8-transforming-the-electricity-sector.html#t5 (emphasis added)

[15] Including a separate report by MMA on *NEM Market Failures and Governance Barriers for New Technologies*, 1 July 2008 (link here)

For instance, the 2011 Garnaut Review Update Paper 7: *Low emissions technology and the innovation challenge* includes a section on Market failures in demonstration and commercialisation, which notes that “the primary market failure at the demonstration and commercialisation phase is one of spillovers”.

The Per Capita report on *Distributed Gas-Fired Power Generation* documents the following market failures[16]:

- Barriers to entry for new producers
- Distorted electricity pricing structures
- Information gaps
- Subsidies to existing producers
- Failures to capture externalities.

More specifically, the relevant market failures include:

- Barriers to participation in the energy market:
  - It is impractical for individual consumers (homeowners or businesses) to try to participate in the energy market by negotiating individual deals with incumbent gen-tailers.
  - This barrier to entry means the benefits of DSP – which includes small scale *generation* as well as reducing consumption – are not captured.

- Externalities: The current regulatory and pricing system does not fully account for;
  - Negative externalities of the current system of generating, transmitting and consuming electricity (eg the incentives of the distribution businesses to over-invest in supply-side solutions; the inefficiency of building capacity to cope for peak demand occurring for only a few days per year; the true cost of consumers’ peak demand does not flow through into retail pricing – eg there is no cost penalty to homeowners who install inefficient air-conditioners, which drives up distribution investment) or
  - Positive externalities of small scale embedded generation and other forms of DSP (eg the public good of generating low emission power close to where it is used with far less strain on the transmission and distribution system).

- Pricing:
  - Caps on retail prices can limit the benefits of on-site generation during peak price periods
  - Lack of a feed in tariff means that small scale distributed generators do not capture all the benefits they deliver to the market. The owner of the generator gets the benefit of the energy used on-site but without a feed in tariff, receives no benefit for the energy exported to the grid.

[16] http://www.percapita.org.au/_dbase_upl/Energy%20Market%20Design.pdf

5. Feed-in Tariff for small scale low emissions technologies

The single most important regulatory change to overcome these market failures is to create a national feed in tariff for all small scale low emissions technologies.

The *defensible* policy rationale for feed in tariffs – as distinct from subsidising particular technologies as a form of industry development or protection - is to overcome market failures, ie to allow homeowners and businesses to participate in the energy market, and to pay them a fair value for the low emission electricity they export to the grid.

This is fundamentally different from a *premium* feed in tariff which is only available for residential solar PV.

Intuitively, a 'fair and reasonable' rate is usually taken to mean a one for one tariff equal to the retail price. In Victoria, the Essential Services Commission, which oversees the feed in tariff regime, has confirmed that the fair and reasonable rate required by the *Electricity Industry Act* means a 'one for one' rate equal to the retail electricity tariff.[17]

This policy holds true regardless of whether the technology is solar PV, other renewables or other small scale low emissions technologies.

This point has been recognised by several reviews and reports:

- The UK Government extended its feed in tariff to low emissions technologies (including small scale fuel cells using natural gas) for this reason:

  > *One of the prime reasons for introducing [feed in tariffs] is to remove the need for individuals and organisations whose primary business is not energy to participate in the electricity market.*
  >
  > *For small generators, finding buyers for their exported generation and achieving a reasonable price for it can be difficult and creates an extra burden that is disproportionate to the value of their exports. It is inefficient for non expert generators at the small scale to negotiate [power purchase agreements.*[18]

- The Victorian Competition and Efficiency Commission, *Inquiry into Environmental Regulation in Victoria* 2009[19], recommended:

  > *That the Victorian Government in responding to challenges in a carbon-constrained economy, commit to the principle of providing for neutrality among renewable energy sources and those with low carbon emissions, particularly in the area of electricity generation and distribution.*
  >
  > *Specifically that Division 5A of the Electricity Industry Act 2000 be amended to extend the requirement for energy retailers to publish prices, terms and conditions for the purchase of electricity from a broader range of low-emission technologies.*

- In January 2010 the Australian Academy of Science report on *Australia's Renewable Energy Future*[20] recommends a feed-in tariff for natural gas combined heat and power (CHP) domestic generation.

It is conceptually quite simple to define "small scale" and "low emission":

- Existing feed in tariff regimes already define small scale generators, typically around 5kW.
- "Low emissions" can be simply defined by reference to the existing emissions intensity of the grid, which is already measured and reported in the National Greenhouse Accounts. Similar figures are already used in State Government energy regulations.[21] So long as a small scale

[17] Essential Services Commission 2008, Guidance Paper - Methodology for Assessment of Fair and Reasonable Feed-in Tariffs and Terms and Conditions, March
[18] http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx
[19] http://www.vcec.vic.gov.au/CA256EAF001C7B21/0/C1FCD09796F81E39CA2576B300116152?OpenDocument
[20] http://www.science.org.au/reports/documents/AusRenewableEnergyFuture.pdf
[21] For example retailers use this figure to calculate emissions on electricity bills under Guideline 13 of the Victorian *Electricity Industry Act*.

generating technology had an emissions intensity of say 25 percent less than than the national grid, it could be classed as "low emission".

As the policy is intended to encourage the generation of low emission *electricity*, the emissions intensity of the product should be measured by electrical efficiency, not by overall system efficiency. Other outputs of the technology or product – eg heating or cooling – should not be included in the calculation of emissions intensity.

Feed-in Tariffs in Other Markets

Many governments have recognised the benefits of expanding policies to include low emissions technologies as well as renewable energy. Several large markets have introduced policies specifically to recognise the benefits of small scale low emissions generators using natural gas.

These policies are summarised in **Appendix A**.

Ceramic Fuel Cells has received very strong interest from partners and customers in each of these markets, and in many other global markets.

Two notable markets with extended feed-in tariffs are Germany and the United Kingdom:

- In **Germany** fuel cell power and heat generators up to 50 kilowatts capacity receive a **gross** premium feed-in tariff of about 14 Australian cents (~€0.10) for every kilowatt hour fed into the grid, including a €0.0511 generation tariff[22]. The total benefit for electricity consumed on-site, including the avoided retail cost, is about 38 to 41 Australian cents (€0.28 – 0.30) per kilowatt hour.
- In 2010 the **United Kingdom** Government introduced a **gross** premium feed-in tariff for small scale combined heat and power units. Households receive a cash tariff of 16 cents (£0.10) per kilowatt for all electricity generated, as well as avoiding the retail price, of about 17 cents (£0.11) – i.e. a total benefit of about 33 cents (£0.21). For electricity exported the homeowner receives an additional tariff of 5 cents (£0.03), ie 21 cents in total (£0.13) per kilowatt.[23]

[22] The tariff is equal to the quarterly average wholesale price (currently about 4 to 7 Euro cents) plus a bonus of 5.11 Euro cents per kWh, ie about 9 to 12 Euro cents for exported electricity.

[23] http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/feedin_tariff/feedin_tariff.aspx

6. APPENDIX A – Table of Government Policies in Key Markets

Government incentives for fuel cell home generators, using natural gas to make power and heat:

Policy	Germany	UK	France	Netherlands	Japan	Korea	USA	Australia
Capital subsidy	-	-	-	✓ A$6,200 (€4,000) for initial units	✓ Up to A$19,400 (¥1.65 m) per unit Various gas utility subsidies	✓ Subsidy as a % of unit costs: 80% 2010 50% 2013 30% 2017	✓ California A$5,400 (US$ 5,000) for a 2kW unit	**No** Federal – solar PV only
Feed in tariff	✓ Premium of 8 cents (€0.0511) per kWh, gross for systems under 50kW	✓ Premium of 18 cents (£0.10) plus export premium of 5 cents (£0.03) per kWh, from April 2010	✓ Premium of 12 cents (€0.078) per kWh	✓ Premium of 14 cents (€0.09) per kWh above 5000 kWh export (depending on supplier)	-	-	✓ California consulting now	**No** State schemes – solar PV & renewables only
Tax breaks	✓ Rebate of fuel tax: €0.0055 per kWh No income tax on electricity sales No "*Energiesteuer*" on the fuel	✓ Discounted VAT (5% not 17.5%) No income tax on electricity sales	-	-	✓ Gas utility offering discounts on input fuel	-	✓ Federal tax credit 30% or A$1,080 (US$1000) per kW, whichever is less	-
"mandatory" purchase **(e.g. included in low emission targets for utilities or homes)**	✓ Installing unit releases home owner from EnEV and EEGWärmeG obligations	✓ ROC's EEC's Renewable heat incentive CERT A$1.7 billion (£1b) per year from 2008-2011	-	-	-	-	-	**No** Renewables only – plus waste coal mine gas

Energy efficiency schemes	✓ EnEV: All homes 30% less energy consumption by 2012 EEGWärmeG: All new homes must use low emission energy for heating / cooling	✓ All new homes zero carbon by 2016, commercial buildings zero carbon by 2019	✓ New homes low energy consumption by 2012 (<50kWh/m²/ year)	-	-	-	-	**No** State schemes - exclude electricity generating equipment
Government targets	✓ 25% of electricity from CHP (large and small) by 2020	Estimated 2-3 million micro-generation units (incl fuel cells) by 2020 (9m with new incentives)	-	-	-	✓ 5% electricity from *New and Renewable Energy* (incl fuel cells) by 2012 10,000 home fuel cell units (and 2,000 commercial units) by 2012	-	**No** Renewables only 5-25% by 2020
Government investment	✓ Hydrogen & Fuel Cells innovation program A$2.1 billion (€1.4 b) 2008 to 2015	✓ UK Carbon Trust funding	✓ Hydrogen and Fuel Cells R&D A$15 million (€10 m) per year	-	-	✓ Funding to achieve fuel cell targets by 2012	✓ Dept of Energy SECA program Federal 'green stimulus' package Loan guarantees	-

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