

***Submission to the
Clean Energy Finance Corporation
Expert Review***

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This submission seeks to provide independent advice regarding the investment climate for clean energy projects in Australia and explores the role the Clean Energy Finance Corporation (CEFC) could play in that environment. It argues that the CEFC will be most effective if its mandate allows it to identify the best market interventions for each different supported clean energy project. Through experience and trial and error, the CEFC will develop policies that lead to optimal commercial, developmental and societal outcomes by specifically tailoring financing support every time it is given. Therefore, the CEFC must be obliged to consider a broad range of market interventions and prioritise investments with regard to a broad range of factors, taking into account the shortcomings of the *REE Act* 2000 (Cth) and the barriers known to be posed by existing law regarding allocation of responsibility on renewable energy generators to pay for connection to electricity networks and for consequential upgrades of those networks. This will ensure that investments by the CEFC positively impact society, reduce the need for carbon intensive energy generation and allow Australia to profit from the transition to a carbon-constrained economy.

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The Role of the CEFC and the Innovation Process

1. This submission understands the role of the CEFC as to facilitate private investment in the deployment of clean energy projects (**CE projects**) and development of clean energy technology (**Clean Tech**). This submission draws upon research that we have conducted generally into renewable energy incentive laws and in particular, more recently, research into the stimulation of investment in geothermal energy projects. That research identified an unfavourable risk/reward profile as the major barrier for investment. As a senior executive of a prominent venture capital firm explained that, “no banks are going to fund these projects, so it’s all got to come from equity and the equity has got to get the appropriate reward”.²

2. Although this comment was made in relation to geothermal development, it describes the kind of “gap” that the CEFC can fill by through investment that the business and finance community have not yet embraced. Other submissions will doubtless discuss the potential for leveraging private investment in this way, and the expert review members’ own research will doubtless canvass the various forms of possible intervention (See paragraph 10).

3. This submission refers to the Australian geothermal industry to illustrate some arguments. It has been recently reported that the Solar Dawn and Moree Solar projects will fail to meet the terms of their grants.³ This is reminiscent of recent failures by geothermal projects to obtain the matching funds required under the Geothermal Drilling Program.⁴

² Interview no. 5, Venture Capital Firm Executive (Telephone Interview, 31 August 2011).

³ Giles Parkinson, ‘Solar Flagships May Fly at Half Mast’, *Climate Spectator*, 2 December 2011 (online) <<http://www.climatespectator.com.au/commentary/solar-flagships-may-fly-half-mast>>.

⁴ John Canaris et al, *ASX Release - Joint Company Statement: GDP Funding Mutually Terminated* (2011) <http://www2.torrensenergy.com/announcements/110808_gdp.pdf>.

From these difficulties arise obvious opportunities for the CEFC to complement existing and future government programs, discussed below.

4. The goal of facilitating investment in clean tech requires an understanding of how new technologies progress from conception through to widespread deployment (See figure 1). Timothy Foxon puts it best: “Technologies make progress along the innovation chain as a result of flows of funding, knowledge and influence between actors in the innovation system.”⁵

5. Under the current Australian framework, private investors will not provide all the capital required to progress clean tech along the innovation chain. As Bürer and Wüstenhagen have explained the problem in general terms: “It is in this middle part, between government-funded R&D and self-sustaining funding from customers, where innovative technology firms struggle most”.⁶ This stage is commonly known as the ‘valley of death’.⁷

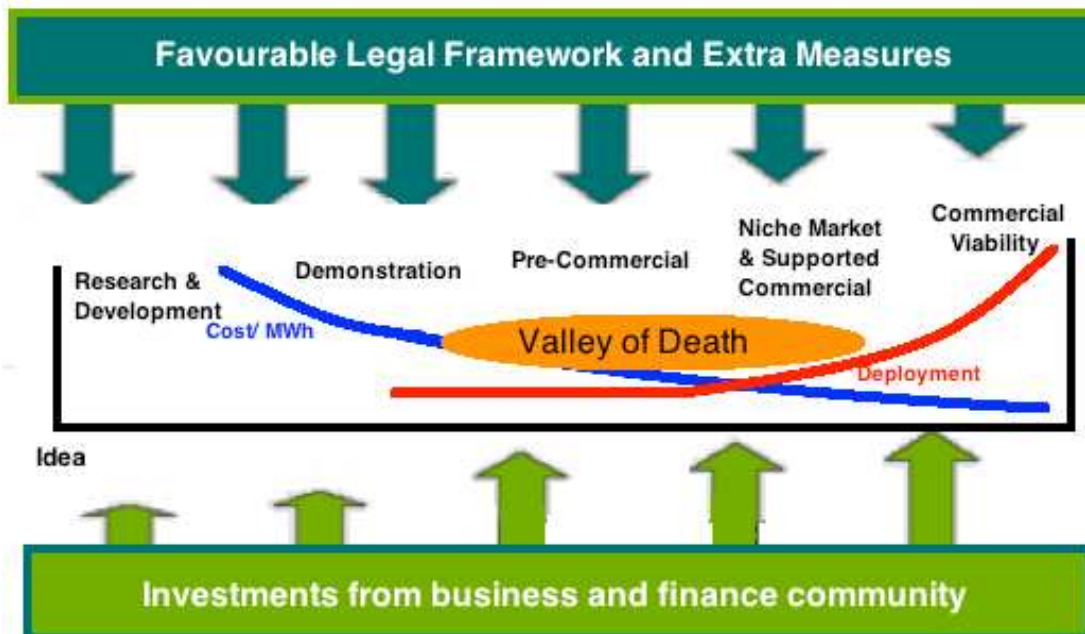
Figure 1: The Innovation Process⁸

⁵ Timothy Foxon et al, 'Energy Technology Innovation: A Systems Perspective' (Report, Garnaut Climate Change Review, December 2007 2007), 39.

⁶ Mary Jean Bürer and Rolf Wüstenhagen, 'Which renewable energy policy is a venture capitalist's best friend? Empirical evidence from a survey of international cleantech investors' (2009) 37 *Energy Policy* 4997, 4998.

⁷ See, e.g., Environmental Audit Committee, 'The Green Investment Bank' (Report, House of Commons, 3 March 2011); Foxon et al, above n 4.

⁸ Adapted from Michael Grubb, 'Technological Innovation and Climate Change Policy: an Overview of Issues and Options' (2004) 41(2) *Keio Economic Studies* 103.



6. The CEFC does not form part of the legal framework under which clean energy projects exist – it is an extra measure, albeit one created by legislation, designed to stimulate investments from the business and finance community. Only sound legal frameworks can provide maximum certainty as to the future yield of CE projects. The job of the CEFC is to stimulate investments from the business and finance community by reducing the risk that projects will fail. This is because investors “tend to hate losses more than they love gains”.⁹ By investing in clean tech and CE projects the CEFC will both reduce the risk that projects will be starved of funding, and reduce the amount needed to be risked by the business and finance community.

7. The funding gap, or, more colourfully, the valley of death, is well illustrated by the challenge facing the geothermal industry in Australia. For that industry, “there is lots of learning to be achieved and better techniques can only come from trial and error; but trial and error is expensive when you’re drilling down five kilometres”.¹⁰ Indeed, the industry

⁹ Interview no. 6, Investment Fund Executive (Telephone interview, 1 September 2011).

¹⁰ Interview no. 5, Venture Capital Firm Executive (Telephone Interview, 31 August 2011).

faces “significant challenges from an exploration and therefore a risk perspective”.¹¹ It is ironic that these risks deter the investment of funds needed to demonstrate the technology in Australia and thus reduce the associated risks. Other technologies face separate barriers. One common barrier is the difficulty involved in securing power purchase agreements with the large generator-retailers.

8. CEFC investments will yield the best financial and societal dividends by providing and catalyzing investment in projects that lead to technological and institutional learning. Learning can lead to cost reductions, more proficient technology operation and “the institutional transformations necessary to support the introduction and diffusion of new technologies and allow them to enter the realm of widespread use”.¹² This can be seen in the dramatic improvement in wind turbine efficiency over the last 20 years, and the ongoing fall in the price of solar PV.¹³ The phenomenon of the “experience curve effect” says that the cost of producing a product will go down as the task of producing it is performed an increasing number of times.¹⁴ Technological learning, though hard to predict, indicates that clean energy solutions will become more efficient and yield increasing returns as they are deployed.¹⁵

9. Institutional learning will be paramount to the ability of the CEFC to effect change and bring about investment in clean energy. The expressed intention to learn from the experience in the UK and USA is the correct approach and will yield a more effective

¹¹ Interview no. 2, ASX Listed Clean Energy Company Executive (Telephone interview, 2 September 2011).

¹² Bob van der Zwaan and Ambuj D Sagar, 'Technological Innovation in the Energy Sector: R&D, Deployment, and Learning-by-Doing' (2006) 34 *Energy Policy* 2601, 2602.

¹³ Patrick Hearps and Dylan McConnell, 'Renewable Energy Technology Cost Review' (Technical Paper, Melbourne Energy Institute, March 2011).

¹⁴ George S Day and David B Montgomery, 'Diagnosing the Experience Curve' (1983) 47(2) *The Journal of Marketing* 44.

¹⁵ See, for example, Arne Klein, *Feed-in Tariff Designs: Options to Support Electricity Generation from Renewable Energy Sources* (Dr Müller Aktiengesellschaft & Co, 2008) 43.

organisation.¹⁶ Key to this effectiveness will be the investment mandate. This must reflect the mission, which is to facilitate or accelerate the financing of at least some CE projects that would not otherwise be financed.

10. The expert panel cannot be expected to have all the right answers to at the end of this review. Therefore, the CEFC must have a mandate that allows it to test novel market intervention mechanisms. Options include direct on-market purchase of shares, direct equity investment in a joint venture, underwriting capital raising, participating in capital raisings, loans, and risk insurance. A logical approach would be for the CEFC to match funding options to technologies they suited. Common sense tells us that different funding mechanisms are best for different projects; logic and history can guide us to better decisions. Concessional loans could finance the expansion of commercially proven projects. Direct investment by share placements, at the right price, would be appropriate where capital is required to grow revenue stream and scale up innovative projects. The optimal intervention by the CEFC will vary between technologies depending on their individual characteristics and position on the innovation chain.

11. By backing the clean technologies of the future, the CEFC may ultimately produce a positive yield. However, in order to develop clean technologies and encourage private investment, the CEFC must take significant risks and have a long-term investment strategy. It should be given the broadest possible scope to profit from its activities so the mandate must allow different market interventions from venture capital style investments through to commercial-rate loans. The mandate must allow the flexibility to invest in a company or a specific project, through a joint venture, so that the CEFC may share the risks and rewards of a that project without exposure to the partner's other operations. The CEFC owes it to

¹⁶ Giles Parkinson, 'Q & A: Jillian Broadbent', *Climate Spectator* (online), 14 October 2011 <<http://www.climatespectator.com.au/commentary/qa-jillian-broadbent>>.

the taxpayer to ensure that it always prefers projects that provide more benefits to Australian companies, employees, shareholders and service providers. This is, however, but one of many criteria to be considered.

12. It is clear that for the CEFC to have a desired impact on emerging clean energy technologies, it must have a risk mandate that assumes that somewhere in the course of investing \$10 billion, some money will be lost. The bankruptcy of Solyndra, the nature of markets and the volume of competing renewable energy technologies strongly indicate that not all companies will succeed. By holding equity in multiple projects and companies, the CEFC will increase its ability to influence the success of investments by harnessing synergies between different interests.

The Context in which the CEFC Operates

13. One pillar of the legal framework for clean energy development is the *Renewable Energy (Electricity) Act 2000* (Cth) (**REE Act**), which aims to encourage additional generation of electricity from renewable sources.¹⁷ It obliges electricity retailers to source a certain amount of the wholesale electricity they buy from renewable sources,¹⁸ and therefore creates a mandatory renewable energy target by which production of an extra 41,000GW of renewable electricity per annum can be achieved by 2020.¹⁹ The *REE Act* also grants the right to trade and bank Renewable Energy Certificates (RECs) representing 1 MWh of renewable energy generated,²⁰ and has been amended to separate Small-Scale Technology Certificates and Large-Scale Generation Certificates (LGCs).²¹

14. It is of major significance that the *REE Act* is technology neutral. Whilst some may see this as a positive feature of the legislation, a more long-term view focussed on dynamic efficiency suggests that this approach is problematic for emerging renewable energy technologies such as geothermal energy, ocean energy, artificial photosynthesis and large scale solar thermal energy. It is well known by researchers and the renewable energy sector that low demand for LGCs and political uncertainty combined with the difficulty in securing a favourable PPA (power purchase agreement) mean that investment in CE projects has stagnated, even in the most commercially viable technologies such as onshore wind. Project development staff of wind energy companies have stated to us on numerous occasions throughout 2011 that the low price of LGCs is likely to persist until some time in 2014, and that one of the major preoccupations of wind farm developers is to keep project planning approvals alive and extended until such time as the LGC price rises significantly

¹⁷ *Renewable Energy (Electricity) Act 2000* (Cth) s 3.

¹⁸ *Ibid* ss 31, 35.

¹⁹ *Ibid* s 40.

²⁰ *Ibid* s 27.

²¹ *Renewable Energy (Electricity) Amendment Act 2010* (Cth).

and when PPA power purchase agreements are more readily secured at a favourable rate. If wind energy project developers are having serious difficulties, it is self evident that those companies involved in further-from-market competitiveness renewable energy technologies are struggling and are expected to continue to struggle for some time to come, under the existing federal legislative framework.

The international journal literature suggests, on the basis of analysis and modelling, that “renewable energy certificate [schemes] have different relative effects for different generation technologies”.²² This is clearly the case in Australia: analysis in August 2011, by Green Energy Markets, projects that virtually all LGCs will continue to be created by wind, bagasse and landfill gas.²³ The *REE Act* is not a significant driver of investment in (currently more expensive) emerging technologies, and offers no support whatsoever for the most viable clean technologies, such as fuel cells (which utilize gas efficiently and cleanly). However, what is certain is that eligible CE projects will need to progress quickly in order to benefit from the *REE Act*, which expires in 2030.

15. The three biggest liable parties under the *REE Act*, AGL, TRUenergy and Origin Energy have all announced that they have already obtained sufficient LGCs to satisfy their liability through to 2014 or 2015,²⁴ and therefore have no immediate requirement to purchase LGCs over the market. This lack of demand undermines the LGC price and the

²² Irina Falconett and Ken Nagasaka, 'Comparative analysis of support mechanisms for renewable energy technologies using probability distributions' (2010) 35 *Renewable Energy* 1135, 1141.

²³ Green Energy Markets, *The Renewables Report: Focus on the LGC market* (2011) <<http://www.greenmarkets.com.au/the-rec-report.html>>.

²⁴ Interview no. 9, Environmental Markets Analyst (Telephone interview, 5 October 2011); Giles Parkinson, 'Between a REC and a Hard Place', *Climate Spectator* (online), 24 February 2011 <<http://www.climatespectator.com.au/commentary/between-rec-and-hard-place>>.

currently subdued prices demonstrate the massive influence of the three massive retailer-generators on the LGC market.²⁵

16. With the support of the generator-retailers, (literally) groundbreaking progress has been made in the field of Engineered Geothermal Systems (EGS). Petratherm, backed by TRUenergy, and Geodynamics, backed by Origin Energy, have the most advanced geothermal projects in Australia. Unable to partner with a generator-retailer, the Solar Dawn project, also employing an emerging clean energy technology (solar thermal) is hoping for the support of the government owned energy retailer, Ergon Energy.²⁶ If the CEFC can catalyze investment in projects that are independent of the three generator-retailers, it could have a huge leveraging effect over the long term. Regarding the solar industry, the posited Infingen/Suntech joint venture lacks a committed generator-retailer partner, but may have the most commercially viable technology. It must be open to CEFC experts to consider investment in electricity as a commodity or new players in the retail market if the right opportunities arise.

17. At present, the three generator-retailers are therefore virtually essential partners in any major CE project. In practice, only the generator-retailers can provide the power purchase agreements that are a virtual requisite for project finance. They will also usually be the ultimate purchaser of the LGCs that are supposed to create demand for such projects. Understandably, all three of the generator-retailers hope to extend this state of affairs and are advocating an extension of the scheme.²⁷

²⁵ Giles Parkinson, 'Australia's Clean Power Struggle', *Climate Spectator* (online), 21 September 2011 <<http://www.climatespectator.com.au/commentary/australias-clean-power-struggle>>.

²⁶ Giles Parkinson, 'Solar Flagships May Fly at Half Mast', *Climate Spectator*, 2 December 2011 (online) <<http://www.climatespectator.com.au/commentary/solar-flagships-may-fly-half-mast>>.

²⁷ Interview no. 9, Environmental Markets Analyst (Telephone interview, 5 October 2011); See also, Giles Parkinson, 'Q&A: Grant King', *Climate Spectator* (online), 26 August 2011 <<http://www.climatespectator.com.au/commentary/qa-grant-king-1>>.

18. Understanding regulatory risk is of the utmost importance to any investor, including the CEFC. However, one way in which the CEFC may be able to leverage investment in CE projects is to buy LGCs or even seek to act as a broker for power purchase agreements. The merits of novel market interventions such as this should face the proper scrutiny by the qualified financial experts. However, from a governance perspective the experts at the CEFC must be entitled to consider and test all potentially profitable investments that will encourage investment in CE projects by the business and finance community. The CEFC will function more effectively, minimize profits, and maximize gains if it is independent from political interference by vested interests.

19. The Review is wisely considering non-financial factors that inhibit clean energy projects. Every single clean energy project is hampered by technological, institutional and social inertia. Unruh (2000, 2002, 2006) has identified this phenomenon as ‘carbon lock-in.’ He explains that “industrial economies have become locked in to fossil fuel-based technological systems through a path-dependent process driven by technological and institutional increasing returns to scale”.²⁸

20. One way in which techno-institutional lock-in is manifested in Australia is in that rarely explored legal jungle: energy network regulation. The most significant regulated market is the National Electricity Market. It is governed by the *National Electricity (South Australia) Act 1996 (SA)*²⁹ and mirror legislation in the other participating jurisdictions.³⁰ The statutory bodies that regulate the NEM are the Australian Energy Market Commission³¹

²⁸Gregory C Unruh, 'Understanding Carbon Lock-in' (2000) 28(12) *Energy Policy* 817, 817.

²⁹ *National Electricity (South Australia) Act 1996 (SA)*.

³⁰ Australian Energy Market Commission, *Relevant Legislation* (2009) <<http://www.aemc.gov.au/Electricity/Legislation.html>>.

³¹ *Australian Energy Market Commission Establishment Act 2004 (SA)*.

(AEMC) and the Australian Energy Regulator³² (AER). The AEMC makes governing rules of the NEM, regulating its operation, its expansion, the integration of new power plants, the necessary network upgrades and the connection charges paid by users.³³ The AER monitors compliance with the rules.³⁴

21. The fact that the rules are designed to facilitate the growth of large coal and gas generation is a major barrier to clean energy projects. This is of particular importance as distributed clean energy generation in the form of small scale solar, wind, and fuel cells proliferate. This is virtually inevitable given the downward pressure distributed generation can apply to retail power prices due by minimizing transmission losses, managing peak loads, delaying the need for network upgrades, and even allowing for combined heat and power use, in the case of fuel cells³⁵ and small-scale solar thermal.³⁶ The current regulations do not contain a process by which distributed generators can connect to the grid and participate in the electricity market. As usual, then, new entrants are reliant on generator-retailers to buy the electricity they generate. Without regulatory reform there is no certainty that either the electricity grid or the gas grid (in the case of fuel cells) will optimally accommodate distributed generation.

22. In the case of large clean power generators, it is usually necessary to build new physical connections from new power plants to the nearest part of the grid. This requires the upgrade of certain parts of the network to keep it reliable and safe. Internationally, this occurs through a variety of mechanisms. It holds true throughout the globe that everyone ultimately pays for network upgrades. However, it varies between international jurisdictions as to where the burden of raising the initial capital falls. Under a deep charging

³² *National Electricity (South Australia) Act 1996* (SA) Pt 3.

³³ *Ibid* sch National Electricity Law, cl 34.

³⁴ *Ibid* s 15.

³⁵ See, for example, <<http://www.cfcl.com.au/products/>>.

³⁶ See, for example, <<http://www.greenearthenergy.com.au/newtechnologies/>>.

regime, the clean energy project pays all costs associated with connection, including upgrades and extensions. Under shallow charging the clean energy project proponent pays only the costs of connecting to the nearest appropriate part of the network.³⁷ The German legal framework provides for shallow charging, except where it is economically unreasonable.³⁸ Both the Spanish and English systems are a compromise between shallow and deep charging (shallow-ish charging).³⁹ The AEMC has found that a majority of industry stakeholders recognise that “the existing framework [is] unlikely to efficiently accommodate new generation connections...”.⁴⁰ The present rules fail to encourage Distribution Network Service Providers (DNSP) to build or upgrade connections to renewable generators. Small, capital-constrained renewable energy developers bear the burden of raising extra capital to pay deep connection charges (though they may apply for a grant to pay for this). This increases project risk and therefore the cost of capital, and makes finance harder to attract.

Investment Considerations

Other Than Commercial Viability

23. The Review is right to consider principles other than financial viability that could be used to prioritize investments. This submission touches on those principles throughout. The

³⁷ Corinna Klessmann, Christian Nabe and Karsten Burges, 'Pros and cons of exposing renewables to electricity market risks— A comparison of the market integration approaches in Germany, Spain, and the UK' (2008) 36 *Energy Policy* 3646, 3658.

³⁸ *Gesetz für den Vorrang Erneuerbarer Energien* [Act on Granting Priority to Renewable Energy Sources] (Germany) 1 January 2009, BGBl. I S, 2008, 2074 §§ 9, 14.

³⁹ Corinna Klessmann, Christian Nabe and Karsten Burges, 'Pros and cons of exposing renewables to electricity market risks— A comparison of the market integration approaches in Germany, Spain, and the UK' (2008) 36 *Energy Policy* 3646, Table 5.

⁴⁰ Tamblyn, Ryan and Woodward, 'Review of Energy Market Frameworks in light of Climate Change Policies: Final Report' (Australian Energy Market Commission, September 2009) 15.

following examples illustrate how different principles should affect decision-making by the CEFC.

24. One illustrative example of a CE project is the collaboration between Ocean Power Technologies Inc (a listed company based in New Jersey USA), Woodside Petroleum and Leighton Contractors.⁴¹ Despite being awarded a grant of over \$65 million to develop 19MW of wave power in 2009, there is nothing in the public domain to suggest that any progress has been made since that time. Delayed commencement of the project creates uncertainty about how it might interact with the REE Act, and how demand for LGCs will affect its commercial viability. What is certain is that the project is well positioned to generate minimal, if any, LGCs under the current REE Act. Were the CEFC to support such a project, it would essentially be supporting the development of foreign owned intellectual property. The likely increase in the value of the technology resulting from the experience curve effect would therefore flow mostly overseas. Further, it may not be in the financial interest of the ultimate proponents of the project for it to be profitable. They may have more to gain from failure than success, given their other interests. This may drastically decrease the likelihood of positive returns and illustrates the importance of subjecting CE project proponents to vigorous scrutiny. Given that the Australian taxpayer funds the CEFC, it would be right to consider the Australian companies (and therefore taxpayers) competing with Ocean Power.⁴² For example, at least two have progressed Australian projects further than Ocean Power *without* a federal grant. In the case of at least one of them, access to capital has been a major barrier to deployment.⁴³

25. A second illustrative example concerns the level of support the company already receives from the business and finance community. For example, Ceramic Fuel Cells, has

⁴¹ See Company Website, <<http://optaustrolasia.com.au/?id=101>>.

⁴² For example, Carnegie Wave Energy and Biopower Systems.

⁴³ Grant Mooney, 3 November 2011, Annual General Meeting Chairman's Address.

progressed a new technology along the innovation process, mostly funded by private equity investments from the finance and business community here and overseas. Having secured larger orders from European utilities, the company recently sought, again, to raise funds on the equity market in order to buy components in bulk and drive down unit prices. Although the company raised sufficient capital, greater access to capital would allow greater economies of scale sooner, and therefore accelerate cost reductions. The CEFC could have partially underwritten the capital raising. This could leverage significant extra investment by indicating to private investors that the company *would* raise the requisite funds one way or another. This encourages investment for obvious reasons, but even if the CEFC were required to actually invest funds in the case of a shortfall, this investment could still be profitable in the long run, thus reducing the risk for the CEFC. In this way the CEFC can leverage private investment, ensuring that Australian owned and developed technologies can compete on a global stage. This may lead to the widespread deployment of fuel cells in Australia, which could have positive effects on society. For example, distributed technology, such as fuel cells, can reduce the cost of retail electricity by flattening out peaks in demand, according to the managing director of Ausgrid.⁴⁴ These is the exactly the kind of consideration the CEFC must take into account if is it to yield optimal benefits to Australian society.

26. These examples depict a variety of possible considerations that ought to be used to prioritise investments. The intention is not to make investment recommendations, but rather to demonstrate that the relevant considerations for prioritizing investments are infinite. Therefore the mandate must be drafted so as to allow the CEFC to consider the best interests of Australians, the environment and the collaborative global challenge of developing solutions to climate change. New technologies, demonstrated and deployed

⁴⁴ AAP, 'Ceramic Fuel Cells up on Smart-Grid Win' 31 May 2011 *Sydney Morning Herald* (online) <<http://news.smh.com.au/breaking-news-business/ceramic-fuel-cells-up-on-smartgrid-win-20110531-1fdwr.html>>.

here, but implemented elsewhere, have the potential to make a significant difference to the global attempt to reduce greenhouse gas pollution. Through leveraging funding to develop new technologies, the Clean Energy Finance Corporation allows Australia to contribute (profitably) to the solution disproportionately to our population. This is desirable given our disproportionate per capita contribution to global greenhouse emissions.