

SUBMISSION TO THE AUSTRALIAN GOVERNMENT REVIEW OF CLIMATE CHANGE POLICIES

MAY 2017

1.1 EXECUTIVE SUMMARY

This submission discusses opportunities and barriers for investment in clean energy and emissions reduction projects that the CEFC has identified as an investor alongside the private sector.

This submission covers the following topics:

- electricity generation (summarising the CEFC's [submission](#) to the Independent Review into the Future Security of the National Electricity Market in February) (section 2.1)
- households, small and medium enterprises and the built environment (section 2.2)
- resources, manufacturing and waste (section 2.3)
- transport (section 2.4)
- land and agriculture (section 2.5)
- government operations (section 2.6)
- research, development, innovation and technology (section 2.7).

1.2 ABOUT THE CEFC

The Clean Energy Finance Corporation invests, applying commercial rigour, to increase the flow of finance into the clean energy sector.

Our mission is to accelerate Australia's transformation towards a more competitive economy in a carbon constrained world, by acting as a catalyst to increase investment in emissions reduction.

We do this through an investment strategy focused on cleaner power solutions, including large and small-scale solar, wind and bioenergy; and a better built environment, with investments to drive more energy efficient property, vehicles, infrastructure and industry.

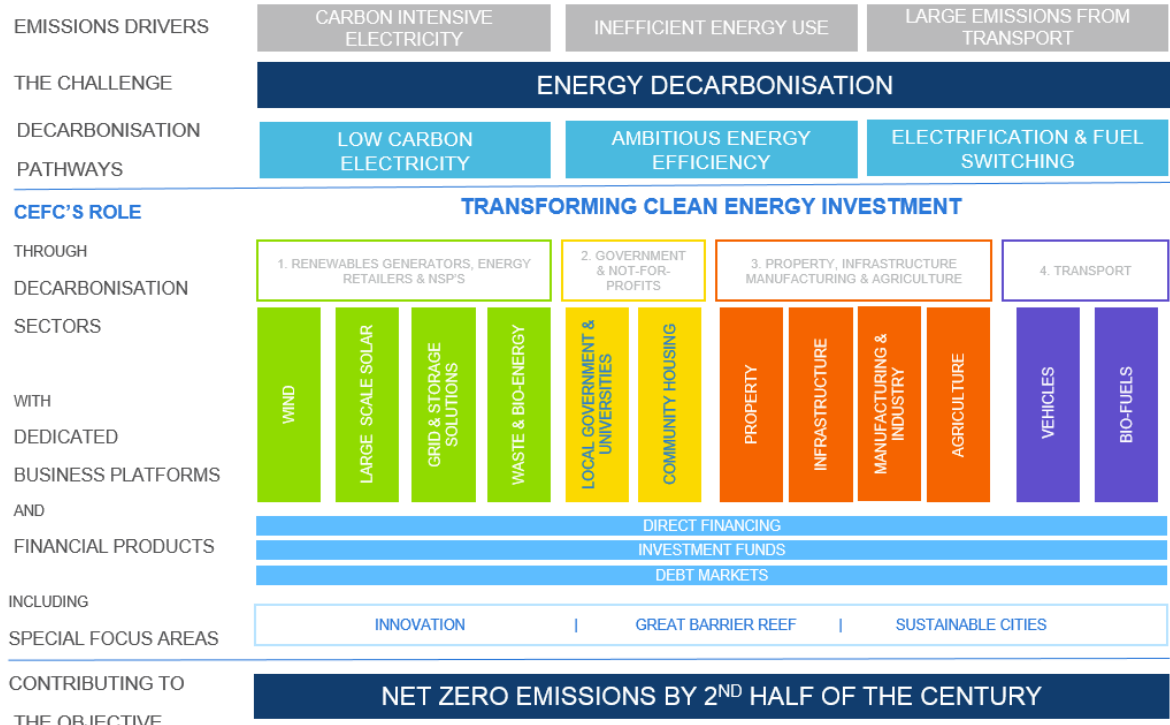
The CEFC also invests with co-financiers to develop new sources of capital for the clean energy sector, including climate bonds, equity funds, aggregation facilities and other financial solutions.

The CEFC operates under the *Clean Energy Finance Corporation Act 2012*.

The CEFC's strategic framework supports sectors in the Australian economy that are the largest sources of carbon emissions to reduce their emissions and ultimately to help to transform the economy to achieve net zero emissions by the second half of the century.

Our strategic framework is illustrated in Figure 1.

Figure 1: The CEFC’s strategic framework



Source: CEFC

2.1 ELECTRICITY GENERATION

Australia's electricity system is seeing significant new investment. Renewable energy is entering the market at increasing scale, replacing ageing generation infrastructure and contributing to meeting Australia's carbon reduction commitments. The cost of producing electricity from renewable resources has declined significantly over recent years and remains on a rapid downward trajectory.

Despite strong growth in renewable energy generation, electricity market design continues to reflect a system dominated by high-emissions thermal generation. Market rules need to be updated for an electricity grid with a growing share of renewable energy to promote a reliable and affordable electricity service. At the same time, investment is required in technologies and infrastructure such as grid-scale storage and transmission to better integrate and optimise high levels of renewables.

The CEFC supports the development of a resilient, balanced and secure electricity system through its investment activities, which include large-scale renewable energy, energy storage and other initiatives.

Drawing on our experience as a specialist clean energy investor, the CEFC made a [submission](#) to the Independent Review into the Future Security of the National Electricity Market (the Finkel Review) in February which identified opportunities and barriers for reducing emissions in the electricity sector. It highlighted the following themes:

Market design to support security and reliability

1. High levels of renewable penetration are technically feasible and are consistent with maintaining energy security
2. Strengthened transmission is necessary to facilitate a secure high-renewables electricity system
3. To minimise costs to consumers and maintain energy security, policies should support investment in renewables and storage to prepare in advance for coal capacity withdrawals
4. Demand management is important for boosting system resilience and lowering costs

Technology to transform the electricity sector

5. Technology costs for renewables and storage are continuing to decline
6. Energy storage will play an important role in an electricity system with high renewables penetration
7. Biomass can deliver baseload renewable energy using established technology
8. The electricity system has lower-cost opportunities to reduce emissions than other sectors and is capable of bearing more than its proportionate share of the national emissions reduction burden to 2030

Barriers to investment

9. Policies to drive the long-term transition must be bankable
10. New fossil-fuel generation in Australia would be unlikely to find private sector finance at an acceptable cost.

Please refer to that [submission](#) for a more comprehensive statement of the CEFC's views on the opportunities and barriers for reducing emissions from electricity generation.

2.2 HOUSEHOLDS, SMALL AND MEDIUM ENTERPRISES AND THE BUILT ENVIRONMENT

Opportunities for households, SMEs and the built environment primarily relate to opportunities for energy efficiency and 'behind-the-meter' renewable energy and battery storage.

The barriers to energy efficiency investment have been well [summarised](#) by the International Energy Agency (IEA) as a combination of *'the lack of awareness of efficiency benefits and addressing complex decision-making barriers (which often overvalue up-front costs and undervalue future energy savings)'*. The CEFC's experience in pursuing investments in energy efficiency has been consistent with the IEA's assessment.

Another report from the IEA highlighted further barriers to financing energy efficiency investment, including small transaction sizes with high transaction costs, the diverse nature of the opportunities, split incentives between owners of property assets and tenants, and difficulties financing energy efficiency against cash flows, since the benefit is a cost saving.

For all these reasons, strong policies are typically needed to encourage widespread uptake of energy efficiency, especially for SMEs and the built environment.

The CEFC is working to address opportunities and challenges for SMEs through our co-finance and aggregation programs with CommBank, NAB, Westpac, Eclipx, and Origin, among others. These programs deliver some degree of concessional finance to businesses that choose energy efficient or clean energy assets and equipment.

These programs can only assist at the time of new purchase decisions. Additional policies could help stimulate further investment by encouraging earlier upgrade of old and inefficient plant and equipment.

Opportunities and challenges in the built environment are complex and vary by sub-sector.

All new buildings and significant renovations must comply with Section J of the National Construction Code (NCC). Most state and federal government leased offices are required to achieve some level of NABERS Energy rating (typically a Base Building rating) as part of the National Green Lease Policy. Leadership from government procurement practices is generally acknowledged to have been transformative in the sector in the past.

The Commercial Building Disclosures Program requires disclosure of energy efficiency performance of commercial offices spaces and as of July 1 2017, the threshold for mandatory disclosure will be lowered from 2,000 square metres to 1,000 square metres.

Mandatory disclosure and minimum leasing requirements have helped drive activity in the commercial office sector. Outside of the commercial office sector, however, uptake of initiatives that go beyond the basic NCC requirements has been minimal.

A [2016 report](#) by the Australian Sustainable Built Environment Council found that cost-effective energy efficiency opportunities in property could deliver almost \$20 billion in financial savings by 2030.

There are significant opportunities to **promote stronger minimum requirements** across commercial and residential properties and infrastructure in Australia. In property, this could be achieved through the 2019 NCC update or state based requirements to augment the NCC. In infrastructure, emissions reductions could be achieved through PPP or government procurement requirements that encouraged emissions reduction initiatives.

Similarly, minimum standards for government leases could also be incrementally increased over time, to provide a stronger market signal to build beyond the current expectations.

Beyond the minimum requirements, continued **support for voluntary 'star rating' type systems** should also be encouraged. These systems can help provide market information and signals not only in property markets, but also in capital markets, where there is growing interest in green bonds.

Robust rating systems can help investors identify and allocate the best performing assets to low-carbon portfolios, or can be used by bond issuers to provide green bonds to the market.

Increasing the supply of low and even zero emissions buildings will help to develop sector expertise and supply chains.

Clean energy investments do not always result in higher capital expenditure, and even where they do, operational savings are often identified. Additionally, as market experience and scale increase, costs are likely to fall.

2.3 RESOURCES, MANUFACTURING AND WASTE

Technologies are readily available to reduce, capture and store or reuse emissions from manufacturing, waste and mining. Adopting new technologies typically introduces an additional cost and in the absence of a policy driver, there are limited incentives for businesses to reduce their emissions. Encouraging abatement in this sector requires incentivising businesses to undertake projects and adopt technology to reduce or capture emissions.

In the absence of explicit regulation or a price on carbon, other policies can encourage abatement in this sector, but will tend to require government funding or other incentives to be unlocked. Almost all the projects the CEFC has financed in this sector have relied on grants or financial incentives from the carbon price programs, ARENA, the Emissions Reduction Fund (ERF) or the Renewable Energy Target (RET).

CEFC investments in the resources, manufacturing and waste

The CEFC provides financing that supports the manufacturing and resources sectors adopt behind-the-meter renewables and low-emissions and energy efficiency technology. The CEFC also uses finance to promote the uptake of small and large-scale energy from waste and emission reduction projects. Projects the CEFC has financed in this sector include:

- Two alternative fuel plants that transform non-recyclable waste into fuel, reducing emissions by ~8Mt CO₂ over the lifetime of the project
- A solar and battery storage installation at [Sandfire Resources copper mine](#) in Western Australia
- [6MW of biogas](#) at six council landfills, reducing emissions by ~800,000t CO₂
- Expansion of a [plant at Moranbah](#) which captures waste coal-mine gas and turns it into electricity, saving some 50Mt CO₂ over its lifetime
- A [plant at meat processor JBS](#) that captures biogas from meat production to power boilers
- A biogas digester at [Darling Downs Fresh Eggs in Queensland](#), which takes chicken manure and uses it to power the farm, reducing grid-electricity use and emissions
- [Expansion of a manufacturer](#) of world-leading carbon-fibre car wheels. The wheels are lighter than aluminium wheels, reducing fuel consumption & emissions.

Manufacturers are also helping Australia transition to cleaner energy, with the help of CEFC finance e.g. [Taralga](#), [Portland](#) and [Ararat](#) wind farms use Australian manufactured wind towers.

The CEFC partners with [Commonwealth Bank](#), [Westpac](#) and [National Australia Bank](#) and others to finance small energy efficiency and renewable energy projects. Customers that choose plant and equipment with higher energy efficiency ratings can access loans at concessional rate. Businesses involved in the manufacture of steel, plastic, carpet and cabinetry, and food and beverages have accessed this finance, helping to reduce costs and emissions. The CEFC has also established a new [equity fund](#) that will help accelerate the uptake of energy from waste.

Unlocking further abatement in this sector is likely to require the continued operation and expansion of some existing policies as well new policies and incentives.

Waste levies: There is [inconsistency in waste levies across](#) jurisdictions. Some states do not have a waste levy and others are not high enough to drive investment in energy-from-waste projects. Waste levies that are consistent across jurisdictions, set at a level that reflects the long-term economic, social and environmental cost of landfill, could address one of the biggest barriers for large-scale energy-from-waste projects and discourage the transport of waste across borders.

Australian Government renewable energy policy that supports energy from waste: There are no large-scale energy from waste projects in Australia, despite widespread take-up internationally.

In addition to providing renewable energy and reducing emissions, the technology has a range of co-benefits such as improving recycling rates and reducing landfill. It can also be used in remote locations. Importantly, it generates firm electricity and can complement variable renewables and provide ancillary services to the electricity market. Its ability to provide firm power will become increasingly valuable as coal retires and the penetration of wind and solar PV increases.

The additional benefits that this technology provides are not captured under Australian Government policies such as the RET, nor in state-based renewable policies like contract-for-difference tenders which tend to favour projects with the lowest LCOE, creating a significant barrier to investment for commercial energy-from-waste projects. There are many small energy-from-waste projects in operation, but to see strong uptake of commercial-scale projects, some form of long-term Australian Government renewable policy would be needed (e.g. an extension of the RET beyond 2030, a clean energy target or contracts for difference). Renewable energy support policies could put value on not only the renewable and abatement potential of any new capacity, but also other benefits such as dispatchability and ancillary services. [The CEFC estimates that](#) there is potential for new bioenergy and energy from waste projects to avoid 9 Mt of CO₂ each year.

Renewable heat incentive: A renewable heat incentive along the lines of the [Non-Domestic Renewable Heat Incentive](#) operating in the United Kingdom for many years could work in tandem with a policy like the RET. An incentive would encourage businesses to generate heat from renewables. Australian companies have already installed renewable energy capacity to produce heat but typically need financial assistance to do so. For example, meat producers AJ Bush and JBS relied on grants from the Australian Government Clean Technology Food and Foundries program. With the grant program now closed, a renewable heat incentive may provide an incentive for other businesses and manufacturers to generate heat from renewables, including their own waste streams.

ARENA funding: ARENA funding has opened up a number of abatement opportunities in manufacturing, waste and resources sector. For example, the [installation of solar and batteries at the DeGrussa copper mine](#) was made possible by an ARENA grant combined with CEFC finance.

There is significant potential for mines and remote communities to reduce emissions by reducing their reliance on trucked-in diesel and by switching to renewables with storage. Rising costs, global competition and the drive to improve environmental performance are motivating companies to look to renewables, but most projects will need an additional financial or policy incentive to make the switch. The transition to low-emissions energy is likely to see an increase in demand for inputs such as lithium, cobalt, nickel, zirconium and copper. Ensuring that mines – particularly greenfield sites – are powered at least partially by renewables will also be important for emissions. ARENA funding will enable similar opportunities to be unlocked in the waste and manufacturing sectors as well.

Emissions Reduction Fund (ERF): Where ARENA funding is not appropriate, other policy or financial incentives such as the ERF may provide the additional revenue stream for a project to proceed. For example, [Landfill Gas Industries' 6MW biogas installation](#) relies on ERF revenue. ResourceCo's alternative fuel plant was also a successful bidder under the ERF. The Department of the Environment and Energy is currently expanding this list of ERF methodologies. To unlock further abatement in the resources, manufacturing and waste sector, the Department could ensure that all potential methods for reducing emissions in this sector are eligible for ERF funding.

2.4 TRANSPORT

Transport is a material and growing source of Australia's emissions. There is extensive scope to reduce transport emissions in Australia by promoting greater use of low-carbon electricity, energy efficiency and fuel switching. Specific opportunities include improving energy performance of large-scale road, rail and air **transport infrastructure** and promoting mode-shifting to very low or zero emissions transport choices; increasing the uptake of **electric or hydrogen vehicles** and enabling infrastructure such as charging stations and zero emissions hydrogen supply chains, and increasing the adoption of **biofuels**.

Investing in energy efficient transport infrastructure

The Australian Department of Infrastructure and Regional Development Bureau of Infrastructure, Transport and Regional Economics [estimated](#) that more than 45% of the \$45 billion of new infrastructure work completed in Australia in 2015-16 was specifically in the transport sector.

Based on forecast growth in freight movements and population, the CEFC has identified transport as a priority and has dedicated a specific business platform to finding opportunities and overcoming barriers for the deployment of finance in this sector. The CEFC is targeting transport sub-sectors including airports, seaports, maritime, roads, vehicles, aviation, rail, electrification and fuel switching, freight, and passenger transport.

Barriers to uptake of large scale energy efficient transport infrastructure projects include a lack of effective and harmonised reporting and analysis of energy data from the sector. Transport lags behind other sectors such as property in the adoption of benchmarking systems for energy and emissions performance (such as building standards in the property sector). This difficulty in benchmarking is at least partially due to the varied nature of core activities across this sector. Transport infrastructure standards across local, state and federal government in general are not focused on energy efficiency and emission reduction outcomes.

Government procurement agencies could set higher energy efficiency and emission reduction standards in transport, including by incorporating higher standards in PPP tender requirements.

Greater policy support and incentives to encourage technology take-up for projects would lead directly to more energy efficient technologies being deployed and reduce perceived risk and costs for future projects.

Promoting low and zero-emissions transport and electric vehicles

Road transport remains the dominant source of transport emissions, [accounting for](#) 79 Mt CO₂ in 2015 or 85 per cent of total transport emissions. Greater deployment of low and zero emissions transport and vehicles provides an opportunity to reduce emissions and lifetime costs of ownership.

Through our existing co-financing arrangements, the CEFC is providing asset finance at favourable interest rates to corporate, government and not-for-profit fleet buyers to encourage them to choose eligible lower emissions and electric passenger and light commercial vehicles.

A ClimateWorks Australia [stakeholder recommendations paper](#) suggested that uptake of electric vehicles (EVs) linked to a cleaner supply of electricity could provide emission reductions of 16 and 47 per cent from passenger and light commercial vehicles by 2050.

There are a number of **barriers to greater EV uptake** in Australia. These include the lack of emission standards on new vehicle sales, the currently higher costs of EVs compared to internal combustion engine alternatives, the lack of purchase incentives to reduce the upfront cost of EVs for consumers, a lack of vehicle choice and a lack of charging infrastructure.

There are potentially significant opportunities for investment in the **hardware and software 'ecosystem' for EVs** and in financing **publicly-accessible charging infrastructure**. Public infrastructure on highways in particular may face patronage risk in the early years until sales and use of EVs reach a critical mass to support more commercial business models. These risks, combined with significant technology uncertainty around vehicle and charging options, make EV infrastructure investment opportunities more risky for private sector financiers. With the expected

global growth in EV markets and investment, there could be significant global opportunities for Australia to become a leader in this area.

The potential for zero emissions **hydrogen produced from renewable energy** provides another opportunity for reduced transport emissions, particularly for heavy vehicles. Development of a hydrogen supply chain would require significant capital investment.

Increasing the use of biofuels

The CEFC also sees opportunities for Australia to reduce vehicle emissions in the transport sector through the **greater use of biofuels**. Australia has a unique combination of agricultural, water and land resources and a strong research and development system gives Australia a natural comparative advantage in the production of biofuels. A small amount of primarily first-generation ethanol and biodiesel is used in the Australian transport sector.

Biofuels face **varying state and federal regulatory regimes** and **varying biofuels mandates** across jurisdictions. The path forward for the biofuels sector remains unclear, with a large diversity in feedstocks, outputs, technologies and project sizes. The sector is also challenged by a lack of experienced local sponsors, a lack of established supply chains and EPC contractors to deliver projects, and a general difficulty for proponents to access bankable feedstock supply arrangements.

Globally, the biofuels sector has many developed and proven first-generation technologies operating at varying scale that could be deployed in Australia without an excessive level of risk.

There is also an opportunity to deploy finance for **biofuels export projects**. As the CEFC noted in our market report [The Australian Bioenergy and Energy from Waste Market](#), world liquid fuel demand is projected to increase 38 per cent by 2040, particularly in developing countries. Australian biofuels production could help meet this global demand.

The CEFC is aiming to accelerate investment in this area, build capacity in the sector and increase the production of biofuels as part of its \$100 million cornerstone commitment to the [Australian Bioenergy Fund](#) managed by the Foresight Group.

2.5 LAND AND AGRICULTURE

Challenges in reducing emissions in the land and agriculture sector include a lack of information, lack of upfront capital and split incentives. Other challenges specific to the sector include:

- **high energy prices** – both in electricity and in gas, particularly affecting intensive farming, irrigation and refrigeration
- **difficulty in planning** around projects given variables with a high degree of unpredictability due to weather, commodity market cycles and disease outbreaks
- a long tail of **indebted smaller producers** whose capacity to borrow or equity fund is highly subject to the above conditions
- **small project scale and geographic isolation** – smaller and remote transactions can be more difficult to finance economically
- **conservation and carbon farming** activities are especially prone to being sub-economic without some form of carbon price
- **policy uncertainty** – around the land sector in particular
- **low or no waste levies** – waste recovery projects are disincentivised if it is cheaper to simply send waste into landfill.

Opportunities to reduce emissions in the land and agriculture sectors include a range of measures that could be cashflow-positive for the sector:

- **greenfields expansion** – e.g. for producing biofuels and bioenergy to displace other fuels, or new ways of intensive farming using renewable energy (e.g. [Sundrop Farms](#))
- **displacing fossil fuels (especially diesel) with renewables**, particularly where behind-the-meter economics make the project stack up rather than relying on export to grid.
- **waste to energy** – from intensive farming or processor wastes – for example using sugarcane bagasse to generate firm renewable electricity
- **process heat recovery or cogeneration and trigeneration** – particularly suited in combination with gasification of waste streams (e.g. waste to energy)
- **process re-engineering and line equipment upgrades** – in many processor and manufacturing contexts, replacing old equipment will result in not only a productivity gain, but an underlying energy and emissions saving
- **refrigeration upgrades and replacements** – saving both on efficiency and on greenhouse refrigerants
- **water efficiency and irrigation equipment upgrades** – water distribution typically involves the use of energy, so to the extent that water conservation and irrigation equipment measures save on the amount of water used, they can also be considered energy savings
- **equipment upgrades** including fuel efficient vehicles
- **farm-scaping** – particularly in removal of fencelines or laser levelling to reduce water, energy and fertiliser use
- **automation and software** – e.g. laser ploughing, soil water moisture measurement and irrigation management.

2.6 GOVERNMENT OPERATIONS

The scope of federal, state and local government operations presents a significant opportunity to achieve meaningful emissions reduction while improving the efficiency and effectiveness of government operations.

There is a lack of emissions data at the total public sector level. Available data tend to count only General Government Sector (GGS) activity rather than the full spectrum of government. GGS activities not only covers “conventional” areas of government, but also large consumers of liquid fuels, and Australia’s third and sixth largest facilities for scope 1 emissions (Department of Defence [2014](#), Australia Post [2014](#), Clean Energy Regulator [2017](#)).

Scoping the emissions footprint of government

Across all levels and including all public-sector entities, government has:

- 1,924,800 public sector employees at June 2016 (ABS [2016a](#))
- \$2.5 trillion of assets and \$1.7 trillion of liabilities (ABS [2016b](#)).

As well as a direct source of emissions, governments are also a very large procurer – as they require buildings, water, sewage, electricity and gas, and travel, vehicles and services to operate. Figures 2 and 3 give an idea of the size of these operations.

Figure 2: Direct state and local government footprint

Employees	1,495,100 in state government and 186,500 in local government
Schools	6661
Hospitals	698
Prisons	81
Universities	31
Police stations, metro fire stations, ambulance stations, state emergency services	Estimate of well over 2,500+. There are 1,460 police stations alone
Public housing units	321,627
Local governments	537
Government authorities and enterprises	Includes transport infrastructure and operations in railways; ports; airports, and public transport; dams, weirs and irrigation schemes; motorway companies; electricity generation, distribution, transmission and retail; water and sewage treatment and reticulation; waste collection and disposal; investment houses, stadiums, cultural institutions

Sources: ABS [2014](#), [2016c](#), [2016d](#), [2016e](#), AIHW [2016a](#), [2016b](#), state and territory governments, Australian Education Network [2017](#), ALGA [2017](#)

Figure 3: Direct Australian Government footprint

Employees	243,300 employees. Includes 58,578 funded ADF personnel of <ul style="list-style-type: none">• 14,290 Navy• 14,274 Air Force• 30,014 Army
Major defence establishments	75
Centrelink/Medicare offices	351 service centres
Universities	1 – Australian National University
Government authorities and enterprises	In addition to core government departments, offices and agencies: <ul style="list-style-type: none">• 71 corporate Commonwealth entities• 15 Commonwealth companies Includes independent authorities, railways, shipbuilders, logistics companies, television and radio networks, telcos, investment houses, research and development companies, Indigenous corporations, cultural institutions

Sources: ABS [2016](#), Department of Defence [2016](#), Department of Human Services [2016](#), Department of Finance [2016](#)

Barriers to emissions reduction in the government sector

Many emissions reduction opportunities create revenue or reduce operational expenditure. Because governments are generally a low-risk borrower, they typically have access to low-cost debt. Access to finance is rarely the primary barrier in the government sector.

Government agencies tend not to realise emissions reduction opportunities in their direct sphere of control for similar reasons to the private sector:

- **a lack of information** – actually taking command of a carbon footprint or energy requires a conscious decision, but many agencies do not know where to start
- **a lack of capability** – the ability within smaller organisations to develop and prosecute a business case to advance an emissions reduction project – particularly when this is not the organisation's 'day job'
- **a lack of upfront capital** – government is increasingly being asked to do more with less, and sourcing and commitment of upfront capital can be an issue at an entity or agency level
- **split incentives** – for example where government is a tenant, or where central budget agencies impose a mandatory centralised energy contracting approach.

However there are additional barriers specific to the government sector, particularly from complex decision making processes and rigidities in budget accounting. These can result in operational budgets that are siloed from capital budgets, or 'sweeps' of operating surpluses that remove the incentive for finding efficiencies.

Many government entities – particularly local governments – are averse to borrowing despite having stable long-term cashflows and long-lived asset investment profiles.

Options for governments to reduce emissions

Governments can take steps to realise the opportunity by strategically examining their entire emissions footprint – as an owner, operator and procurer. Examples include:

- amending budget rules to encourage cashflow-positive emissions reduction activities
- building financial and energy assessment capacity within agencies and develop better budgeting tools which show the true costs of procurement decisions, particularly for ongoing operational expenses
- directing boards of corporatised entities and independent business units to develop a plan to meet at least the national emissions target in the required timeframe in respect of the business unit's footprint
- encouraging behind-the-meter opportunities in renewables generation
- promoting energy from waste, and avoided landfill
- leveraging the security of government as a counterparty by setting high standards in procuring property leases, vehicle fleet, energy, water, other consumables and services
- imposing standards across all public sector entities
- demonstrating to the market in advance that the standards will continue to improve
- where the government is a dominant market participant (e.g. in public and social housing) – signalling to the market now that government is moving to set minimum standards.

How the Clean Energy Finance Corporation can work with the government sector

Government agencies in Australia often have established access to low-cost finance, normally accessed through a centralised borrowing function.

The CEFC looks to provide finance where the borrower has a capacity to repay and/or can provide appropriate security and the project or asset being financed makes an economic return and reduces emissions. The CEFC can add value to government via its expertise in deal structuring for clean energy technologies and tailoring to the particular characteristic of the relevant entity as Figure 4 shows.

Figure 4: Illustrative CEFC financing in the government sector

Typical government entity: Government entities that are on balance sheet for budget purposes, e.g. departments, parliament, public schools and hospitals, emergency services, statutory authorities, some government-owned corporations.

Typical needs: High energy consumption, high recurrent operational expenditure resulting from use of old technology, need to avoid taking on debt, limited capital budget, wants to reduce environmental footprint, wants to have effective policy outcomes on energy and carbon emissions.

Potential CEFC solutions:

- The CEFC can structure off-balance-sheet finance such as operating leases, rental, Power Purchase Agreement (PPA), Energy Performance Contract (EPC), or Build Own Operate Manage (BOOM) arrangements
- Working with state government counterparties to help use government procurement to achieve emissions reduction goals.

Examples:

- **A state government is looking to purchase clean energy for schools, where the time of use matches the solar PV output.** It is not necessary for the state government to own the solar PV systems. The CEFC could finance quality PV providers as determined by the state to install the systems and provide a template for schools to purchase their electricity at lower cost.
- **A state government may want to electrify a suburban train line.** The CEFC could provide finance under a PPA, EPC or BOOM model to the relevant private sector contractors/providers/owners involved.
- **A state or local government wants new bus fleet.** The government could mandate new high efficiency bus requirement in procurement and CEFC can work with panel tenderers to provide the finance necessary to upgrade their fleet to new electric busses.
- **A state government is seeking to reduce recurrent operational cost of major hospital.** The CEFC could finance installation of tri-generation system at hospital with the state to purchase power, heating and chilling at a pre-agreed rate that is lower than existing costs.

2.7 RESEARCH, DEVELOPMENT, INNOVATION AND TECHNOLOGY

The innovation chain is often characterised as having three phases: *early research* (basic science and knowledge with few immediate commercial returns); *demonstration and commercialisation* (applying new knowledge through pilot, demonstration and first commercial-scale projects) and *market uptake* (new technologies embodied in a product or service that competes with mature products in the market) (Garnaut 2008). **Investment at all stages of the innovation chain** is critical to meeting Australia's emissions reduction challenges.

The CEFC generally invests in projects at the market uptake phase, though the Clean Energy Innovation Fund targets projects that seek to demonstrate and commercialise new technology.

The Clean Energy Innovation Fund is a \$200 million program supporting the growth of innovative clean energy technologies and businesses which are critical to Australia's clean energy transformation.

The Innovation Fund targets technologies and businesses that have passed beyond the research and development stage, but are not yet established or of sufficient maturity, size or otherwise commercially ready to attract sufficient private sector capital. These activities can benefit from growth or early stage capital to help them get to the next stage of their development.

The Innovation Fund can provide debt and/or equity finance for innovative clean energy projects and businesses which support renewables, energy efficiency and low emissions technologies. The Innovation Fund does not make grants.

The Innovation Fund is a part of the CEFC and is operated in consultation with the Australian Renewable Energy Agency, drawing on the complementary experience and expertise of the two organisations. Final approval is provided by the CEFC Board, which is responsible for all investment commitments made under the CEFC Act.

Clean Energy Innovation Fund **investments** are good examples of the opportunities to invest in innovations that reduce emissions. Examples include:

- In January 2017, the Innovation Fund committed [\\$5 million](#) to **GreenSync**, an innovative Melbourne-based company aiming to bring smart technology solutions to the energy grid of the future, as part of an \$11.5 million Series B capital raising.
- In December 2016, the Innovation Fund committed [\\$10 million](#) to the \$50 million capital raising of **Carbon Revolution**, a Geelong-based company that produces one-piece carbon fibre car wheels that, through their light weight, help reduce energy consumption and carbon emissions from lighter vehicles.
- In September 2016, the Innovation Fund made a [\\$10 million cornerstone commitment](#) to the \$20 million **Clean Energy Seed Fund**, which focuses on unearthing and financing emerging innovations and startups in clean energy. The Seed Fund is managed by Artesian Venture Partners.

The Innovation Fund targets a diversified portfolio of Australian-based clean energy investments with a long term commercial outlook. As part of the Innovation Fund's activities, the CEFC also provides opportunities for private and institutional financiers to also support innovative clean energy investments through co-investment opportunities. Eligible investments span renewable energy, energy efficiency and low emissions technologies.

Barriers to investing in innovative and emerging projects and companies relate to the higher level of risk compared to later stage opportunities due to greater technology and market or business model risk. More significant policy support for emission reduction would help grow the 'ecosystem' of early stage and innovative investment opportunities in Australia.