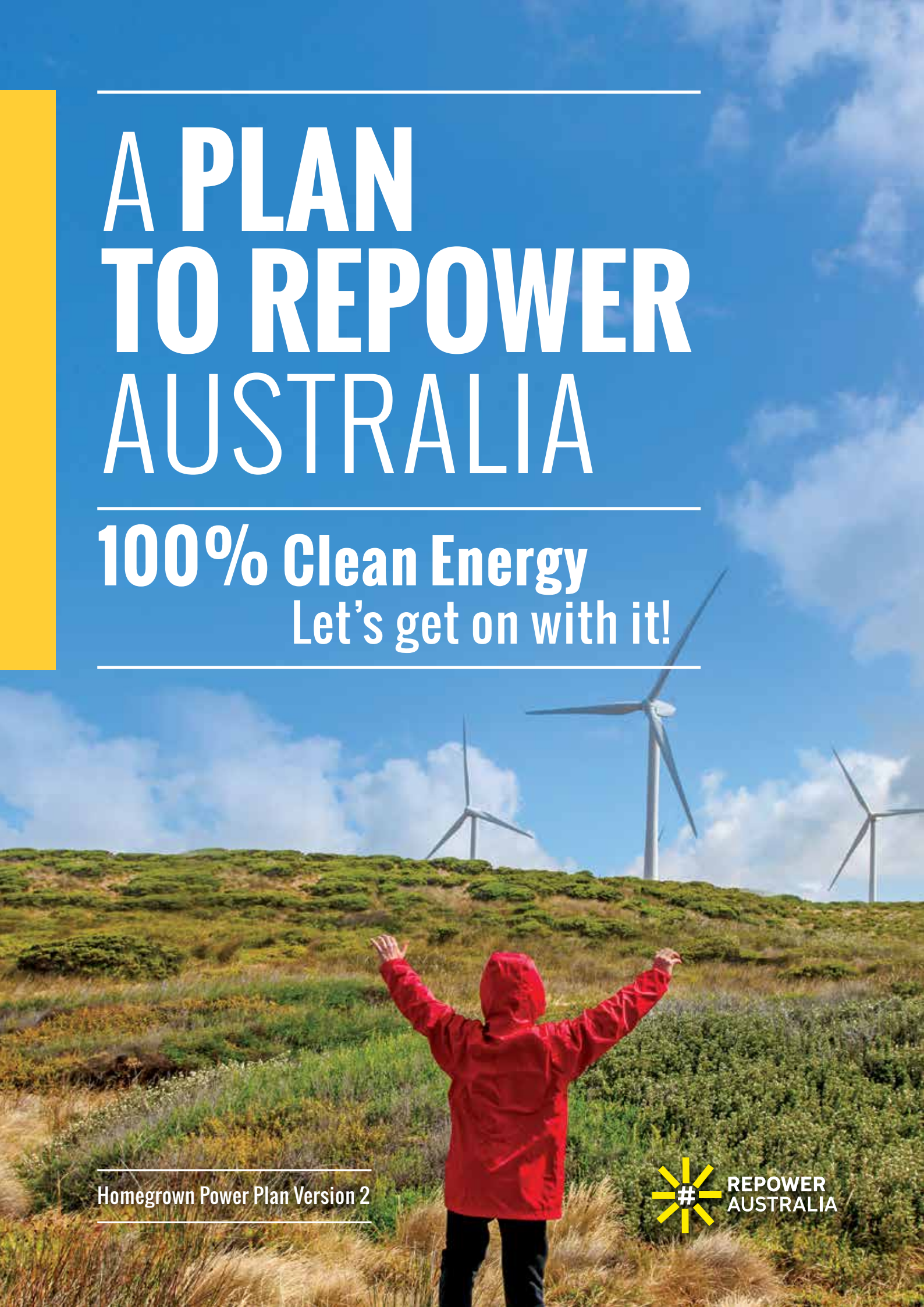
A PLAN TO REPOWER AUSTRALIA

100% Clean Energy
Let's get on with it!



Homegrown Power Plan Version 2

REPOWER AUSTRALIA

100% RENEWABLE.
100% DOABLE.
100% BETTER.

Repowering Australia with clean energy will create a better life for everyone. Upgrading our energy system will help us fix damage to our climate. It will bring cleaner air, better jobs, and help us all control our energy bills.

But right now, a few polluting energy companies are locking us into old technologies they control. These companies and the politicians in their pockets are holding back change.

To hoard more profits they are pumping pollution into our skies, making people sick and putting our whole world at risk.

The good news is we can take back control with clean energy for everyone. We must stand up for solutions that support people and communities, not big polluters. We all want to keep enjoying life on our beautiful planet – with abundant coral reefs, clean air and thriving communities.

To do this we need to move beyond burning coal and gas. We must upgrade our old energy system, ensuring a just transition for workers and communities, and ramp up our efforts to harvest the power of the sun and the wind.

We already have the technology, skills and solutions to do this. We need to get on with it!

Solar, wind and storage are clean, cheaper than coal, and reliable. Australia's people and many Australian companies are leading the way. Now it's time for our elected representatives to catch up.

That's why we've created a second version of the Homegrown Power Plan: *A Plan to Repower Australia: 100% Clean Energy, Let's get on with it!*

The original Homegrown Power Plan was a project of GetUp and Solar Citizens and was released in 2016. This version is a joint project between the Australian Conservation Foundation, GetUp!, Solar Citizens, the Nature Conservation Council, Environment Victoria, and 350.org. It has been authored by the Community Power Agency. 'The Repower Australia Plan' outlines how we can repower the country with clean energy, rewrite the rules of our failing electricity system and replace the polluters holding us back.

REPOWERING AUSTRALIA IN THREE PARTS:

All Australians, no matter what they earn or where they live, deserve access to affordable clean energy. Unfortunately some parts of our community face barriers that block them from benefiting from the renewable revolution. The Repower Australia Plan outlines how we can overcome these barriers and reach a 100% clean energy future.

1 Rewrite the rules

Rewire our laws to deliver affordable, 100% clean electricity.

- Stop old energy dinosaurs from squashing their cleaner competitors
- Reward people for contributing to the energy system instead of punishing them so they flee the grid
- Secure affordable electricity and a fair go for electricity consumers, whether they have solar or not.

2 Repower the country

Turbo-charge our existing clean energy policies and add some missing parts.

- Ramp up clean energy, storage and energy efficiency
- Enable an inclusive people-powered energy revolution, where everyone shares in the benefits of clean energy
- Make Australia a renewable superpower for good by exporting clean energy to the world.

3 Replace the polluters

Stop companies burning fuels like coal and gas.

- Plan the gradual, orderly closure of coal-fired power with a just transition for workers and communities
- Stop the health hazards of burning coal by introducing pollution standards with teeth
- Support households, industry and our power sector to get off expensive and polluting gas.

Photo: Pingala Solar

THE **REPOWER AUSTRALIA** PLAN

REPLACE THE POLLUTERS, ENSURING CLEAN ENERGY ISN'T HELD BACK BY THE LEGACY OF A BYGONE ERA.

- Plan the orderly closure of coal-burning power with a just transition for workers and communities
- Help households, industry and our power sector quit polluting and expensive gas for good
- Stop the health hazards of burning coal by introducing pollution standards with teeth

REWRITE THE RULES, REWIRING OUR LAWS TO DELIVER AFFORDABLE, 100% RENEWABLE ELECTRICITY.

- Stop old energy dinosaurs from squashing their cleaner competitors
- Make clean energy accessible for all energy users, whether they have solar or not
- Reward people for contributing to the system instead of punishing them so they flee the grid

REPOWER THE COUNTRY WITH CLEAN ENERGY AND MAKE AUSTRALIA A RENEWABLE SUPERPOWER.

- Use our abundant wind and sun to power households and industries in Australia and around the world
- Improve energy efficiency, making the transition easier and more affordable for everyone
- Enable a people-powered energy revolution where everyone benefits from clean, affordable energy

100% DOABLE

Experts agree that shifting to an energy system powered by the sun and wind is technically feasible and economically responsible. Nine different expert organisations, from the University of New South Wales to the Australian Energy Market Operator, have all conducted studies that show 100% renewable energy for Australia is 100% doable.

We can do this!

Research from the Institute for Sustainable Futures (ISF) at the University of Technology Sydney shows:

- By 2030, we can power all of Australia's homes and businesses with 100% renewable electricity[1]
- By 2035, we can meet around 40% of our transport needs with renewable energy as well
- By 2050 we can cut all climate pollution from the whole energy system. Everything we do, from driving a car to hauling freight, from manufacturing to heating to taking a flight, can run on clean, affordable energy generated from the wind, sun, and other clean energy sources
- We can move to a 100% renewable power supply, and phase out all coal-fired power by 2030, with electricity that is more reliable than it is today.

[1] Excludes additional electricity demand from increased electrification of the transport sector.

The numbers add up:

- Getting pollution out of our entire energy system by 2050 means Australia gets a $800 billion slice of the global renewables investment, and all the jobs that come with it
- Investing more in clean energy means spending less on burning coal and gas
- Between 2017 and 2050, moving to clean energy and increasing energy efficiency will result in fuel cost savings that cover 110% of the cost of this shift. Our investment in fuel-free electricity would start paying itself off in lower prices as early as 2025, and by 2040 at the latest. Australia would save, on average:
  - $9 billion a year on power sector fuel costs
  - $11 billion a year on transport fuel costs.
- The combination of renewables and energy efficiency will deliver massive reductions in carbon pollution. Total energy-related carbon dioxide emissions will decrease from 450 million tonnes in 2015 to 196 million tonnes in 2030, and from 19 tonnes per person today to seven tonnes per person in 2030.

Photo: James Thomas

PART 1: REWRITE THE RULES FOR PEOPLE NOT PROFIT

Our National Electricity Market (NEM) is a mess. It combines the worst aspects of various approaches in the one system. Controlled by a few powerful energy companies, it is neither clean nor cheap, neither simple nor sophisticated. Nor is it public and fair or private and competitive.

It's a system so rigged that over the past decade energy companies have spent over $75 billion dollars 'gold plating' network infrastructure to the point where it now costs even more to sell electricity than to generate it. And you pay for it via your electricity bill.

A NEM PURPOSE BUILT FOR THE CLEAN ENERGY FUTURE

To transition to 100% clean energy we need to redesign Australia's antiquated electricity system. Here's how we do it:

1 Put 100% clean energy in the National Electricity Objective

The National Electricity Objective (NEO) is the one sentence that rules them all – it dictates how the electricity market works. Our current NEO was explicitly designed to exclude the environment or social justice. This means decision-makers are overlooking the innovative renewable projects we urgently need. Change the objective, and everyone with the power to change the system will start working towards an affordable clean energy future, instead of fighting against it.

2 Power Access: Create a public interest retailer for people who need it most

We've been told time and time again, deregulation means more competition and lower prices for energy users. But when it comes to the NEM, three big energy companies now control the market and are increasing our energy bills. This is unfair and unnecessary.
To help fix this mess we need the federal government, in partnership with states, to establish 'Power Access': a public-interest retailer that would provide clean energy services like energy efficiency upgrades and solar PV to help reduce low-income households' energy bills.

3 Make the electricity network act more like the internet

Right now, people are completely beholden to a clunky, centralised electricity system and the handful of companies that dominate it. By shifting the electricity network business model from analog to digital, millions of us could trade clean energy locally, instead of a few big centralised generators selling us their polluting power from far away. Imagine a website that lets you easily buy your electricity from your neighbour, or get it from the nearby solar garden that you part-own, or the wind turbine at your friend's farm at the edge of town. Think eBay, but for local energy.

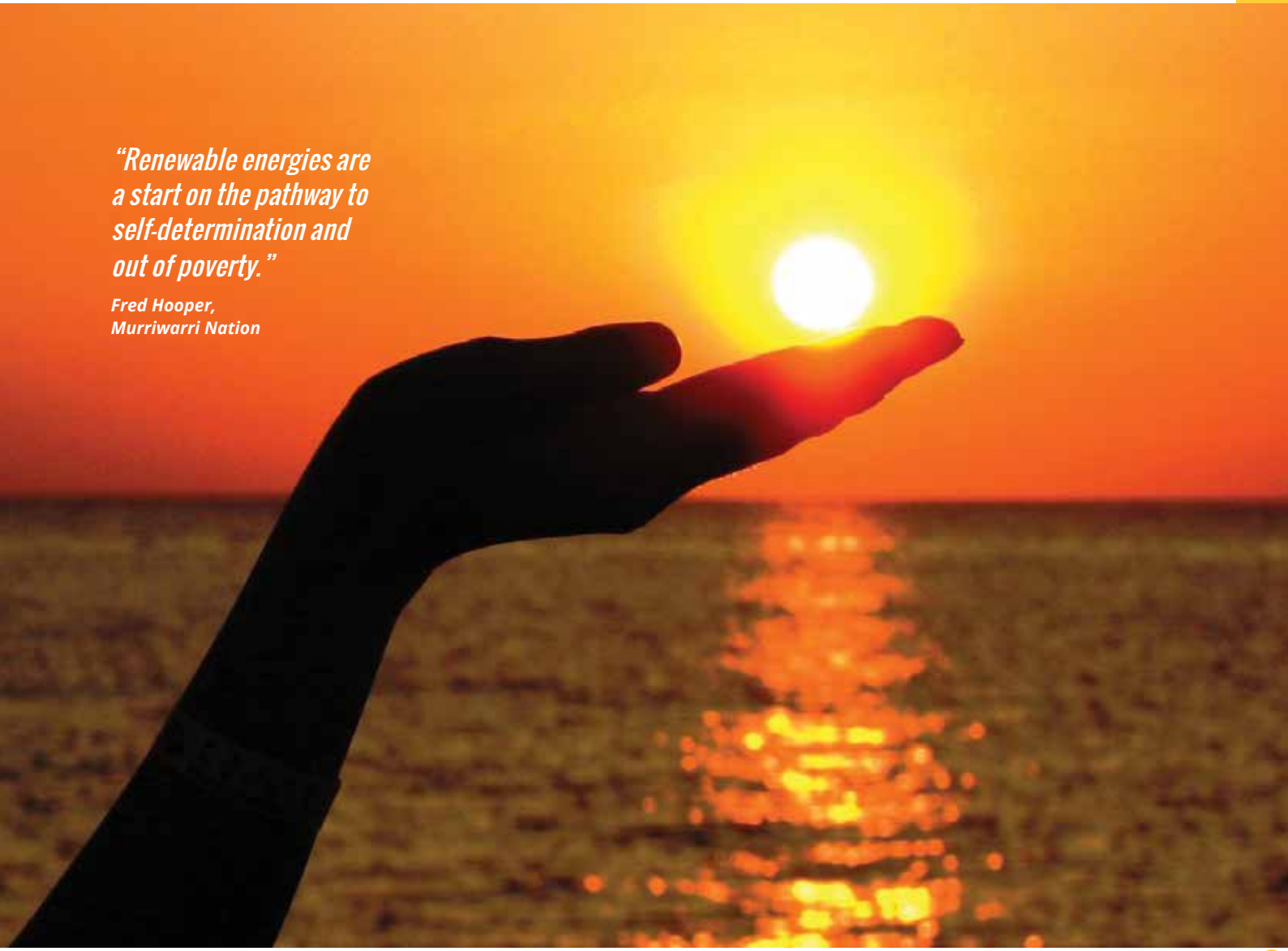
TURNING THE ELECTRICITY MARKET UPSIDE DOWN IS NECESSARY, BUT IT WILL TAKE TIME. THERE ARE A FEW THINGS WE CAN DO RIGHT NOW TO KICKSTART THE TRANSITION.

Reward network companies for saving their customers money instead of wasting it

Give citizens a real seat at the table on the decisions that affect us

Create a fair feed-in tariff

Ensure equal access to the grid



"Renewable energies are a start on the pathway to self-determination and out of poverty."

Fred Hooper, Murriwarri Nation

Photo: Sabine Löwer

PART 2: REPOWER WITH CLEAN ENERGY

The past five years has seen a revolution in the economics of clean energy. Building new wind and solar capacity is now cheaper than building coal and gas, and households can generate electricity on their own rooftops for less than what retailers charge. Some people are starting to use energy more efficiently – but there's still much more we can do.

The transition to clean, renewable energy is inevitable. What's not inevitable is a transition that takes place fast enough to stop damage to our planet, or one that shares the benefit of wind, solar and storage with all Australians. That is, unless we all work together to take our power back – literally.

RAMP UP CLEAN ENERGY AND ENERGY EFFICIENCY

1 Get smarter about Australia's energy use

We need a government commitment to double Australia's energy productivity by 2030, with policies and actions to make it happen. Doubling energy productivity means we use energy much more wisely and we get more output from every bit of energy that we use. Stringent vehicle emissions standards could give us the cleanest and most efficient cars in the world. Better building codes could bring energy independence within reach of more households and businesses. Stronger appliance standards would protect people from inefficient products.

2 Go big on wind and solar

To make sure we have enough wind and solar in the system to lower climate pollution, we need a policy in place that signals to investors and the energy industry to build, build, build! Whether it's a Clean Energy Target, an extended Renewable Energy Target (RET) or an Emissions Intensity Scheme, this policy must drive a rapid reduction in carbon pollution, consistent with Australia's Paris commitment to ensuring warming does not exceed 1.5-2 degrees over pre-industrial levels. It must speed up the replacement of dirty coal power with clean energy. Offsets slow down action and should not be allowed as a replacement.

3 Build the right renewables in the right places with reverse auctions & public ownership

Policies like the RET deliver lots of low-cost wind and solar power. To put us on the path to a stable, affordable, 100% renewable system, we also need complementary technologies, including storage, in the right locations. Federal and state governments should hold regular clean energy auctions for on-demand clean energy such as battery storage and concentrated solar thermal with storage. Or they could put these technologies in public hands, operating them for the public good.

> *"Storage is able to respond faster than traditional power generators in an emergency, which means it helps with power stability in peak demand situations. It is a decentralised and distributed technology, which builds resilience and redundancy in the National Electricity Market (right down to a household level in the case of residential batteries with blackout protection)."*
>
> **Emily Driscoll, Off-Grid Energy**

CLEAN ENERGY FOR ALL

All Australians, no matter what they earn or where they live, deserve access to affordable clean energy. But some parts of our community still face barriers. This needs to change and with these people-powered programs, it can.

1 Smart Energy Communities Program

Already, well over five million people live under solar roofs and community energy groups are springing up across the country. A well-resourced grassroots organisation would speed up this people-powered energy revolution. Think Landcare for clean energy. The Smart Energy Communities program would support 'solar gardens' for renters, bioenergy hubs for farmers, and energy efficiency improvements and solar for low-income households. It should be funded by governments to kick-start community clean energy projects in towns and suburbs across Australia.

2 Clean Power Program designed with remote Indigenous communities

Those on the frontlines of climate change, who want to care for country, should be first in line to benefit from renewable energy. We should establish a collaboratively-designed, well-funded Remote Indigenous Communities' Clean Power Program. This would ensure that all remote Aboriginal and Torres Strait Island communities have access to clean, affordable, local renewable electricity.

3 Minimum energy performance standards for rental properties

Australia's houses are like leaky tents – cold in winter, hot in summer. Efficiency standards are trying to change this, but they are only in place in Australia for new buildings, leaving a huge gap in the rules for older rental properties. However, about half of low-income households live in rental properties, and low-income households are twice as likely to be renting as those in the highest income quintile. As a consequence, rental homes often lack basic efficiency measures that are nearly universal for owner-occupied properties. Landlords must be required to provide basic levels of energy efficiency for rental properties, which will immediately reduce energy burdens for low- and middle-income Australians.

> *"Our house gets to 35 degrees inside in summer and as low as 10 degrees in winter. I'm worried about climate change, so I don't want to run the heater all day if I know all that energy is just blowing straight through the roof."*
>
> **Margaret, renter**

MAKE AUSTRALIA A RENEWABLE SUPERPOWER

As the sunburnt country, we have the opportunity to be a power for good in the age of renewable energy, embedding low-cost clean electricity into every household and business and exporting our success to the world. Becoming a renewable superpower would create new industries, new investment and new secure jobs with a future. But this will not happen without a proactive approach.

1 Clean Energy Solutions Centre: Solar and wind powering our industry

Every year, business and industry uses around 70% of Australia's electricity. Supporting large energy-users to repower with clean energy is good for the planet and good business. Already, businesses from Whyalla Steel to Telstra are cleaning up their act with wind and solar, but others need a helping hand. The Clean Energy Solutions Centre would work with Australia's largest energy users to identify, finance and install the right efficiency and clean energy options. This would save money, cut pollution and supply sun-powered products to the rest of the world.

2 Export liquid sunshine to the world

Using excess renewable electricity to create renewable hydrogen enables Australia to bottle our solar and wind power and export it to the world. Australia needs a coordinated plan in the form of a Renewable Export Roadmap, as well as funding for demonstration and commercialisation projects, that will turn this huge opportunity into a sun-powered reality.

3 Get serious about good, renewable jobs

We can boost homegrown jobs and industry if we encourage local manufacture of components and use of local tradespeople. To do this we need to hunt the jobs out, with a Parliamentary Inquiry into the renewable supply chain. Then we need policy incentives to make the potential jobs a reality, particularly in regional Australia where the jobs are needed most.

There's no silver bullet to transition to clean, renewable energy. Here are a number of policies that we need to make 100% renewables a reality for Australia:

- Restore federal funding to the Australian Renewable Energy Agency and maintain federal support for the Clean Energy Finance Corporation
- Ensure everyone can access solar, including renters and apartment dwellers
- Accelerate the roll out of batteries
- Set up an electric vehicle charging network for a renewable-powered superhighway around the country
- Ensure the Australian workforce has the skills our renewable future needs
- Support our neighbours in Asia and the Pacific to access clean, affordable energy solutions – through our renewable exports

"The construction and operation of these [new solar thermal] plants bring real jobs to real families, making real electricity, clean electricity, for decades. That is the vision we want to share for our country, and for our region."

Gary, Port Augusta

PART 3: REPLACE THE **POLLUTERS**

It might seem obvious, but given the power of big polluting companies over Australian politics, we need to spell it out: burning coal and gas has no place in a clean energy future. To fully unleash clean energy, we need to get polluting fuels out of the system. We also need to undo the legacies of years of industry lobbying, like our wasteful fossil fuel subsidies.

HERE'S HOW TO DO IT:

1 Start coal power clean up ASAP

Australia's fleet of coal-fired power stations is among the oldest and least efficient in the world. Everyone knows they will have to be shut down sooner or later – the only question is when. Federal and state governments should set policies to enable the accelerated closure and rehabilitation of the most polluting coal-fired generators. This could be through Coal Clean-Up Auctions, or realistic age limits based on a carbon budget for the Australian electricity sector.

2 Ensure a just transition for coal communities

Snap closures of coal-fired power plants in Port Augusta and Latrobe Valley show why the foundations of a post-coal future must be laid early if workers and communities are to thrive through the transition. Federal and state governments should immediately start to develop community-driven economic renewal plans in areas facing closures. They should work with unions, employers and community groups to retrain workers, fully fund early retirement, and create redeployment options.

3 Implement toxic pollution controls with teeth

Evidence is clear that air pollution is a significant health risk. Each year, more than 3,000 people die from urban air pollution in Australia. Federal and state governments should make coal and gas companies responsible for their own mess. Governments should set binding pollution standards in line with international best practice, commit to better monitoring, and create load-based licensing schemes. The federal government should establish a new national Environment Protection Authority (EPA).

4 Support households, business and the power sector to quit gas for good

It's time to quit gas. Unconventional gas pollutes our air, water and farmland. Meanwhile, a handful of price-gouging gas companies are driving up the cost of energy for the rest of us. Federal and state governments should work with industry to promote renewable heat alternatives to gas through targeted loans and dedicated renewable industry precincts. They should support households through a Cash for Gas Guzzlers scheme and ban gas infrastructure in new residential developments.

5 Shift money from polluters to problem-solvers by ending fossil fuel subsidies

In their persistent search for budget savings, Australian governments keep pushing aside the billion-dollar savings they could make by winding back fossil fuel subsidies. If we stop letting big polluters free-ride on the rest of us, we could free up at least $6.4 billion a year in revenue that could be put to much better use. This should start with the diesel fuel rebate: by capping it at $20,000 per claim, we could deliver a federal budget saving of $15 billion over the next four years. This would incentivise big mining companies to save energy and invest in cleaner alternatives, while ensuring that the rebate is still available to most farmers.

"Knowing that with the big increase in gas prices as well as Australia's increased usage of fracking for gas supply, removing myself completely from gas grid was a great way to make my small mark on addressing climate change and moving to something smarter, more sustainable and affordable."

Jay, homeowner, Adelaide

LET'S REPOWER **AUSTRALIA**

We can't keep powering our lives with climate-wrecking fuels from the last century. Climate change is here, now, and we know how to fix it. It's time to repower Australia with clean, renewable energy from the sun, wind and waves. Let's ensure our future energy system puts people and the planet first – not a handful of big polluters.

As we repower Australia, we are creating cleaner air and healthier communities. We are protecting ourselves and our planet from extreme weather caused by global warming. We are driving lower energy bills and better jobs with a future, that are good for our future. Most importantly, we'll have a liveable planet.

This is not a matter of 'we should do this', or 'we'd be wise to.' It's simpler. We must. And we can. So let's get on with it.

Photo: Infigen Energy

Authors

Nicky Ison is a Founding Director of the Community Power Agency, a Strategist at Climate Action Network Australia, and a Research Associate at the Institute for Sustainable Futures at the University of Technology, Sydney. She is an expert in the field of energy policy and community energy and has worked with and visited over 60 community energy groups in Australia, Europe and the US. Nicky has a detailed understanding of the working of Australia's energy system. Relevant projects include lead authorship of the National Electricity Market Report Card and the National Community Energy Strategy, developing energy price projections and contributing to the Decentralised Energy Roadmap and the modelling that underpinned it. Nicky was formerly the Convenor of the Solar Citizens Steering Committee and Coordinator of the Coalition for Community Energy. In 2014, Nicky was recognised on the Australian Financial Review's 100 Women of Influence List.

Miriam Lyons is an Australian policy analyst, researcher and commentator, and is the Environmental Justice Coordinator at GetUp! She is the co-author, with Ian McAuley, of Governomics, published by Melbourne University Press in May 2015. Miriam is a Fellow and former CEO of the Centre for Policy Development (CPD), which she co-founded with John Menadue AO and others in 2007. She is a board director of the Centre for Australian Progress. Miriam is a frequent guest on various TV and radio programs, has contributed to several publications and co-edited the CPD books *Pushing Our Luck* and *More Than Luck*. Earlier roles include policy editing for newmatilda.com, researching freedom of speech in East Timor, and organising ideas festivals.

John Atkinson is a policy and communications consultant with over a decade of experience at the intersection of energy and the environment. He has worked with a wide range of clean energy companies in his native America as well his current home in Australia. Companies include Mosaic, one of the US pioneers of community renewables and home solar financing, as well as ShineHub, a Sydney software startup helping communities switch to solar and battery solutions. Prior to his work on the Repower Australia Plan with the Community Power Agency, his research projects have included reports on renewable energy in Latin America for the Inter-American Development Bank and on alternative fuel transit buses for the US Department of Energy.

Acknowledgements

The authors wish to thank the dozens of people whose advice, research, expertise or ideas we have drawn on while writing this report. We specifically want to thank Alexandra Nash and Suzanne Harter at ACF, Cat Nadel and Dean Rizetti at Environment Victoria and Franziska Mey at Community Power Agency and Claire O'Rouke formerly at Solar Citizens for their significant input and editing. This project was also made possible by a grant from The Garry White Foundation. We would also like to thank the following people:

Nick Aberle, Ryan Ahearne, Larissa Baldwin, Daisy Barham, Adam Black, Ric Brazzale, Catherine Burrows, Tom Butler, Stephen Bygrave, Mark Byrne, Amanda Cahill, Ben Caldecott, Kellie Caught, April Crawford-Smith, Lily Dempster, Oliver Derum, Mark Diesendorf, Elsa Dominish, Gerard Drew, Chris Dunstan, Ben Elliston, Tim Forcey, Peter Frank, Jack Gilding, Matt Grudnoff, Steve Hatfield-Dodds, Jess Hill, Naomi Hogan, Anisha Humphreys, Melissa Jackson, Frank Jotzo, Glen Klatovsky, Jono La Nauze, Sam La Rocca, Donna Luckman, Anne Martinelli, Louise Matthiesson, Ian McAuley, Dylan McConnell, Lance McCullum, Bridget McIntosh, Jason Mogus, Rob Murray-Leach, Tim Nelson, Deborah Oberon, Paul Oosting, Claire O'Halloran, Bruce Robertson, Matthew Rose, Ray Pratt, Tom Quinn, Alex Rafalowicz, Sam Regester, Jenny Riesz, Matt Rose, Gary Rowbottom, Jay Rutovitz, Hugh Saddler, Anna Skarbek, Brad Smith, Lindsay Soutar, Dan Spencer, Louise Stanley, Louise Sylvan, Shani Taeger, Sven Teske, Bruce Thompson, Reece Turner, Adam Walters, Tony Westmore, James Whelan, the Energy Team at the Institute of Sustainable Futures, the team at ITPower, the Community Power Agency team, the Clean Energy Council, the Climate Action Network of Australia support team, and everyone on CANA's Renewable Energy Working Group. This document is a refresh and update of the Homegrown Power Plan released by GetUp and Solar Citizens in 2016 and we would like to acknowledge their work.

All conclusions and any errors in the report are the authors' own.

CONTENTS

ENDNOTES

TABLES

FIGURES

BOXED TEXT

INTRODUCTION

TRANSITION **IS INEVITABLE**

1. It's time to stop thinking small

Across the country, people overwhelmingly care about – and are standing up for – the planet we call home. Businesses and whole communities are saying no to companies digging up and burning dirty fuels like coal, oil and gas. Instead, they are transforming the way they power their lives – choosing clean energy from the sun, wind and water.

Clean energy makes sense – it doesn't harm our climate, fuel coral bleaching or pollute our air and water. It's affordable and good for our communities. It is already creating lots of good jobs in new industries with a big future. It can deliver even more benefits, if we put our minds to it.

Around the world, wind and solar are the fastest-growing sources of energy by far. In 2016, solar was the largest source of new electricity capacity in the world, and renewables accounted for more than two-thirds of new global capacity overall.[1]

Plummeting technology prices are a game-changer. Globally, since 2009 the cost of solar power has dropped 75% and the cost of wind power has fallen by 30%.[2] In Australia, wind and solar now cost less than new-build coal or gas.[3] Rooftop solar is now cheaper than retail electricity and an Australian household installs a rooftop solar system every three minutes,[4] with a massive one gigawatt (GW) installed in 2017 alone.[5]

When you stop to think about it, the transition to renewable energy is physically inevitable in the long run: every source of energy that isn't renewable will run out. The sun, the wind, heat from the earth, the power of moving water – why wouldn't we want to harvest these everlasting and abundant resources? It just makes sense.

The owners of existing coal-fired plants agree they're on the way out and won't be replaced with more of the same. Around the world, a consensus is building: coal-fired power has had its day. It's no longer a question of whether it gets phased out, but when.

And the timing matters.

Not only is the burning of fossil fuels for electricity Australia's single largest source of climate pollution, it's also the easiest to replace. Accelerating the shift from polluting fuels to clean renewable energy and energy efficiency in the power sector is one of the fastest ways to cut climate pollution. And as the research from a range of organisations shows, our investment in clean, renewable energy will save us money along the way.[6]

1.1 Transition is inevitable, but our damaged climate means it must also be rapid

The bigger the ship, the longer it takes to turn. Australia's electricity system is a 200,000,000-megawatt hour hulking rust bucket. While a change of direction is inevitable, it will take a serious effort to swerve fast enough to fulfil the promise we made at the 2015 Paris climate summit.

We love the local health benefits of clean energy. We love how local renewable energy literally puts power in the hands of the people. We even love the way a solar thermal tower glows in the light of a hundred mirrors. But that's not the main reason we need the Repower Australia Plan.

This century, the world has already sweated its way through 16 of the 17 hottest years on record.[7] The climate pollution produced by a small handful of major polluters digging up and burning fuels like coal and gas is doing unprecedented damage to our climate, leaving the rest of us to deal with the consequences.[8]

In Paris, when Australia and almost 200 other countries committed to trying to keep dangerous global warming under 1.5°C, they chose that number for a reason. We've only just passed 1°C, and we're already paying the price: more extreme weather and warming oceans that, amongst other costly impacts, cause coral bleaching and threaten the Great Barrier Reef, one of our world's natural wonders, with extinction.[9]

The fallout affects us all but is hitting the poorest countries first and hardest. For some Pacific Island countries, it is a threat to their very survival. We can and should stand up and do the right thing by our neighbours and by people on the frontline of climate change here in Australia, particularly in Indigenous communities.[10]

Here's what a 1.5°C guardrail means for how the world generates energy:

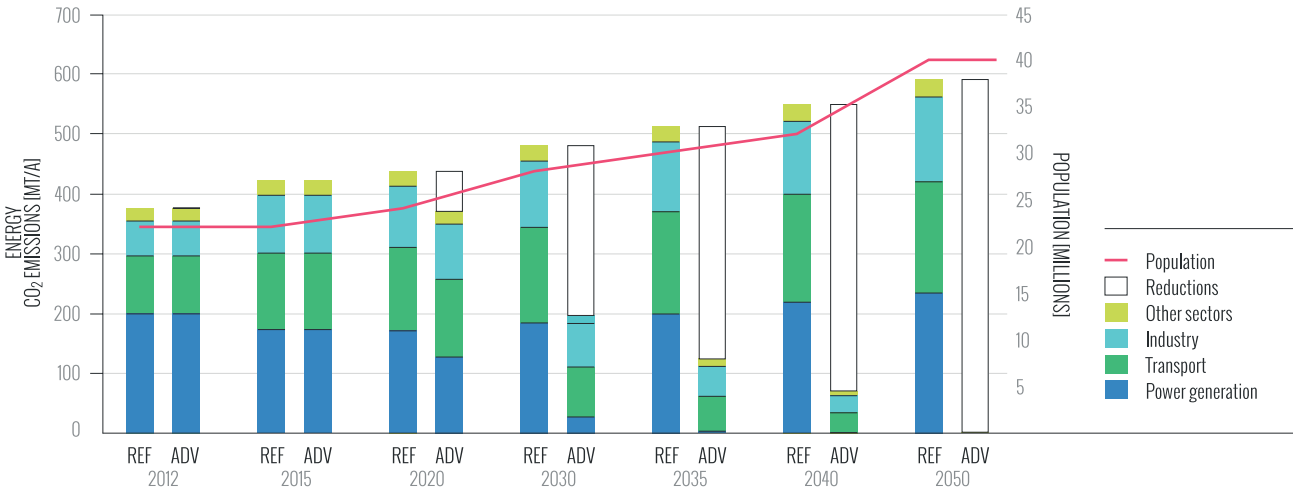
- All climate pollution (greenhouse gas emissions) that can be eliminated must be eliminated, as fast as possible.[11]
- More than 80% of known coal, oil and gas reserves must stay in the ground.[12]
- No more coal or gas-fired power plants should be built, starting yesterday.[13]

The Climate Change Authority, the federal government's main source of independent expert advice on climate policy, recommends Australia cuts its greenhouse gas pollution by between 40-60% below 2000 levels by 2030. They also said the stronger 60% reduction could be appropriate if the world was working to limit warming to 1.5°C.[14] Let's break that down:

- In 2000 Australia emitted 497 MT of CO_2 equivalent (which includes potent greenhouse gases like methane). In that year there were 326 megatonnes (MT) of CO_2 from energy use alone.
- In 2030, reducing our greenhouse gas pollution by 60% below 2000 levels would mean emitting 199 MT of CO_2e. Reducing CO_2 from energy use in line with all other sectors and all other greenhouse gases would mean emitting 131 MT of CO_2 from energy use. **If we took the less ambitious target of 40% below 2000 levels, that figure would be 196 MT.**[15]

If we follow the pathway to 100% renewable energy outlined by Dr Sven Teske and the research team at the Institute for Sustainable Futures (ISF) at University of Technology Sydney (UTS), then we would cut carbon pollution from energy used in the power, transport, industry and heating sectors to **196 MT of carbon dioxide (CO_2) in 2030 (see Figure 1)**. In outlining the pathway to 100% renewable energy for Australia, Teske's team analysed three scenarios. This pathway (which involves repowering Australia with 100% renewable electricity by 2030, or by 2035 if we include additional demand as households and businesses switch to electric vehicles) would therefore deliver emissions reductions in line with the lower end of the Climate Change Authority's suggested range, if that range were applied to domestic emissions alone. While the Climate Change Authority's modelling allows for offsets, the Institute for Sustainable Futures 100% renewable scenario would see Australia achieve these reductions solely through our own efforts rather than by buying in reductions from other countries.

Figure 1: Australia's energy emissions pathways



Source: 100% Renewable Energy for Australia: Decarbonising Australia's Energy Sector Within One generation Teske et al, 2016

Box 1: What it would take to really pull our weight

Australia's fair share of the task of reversing dangerous climate change is a question of ethics, not economics. The 'Climate Equity Reference Calculator' developed by the Stockholm Environment Institute allows anyone to come to their own judgement about what a fair share of the task of saving our planetary home looks like.[16] You might think that those who have polluted more over the past century should do more of the heavy lifting than those who have barely begun to industrialise their economies. You'd be right. You might also think that how difficult or easy it is to take action should be a factor. That those who earn the equivalent of less than US$7,500 a year, for example, should be counted out of a country's capacity to reduce its pollution. Again, you'd be right.

Plug those assumptions into the climate equity calculator with a 1.5°C target and here's what comes out: -89 MT of greenhouse gases in the year 2030. That means reducing our own pollution to zero and doing a great deal more to help others do the same. We have a lot of cleaning up to do.

In other words, the measures outlined in the Repower Australia Plan are the very least we should do. We'd be making a big step in the right direction, but would still be expecting the people of countries like Bangladesh, Kenya or East Timor to work a lot harder on the climate clean-up task than we do. When Australia reports back on the commitments we made in Paris, we can show up with a concrete plan to start cleaning up our own mess and play a serious part in the effort to stop global warming. Or we can shift uncomfortably and stare at our feet while the rest of the world gets on with the job.

1.2 Transition is inevitable, but justice isn't

The way we power our country is changing. But how we manage the inevitable transition will have major social consequences.

The old system put too much power in the hands of too few companies. The influence of those companies and their well-paid lobbyists is written all over Australia's electricity bills. The mismanagement of our electricity sector over the past decade not only sent electricity prices through the roof, it also increased energy poverty. Too many of those who could least afford it had their power cut off because they were unable to cover the costs of the industry's record profits.[17]

A well-planned transition is an opportunity to create a better, fairer system that meets the needs of all Australians. It's a chance to ensure that the benefits of clean energy are widely shared and giving power back to all people, communities and businesses. It's also a chance to ensure that those who have worked hard on supplying Australia's electricity during the fossil fuel era get the benefit of a well-managed and orderly transition, rather than being subjected to the uncertainty of surprise closures. For the communities literally at the coalface of this transition, it has not been an easy ride. Supporting local communities through the change must be a top priority.

1.3 Transition is inevitable, and it's 100% doable

Although the transition to 100% renewable energy might not be as straightforward as changing your bank account, experts have shown that 100% clean energy is 100% doable and will save us a lot of money over time.

Modelling from the ISF shows that given the abundance of Australia's solar, wind and sustainable bioenergy resources, a transition to 100% renewable energy within one generation is both technically feasible and economically responsible.

And they are not alone with their findings. There are at least nine other studies conducted in the last seven years that have analysed how Australia can move from an electricity system based on polluting coal and gas to one powered by the sun, wind and waves.[18]

Indeed, the Australian Energy Market Operator (AEMO) – the very body tasked with making sure we have energy when we need it – found that there are "no fundamental limits to 100% renewables", and that current standards of system security and reliability will be maintained.[19]

These studies all show different pathways to 100% renewable energy, however what they all agree on is that 100% renewables can be achieved. They also all

agree that the future energy system looks different from the one of the past – and that's a good thing. A modern energy system, powered by clean, abundant renewable energy will actually be more reliable, give us more control over how we power our lives and be more affordable, so we can all access the energy we need no matter where we are or what we earn.

1.4 So what would a 100% renewable electricity system look like?

If we get our policies right and implement core ideas in the Repower Australia Plan, the electricity system of the future could look something like this...

1. Big on wind and solar

In the future, the bulk of our electricity will come from the most affordable technologies – wind and solar photovoltaic (PV). In the areas with the best renewable resources, big wind and solar projects connected to big transmission lines will generate lots of electricity to power Australia's industry, transport and cities. Modelling by the University of New South Wales (UNSW) suggests that wind generation will supply up to 70% of Australia's electricity needs,[20] while modelling by CSIRO and Energy Networks Australia found that wind and solar will provide nearly all generation by 2050.[21] UNSW's analysis also found that many of the best solar and wind sites in Australia are in remote locations, needing new transmission investments to harvest these amazing resources.[22] Already the QLD government has announced $150 million in funding for a new transmission line in regional QLD that will open up a huge new area where we can harness the sun's rays.

2. Lots of different technologies in different locations

These solar and wind farms will be spread across the country, sharing their output – because in a huge continent the size of Australia it's never cloudy and calm everywhere. The wind is always blowing somewhere.

Then we will fill the gaps in supply with a range of on-demand renewables and storage such as concentrating solar thermal with storage, pumped hydro, batteries (grid and domestic), sustainable bioenergy and more.

For example, a study by Andrew Blakers at Australian National University (ANU) found pumped hydro could provide enough back-up for a grid entirely powered by wind and solar power. Hold on, the dry continent of Australia and hydropower? Yes really, they have identified 22,000 potential sites, mainly off-river reservoirs in hilly terrain or abandoned mine sites, and just 0.1 per cent of those sites could meet all of Australia's storage needs in a 100% renewable grid.[23] Already we have some pumped hydro, with more trials underway.[24] Meanwhile the South Australian government has commissioned Australia's first large-scale battery as well as our first concentrating solar thermal (CST) power plant with storage in Port Augusta, as originally proposed by Beyond Zero Emissions in their 2010 Stationary Energy Plan.[25]

3. Small so everyone can benefit

According to CSIRO and Energy Networks Australia at least 30-45% of Australia's future energy generation will be local and customer-owned, in homes, businesses and communities.[26] In the future all Australians will be able to access and benefit from decentralised generation and energy efficiency and storage such as solar or small-wind, hydro or bioenergy projects.

4. Demand is as important as supply

Future electricity use will be much more dynamic – demand follows generation, as much as generation follows demand. When the sun is shining and it's blowing a gale, smart software will send a signal to energy users to turn on their pumps and fill up their batteries. When wind generation is low, batteries are signalled to turn on. As the Alternative Technology Association's 100% Renewable Grid report found,[27] this approach can deliver reliable grid electricity and lower electricity bills – a win-win. Already there are many companies such as Greensync and Tempest Energy that are providing these demand management and dynamic control services to businesses and households. There are also trials underway run by the Australian Renewable Energy Agency and the Australian Energy Market Operator using incentives to reduce the demand of big energy users when demand is spiking and capacity is limited.

In addition, in the future we will use electricity and energy much more efficiently, more than doubling energy productivity. Our houses and buildings, equipment and appliances, as well as our transport and industrial processes will all be more efficient.

5. Poles and wires – we'll only build them when we need them

In the future our electricity grid will continue to act as an essential service, however it will be run for the public good, not private profits. That means households and businesses will be incentivised to use the local grid infrastructure through revised tariffs and peer-to-peer energy trading, rather than forced to go off-grid due to bad management. And while households will draw less electricity from the grid than they do now (due to energy efficiency or rooftop solar), the demand for electricity overall will increase as we electrify domestic transport and industrial processes, ensuring that the grid we need is affordable for all.

100% Renewable Reports

However, in some places where it's cost effective, edge of grid communities will be slowly taken off the grid. As the poles and wires become too expensive to maintain for just a few users, these communities will be powered by renewable microgrids and storage. Some households and farms will also head in this direction. Already, Horizon Power in WA is in the process of taking a number of communities off-grid where it is cost-effective to do so.[28]

6. Industry and transport go renewable too

A pathway that gets us zero-pollution energy by 2050 requires that we get to zero-pollution electricity by 2030 (or 2035 if you include electric vehicles – see Figure 1 for the emissions reduction pathway). The electrification of many things that currently run on gas or liquid fuels is a crucial step on the way to 100% renewable energy in 2050. Therefore, that we shift rapidly to renewable energy in the power sector. No one wants to be running their electric car on coal-fired power.

Taking the pollution out of our transport and industrial sectors means helping them to switch from fossil fuels to other energy sources. After energy efficiency, switching transport, heating, and other uses of energy over to renewable-powered electricity is one of the cleanest and most efficient ways to meet many of our energy needs. As our grid gets cleaner it will make even more sense to switch from other fuels to electricity. Examples include switching from

- petrol to electric vehicles
- gas to electric (or geothermal) heat-pumps for heating.[29]

Transforming our transport sector to be powered by 100% renewable energy will require not only fuel switching to renewable energy powered vehicles but mode-shifting to greater public and active transport. In the future, heavy transport like our garbage trucks, for example, are likely to be powered by renewable hydrogen (see Part 2, Section 4).

In our industrial sector, we will see the rise of renewable industry precincts where heat-intensive industries can access renewable heat from bioenergy, concentrating solar thermal and renewable gas

Box 2: What about nuclear power, or carbon capture and storage?

Both nuclear power and coal-fired power with carbon capture and storage (CCS) technology are vastly more expensive than wind and solar PV on capital costs alone, and gas with CCS is also more expensive to build than wind or solar.[30] The very long construction timelines for nuclear power also rule it out of a scenario that involves rapid decarbonisation of the stationary power sector.[31] Not to mention the fact that nuclear is seriously unsafe.

Because variable renewables are already cheaper to build than coal and gas, and getting cheaper every year, most plausible scenarios for Australia's future assume that they will make up a much higher proportion of the generation mix. As explained in Part 1 Section 3.1, 'baseload' generators like coal and nuclear power, which are very slow to ramp up and down and lose their owners' money when they're not running, are a poor match for an electricity system with a high proportion of variable renewables. What's needed is electricity that can be dispatched on short notice to meet peaks in demand or drops in supply, and that provides the right kind of grid-stabilising services.[32] As outlined above, these needs can be met by a range of technologies, including hydro, pumped hydro, batteries, concentrating solar thermal with storage, geothermal and sustainable biomass technologies. Most projections of the cost of electricity in 2030 see rapid drops in the cost of these technologies, particularly concentrating solar thermal with storage.[33]

Gas with carbon capture and storage is potentially a low-pollution (but not zero-pollution) source of dispatchable power, but modelling from the Centre for Energy and Environmental Markets at UNSW indicates that "the optimal strategy for minimising costs, minimising cost risk and reducing greenhouse gas pollution levels in the electricity sector involves minimising energy sourced from gas, and increasing renewable generation."[34] An exception is rarely-operated gas-fired peaking generation (such as open cycle gas turbines), which are present in small amounts in the ISF 100% renewable scenario, and can be replaced over time with biogas, batteries or other on-demand alternatives.

production. These precincts will also be the key locations for Australia's renewable export industries – energy intensive products and the production of renewable hydrogen and ammonia. Our renewable exports will support countries like Japan, South Korea and Indonesia to go to 100% renewable energy.

7. Resilient to extreme weather

While doing our fair share to cut pollution will help to avert the worst aspects of climate change, we cannot avoid the warming that is already locked into the system. As such our future electricity system will have to cope with more extreme weather events. During these events, urban and rural areas will be able to island themselves, having sufficient capacity to power themselves as standalone grids for at least 6-12 hours. This creates a more resilient and reliable electricity system. This is already what the Danish electricity system operator does to better manage their system.

1.5 The faster we transition, the sooner we benefit

Burning polluting fuels is costing people their lives and damaging our planet. Moreover, there are huge benefits in store if we can overcome the resistance to change.

The health benefits of phasing out coal, oil and gas for electricity and transport are significant, measurable and increase the more pollution levels are reduced. In Australia, we could save up to $6 billion annually through a shift to clean energy and clean transport, just by avoiding the direct health costs of air pollution such as lung and heart diseases.[35] Research estimates that 24 people die for every terawatt hour (TWh) of coal burnt.[36] Australia's National Electricity Market consumed over 196 TWh of electricity in 2016-17 and more than three-quarters came from burning coal.[37] It doesn't take too much effort to realise how many lives are being put at risk every year that Australia remains addicted to burning coal.

Australian new business investment has been falling since 2012.[38] Committing to 100% renewable energy would stimulate a huge investment in our future and in jobs right now.[39] This new investment in clean renewables would go a long way towards filling the gap left when the mining boom collapsed. A record US$287.5 billion was invested in clean energy globally in 2016.[40] The International Renewable Energy Agency (IRENA) has calculated that doubling renewable energy's share of the global energy market by 2030 would involve investment of at least US$500 billion a year.[41] Australia badly needs to diversify its economy, and our huge natural advantage as a sunny, windy country makes renewables a logical choice – both for our own energy advantage and to generate new jobs and investment with a whole new renewable export industry. The ISF found that decarbonising our entire energy system by 2050 means Australia gets a AU$800 billion slice of the global renewables investment pie, and all the jobs that come with it.[42] The sooner we enable this industry to thrive, the sooner we can go beyond a 100% renewable economy to a 200% or 300% renewable economy, by exporting solar fuels and sun-powered products to our region and the world. Australia is perfectly positioned in a region hungry for energy but deeply concerned about its pollution, and with some neighbours that lack the resource potential or land mass needed to harvest enough sun and wind to meet all their needs. Australia has world-leading resources, and the technological know how to genuinely excel with renewable exports (see more of this in Part 2, Section 4).[43]

There are also major economic risks attached to continuing on our current path. In fact, all studies in recent years unanimously find that the cost of this transition is going to be cheaper than 'business as usual'. Already big financiers such as Deutsche Bank and CitiGroup are shying away from putting their money into any dirty coal projects.[44]

The story of dirty generators is like the Titanic. Their hubris makes them believe they have nothing to fear from the iceberg of public opinion, changing economics and climate action. Research suggests that 80% of publicly listed fossil fuel reserves are 'unburnable' if we want to avoid disastrous climate change.[45] A study from the University of Oxford suggests that demand for oil, coal and gas will peak by 2020,[46] leaving stranded assets and a carbon bubble that will see governments, business, and everyday people lose a lot of money unless we act now. As clean energy forges ahead, only the most short-sighted politicians would choose to stay on the coal lobby's doomed vessel.

Governments *could* cost the community billions by continuing to approve or even subsidise the construction of costly polluting infrastructure, which will become unviable as soon as political reality catches up with climate reality. Or they could take climate action instead.

There is no shortage of evidence that countries that act early have lower long-term costs. Australian government modelling back in 2007 found a 15% early-mover dividend for countries that take the lead on decarbonising their economies.[47] In contrast, latecomers may face more competition for investment, and without long-term policy commitment, businesses find it harder and more expensive to secure finance or put skilled people in the right positions.

In contrast, the clean energy future entails huge savings potential. Investing more in renewables means

spending less on fuel. The ISF found that between now and 2050, the shift to renewables and increased energy efficiency delivers enough fuel cost savings to cover 110% of the bill for building 100% renewable power. As Figure 2 indicates, Australia would save on average:

- $9 billion a year on power sector fuel costs
- $11 billion a year on transport fuel costs.

By 2050, if we repower Australia with 100% clean energy our annual energy costs will be 1/3 of what they would otherwise be under business as usual and will already be significantly less than BAU by 2030.

Similarly, CSIRO and Energy Networks Australia found that the total system spending is reduced by $101 billion for both upfront costs and customer electricity bills as fossil fuels are eliminated.[48] This translates to savings for household electricity bills of $414 per year compared to business as usual by 2050.[49]

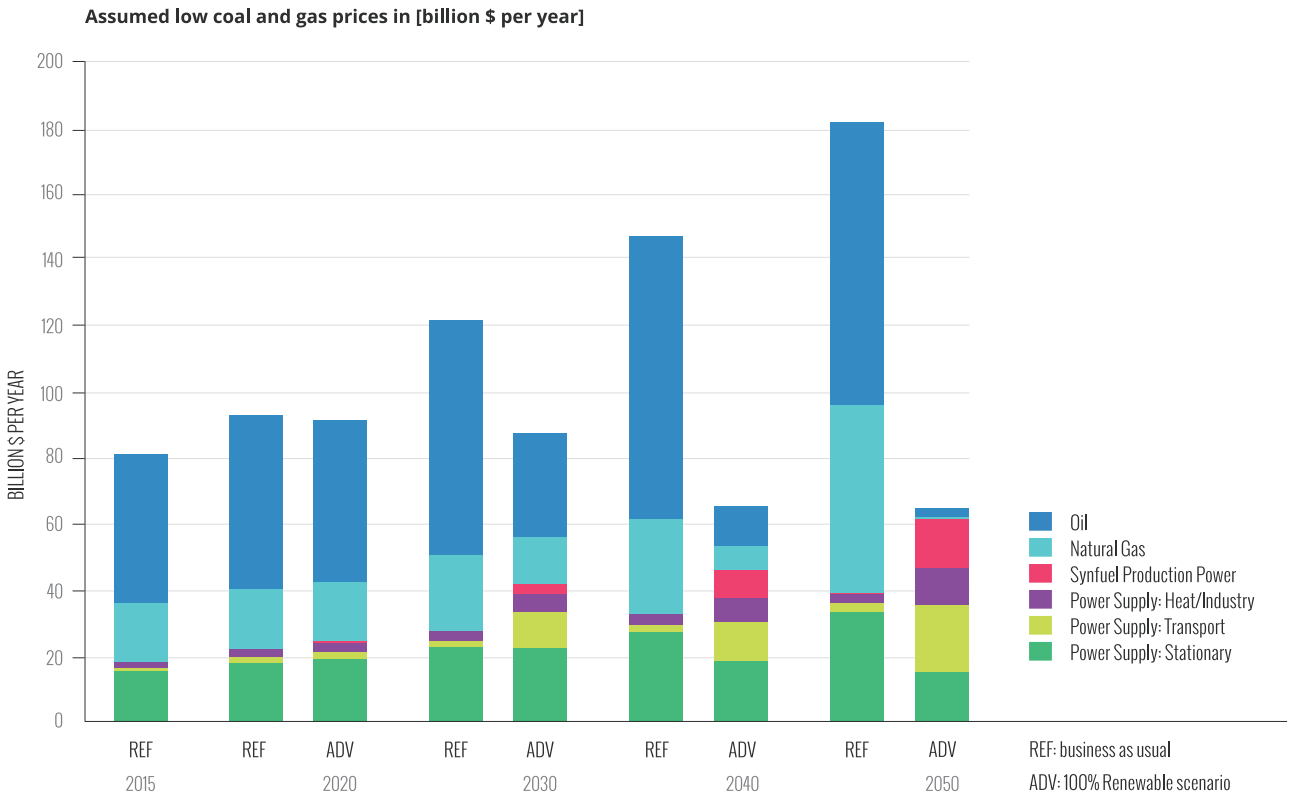
There is one more fact that the experts agree on: we need to act now. ClimateWorks have found that strong action in the electricity sector is essential to a cost-effective pathway to climate pollution reductions. Their analysis clearly shows that not all sectors have equal opportunities to reduce pollution, or costs.[50] Instead, the electricity sector is well placed to do the heavy lifting.

Both the challenges and opportunities underscore the need for a vision, a plan and a policy package that puts us on the path to 100% renewables in the timeframe climate change demands.

1.6 Others are leading the way

Across the world, countries, states, cities and businesses are all committing to transition to renewable energy (see Table 1). At the end of 2016, an incredible 176 countries had renewable energy targets of some kind, including 150 with renewable targets for the electricity sector.[51] Over 100 major international companies, including Apple, Google, Facebook, Microsoft, General Motors, Nike, Coca-Cola, IKEA, Proctor & Gamble, and Unilever have also committed to procuring 100% of their power from renewable sources.[52]

Figure 2: Electricity and fuel costs by sector



Source: 100% Renewable Energy for Australia: Decarbonising Australia's Energy Sector Within One Generation

Table 1: Who's giving it 100%?

Where	What they're working on
ACT	100% renewable electricity by 2020[53]
Tas	100% renewable electricity by 2022[54]
SA	As close to 100% renewable electricity as possible
Sweden	100% renewable energy (all sectors: electricity, heating, transport, everything)
Denmark	100% renewable energy (all sectors) by 2050, and fossil-fuel free electricity and heating by 2035[55]
Scotland	100% net renewable electricity by 2020
Costa Rica	100% renewable electricity by 2021
Iceland	100% renewable electricity already[56]
Uruguay	94.5% renewable electricity already[57]
New Zealand	90% renewable electricity by 2025[58]

2. What is the Repower Australia Plan?

The Repower Australia Plan is what an Energy White Paper looks like when it's written with the long-term interests of people and the planet in mind. When equity, respect for nature's limits and long-term prosperity are put before the influence of vested interests.

The Repower Australia Plan is underpinned by ten studies that show 100% renewables is 100% doable. All we need is a plan to make it happen.

This policy blueprint puts us on the path to a 100% renewable electricity sector in Australia by 2030 (or 2035 if we include increased electricity demand from transport). It also flags some of the initial steps needed to transition to renewable energy in other sectors. The urgent need to slow and then reverse dangerous climate change means that this is the least we should do. But even if our nation's leaders – state and federal – decided to take it slower, the types of policies and the scale of action outlined in the Repower Australia Plan would still be needed to step up our renewable energy ambition and deliver an electricity system that is powered by clean, abundant, reliable and affordable energy that is good for all of us and the planet we call home.

The Repower Australia Plan is not the only possible path we could take to reach our destination. But to build a better future, we first imagine it. We hope that the Repower Australia Plan feeds your imagination with ideas on Australia's bright, sunny, 100% renewable future.

2.1 The thinking behind the Repower Australia Plan's policies

As authors, we've tried to look at the whole electricity system – social, environmental, technical, financial, and how the different aspects of the system interact.

There are no silver bullets. Arguing about the comparative effectiveness of community energy projects, efficiency measures, research and development (R&D), tariff reform, grid access guarantees or clean energy auctions is like arguing about whether water, food or oxygen is more necessary for life. Some tools will of course work faster than others, and there is a good argument for pushing ahead with 'quick wins' which will make an immediate impact while simultaneously designing and implementing more complex long-term measures.

> ***"After the final no, there comes a yes, and on that yes, the future world depends."***
>
> ***Wallace Stevens*** [59]

Each policy put forward in the Repower Australia Plan would complement the others. Clean energy auctions would deliver on-demand electricity and storage, balancing out the low-cost wind and solar PV driven by the Renewable Energy Target (RET). Regional energy hubs would foster efforts to democratise the energy system from the outside in, while rewriting the National Electricity Objective would transform its byzantine maze of rules and institutions from the inside out. Coal Clean-Up Auctions would get the oldest and dirtiest power plants out of the national electricity market, while an unshackled Clean Energy Finance Corporation would provide the finance needed for new players to enter. Don't know what we mean by these terms? Check out the Punters Guide to Jargon (Table 2) and read on for how all of these great policies would work in practice and why they're needed.

The effort to transform our energy system will take the combined efforts of the public sector, private sector, and civil society. We all have a part to play. That's why the Repower Australia Plan puts forward policies that would encourage a diverse range of groups to take action in their own ways.

We shouldn't wait around for governments to take the lead, but neither can any level of government shirk their responsibility. There is an urgent need for national and state government action to drive this transition. The Repower Australia Plan focuses on what federal and state governments should do to turn the transition to renewables into a fair and transformative nation-building opportunity, but many of the policies outlined here can also be implemented at a local government level.

The choice between a RET or a price on carbon pollution or a National Energy Guarantee[60] (NEG) as the primary market mechanism to drive investment in renewables beyond 2020 remains an open question. We're with economist Nicholas Stern on this one: unpriced carbon pollution is the biggest market failure of all time. The playing field for renewables can never be

called level unless polluters are made to pay in full for the damage they are doing to our planet. A price on carbon pollution, shaped in line with a 1.5°C target and based on the lessons of the most successful and least gameable models worldwide, would be transformative.

But the ongoing lack of political enthusiasm for making polluters pay and the acronym soup of energy politics is no excuse for inaction. In the RET we have a proven, popular, cost effective tool for cutting Australia's biggest source of carbon pollution. Enough renewable energy is now locked in to meet the existing 2020 RET, leaving us with no national policy to foster clean energy. A rock-solid commitment to a target that will speed up the roll-out of clean energy is the least of the tests that a political leader must pass to prove they take our energy and climate future seriously. And in the absence of national climate leadership, there is no shortage of actions that state governments can and must take to ensure a fast and fair transition to 100% clean energy.

Addressing one market failure does not eliminate them all (see Box 3). A hefty dose of institutional economics lies behind the thinking in this report. In a time of massive disruption, we need to broaden our understanding of what an 'efficient' approach to problem solving looks like. It's an approach beyond 'doing more of the same thing with less resources', to 'finding a completely different way to do things with different resources'. This involves looking at the culture of institutions and how power dynamics play out in practice, recognising that a nation's advantages are both inherited and shaped, and then building on what's already working while planting the seeds of transformative change.

Box 3: Energy market failures

Anyone who reads past the first page of their economics textbook knows that real-world markets don't tend to resemble smooth supply and demand curves. Factors that make markets malfunction are referred to as 'market failures', and the energy market has them in spades. When market failures are present, the visible hand of government is often needed to ensure that Adam Smith's 'invisible hand' doesn't drop what it's holding and make a big mess. Here are a just a few features of the energy sector that fit the bill:

- Unpriced pollution from a coal-fired power plant damages the health of the local community and contributes to global warming. **| negative externalities**
- A company decides to respond to community opinion by shutting down a polluting power plant, and its less mindful competitors reap the benefit of slightly higher wholesale prices. Another company is considering closure but deterred by the high costs of decommissioning and rehabilitating the site. **| positive externalities, first-mover disadvantage, barriers to exit**
- A network company charges as much as it can get away with for a new renewable generator to connect to the grid and the generator has no alternative but to pay up: there's only one set of poles and wires. **| natural monopolies, barriers to entry**
- A new renewable generator pays the full price for new grid infrastructure that others can then connect to for less. **| positive externalities, first-mover disadvantage**
- A research team makes a breakthrough that leads to cheap, printable solar panels. The crowd goes wild. **| public goods**
- A new renewable generator can't convince one of the big three retailers to sign a power purchase agreement because they're worried it will undercut the market for their coal-fired power. **| oligopsony, barriers to entry**
- A real estate agency in Tas fails to disclose a property's lack of insulation to their tenants, who get stuck with massive heating bills in winter. **| split incentives, asymmetric information, markets for lemons**
- A customer buys a new car on sale, not realising that its poor fuel economy will cost them more within years than they saved upfront, and its carbon emissions will be even more costly to the planet. **| bounded rationality, asymmetric information, negative externalities**

Table 2: A punter's guide to electricity jargon

Generation	The technologies that convert energy (coal, gas, wind, solar) into electricity are collectively known as generation. In Australia, the generation sector is broken down as follows: Black coal – 43% Brown coal – 20% Gas – 21% Renewables – 14% (of which 5% is hydro, 5% wind and 2% solar) Other– 2%[61]
Transmission	You know when you travel through the countryside and you see what looks like a big string of metal robots holding skipping ropes? Those are transmission lines.
Distribution[62]	The telegraph poles strung along your street are part of the distribution network. Why do we still call them telegraph poles even though we haven't used them to send telegrams for over half a century? Like our electricity regulations, language is slow to change. Taken together, the transmission and distribution networks make up the electricity network or 'grid'.
kW, MW and GW	Power, measured in kilowatts, megawatts or gigawatts. At the supply end this refers to capacity. At the consumption end, it refers to the rate of usage.
kWh, MWh, GWh, TWh	Energy, measured in kilowatts hours, megawatt hours, gigawatt hours and terawatt hours. Can refer to either generation or total usage. One kilowatt-hour is the amount of electricity produced or consumed in an hour by a one kilowatt generator or appliance (kWh = kW x h). If a kW were speed, then a kWh would be the distance covered at that speed over an hour. The average Australian household goes through 17 kWh a day.[63]
AEMC	The Australian Energy Market Commission is the 'statutory rule maker', which means they're in charge of making the rules energy market players have to obey if they don't want to be sent off the field by the referee (the Australian Energy Regulator (AER)). The AEMC reports to and advises the Council of Australian Governments via the Standing Council on Energy and Resources.
AER	The AER is the energy market referee, enforcing the rules made by the AEMC. It sits under the Australian Competition and Consumer Commission. One of the AER's biggest jobs is deciding how much revenue network companies can recover from customers that use their poles and wires. It also regulates retail markets in most (but not all) of the National Electricity Market (NEM).
NEM	The NEM is both a physical electricity grid and a wholesale market for the trading of electricity. It is, confusingly enough, not actually national: it includes QLD, NSW, the ACT, Vic, Tas, and SA. In 2012–13 the NEM covered 84% of Australia's electricity consumption.[64] (WA is coming into the market side of the NEM soon, though it will remain physically separate).
Grid parity	An energy technology is said to have reached 'grid parity' when it costs less over the lifetime of the technology to install and use than to buy electricity from the grid/wider energy system. For example, solar PV reached grid parity a few years ago and battery storage is predicted to reach grid parity in the next five years or less.
Distributed generation	Generation technologies that are distributed throughout the energy system, typically smaller scale and closer to where energy is used. Examples include rooftop solar PV, bioenergy plants, a small 1-2 turbine wind farm, diesel generators. Also known as local or decentralised energy.

Feed-in-tariff (FiT)	The amount of money that a generator receives for the electricity generated. In Australia FiTs have typically only been available for small-scale solar PV systems. Most FiTs are mandated through law or regulation and retailers are required to pay it, though retailers may voluntarily choose to pay a higher FiT than legislated. Gross feed-in tariffs are those where a generator gets the same rate for every kWh generated, regardless of whether the kWh is used on-site or exported to the grid. Net feed-in tariffs are those where a generator gets a certain rate for every kWh exported to the grid, not including the ones used onsite.
Microgrid or mini-grid	The combination of energy generation and distribution that typically operate as isolated electricity systems. Mini-grids mostly exist in remote areas that are separated from the national grid or on islands. However, there is also a growing interest in grid-connected or embedded mini-grids because it allows for greater control of the electricity generation (e.g. from renewables) and can reduce network costs.[65]
Smart grid, smart meter	This refers to energy infrastructure such as an electricity meter that is combined with communications technology. A smart meter can track and provide in real-time how much electricity you are using or generating from your solar PV system. Adding smarts to electricity infrastructure creates a huge number of options to better manage energy for the benefit of the individual and the benefit of the energy system, if the information is made available in secure and useful ways.
Demand response/ demand management	When we think about the electricity sector we focus a lot on supply – wind turbines, solar panels, coal fired power stations, but very little on demand – like when you turn on your air conditioner or lights, how efficient they are etc. 'Demand response' or demand management is when at times of high electricity demand a customer (usually a business, but increasingly households) agrees to reduce their demand usually only for a short time – for example by shutting off unnecessary processes or appliances.
Merit-order effect	The wholesale electricity generation market that is the key feature of the NEM works by generators bidding in a certain amount of electricity (MWh) at a certain price every 30 minutes for five-minute intervals. For each of those five-minute intervals a certain number of MWh is needed to meet the electricity demand at the time (from people switching on their lights to factories firing up conveyor belts). The bids get ordered from lowest price to highest price. This is called the 'merit order'. Only the bids that stack up to the demand limit get purchased, and any bids more expensive than that don't get used (those generators have to stop or limit their generation). Every bid below that threshold gets paid whatever the highest successful bid was. Renewable energy generators have low marginal costs (the cost of producing one extra unit of electricity), which means they can bid into the wholesale market low. This pushes more expensive generators out of the stack of successful bids and lowers the overall wholesale price of electricity for all of us. This is called the 'merit-order effect', and why it's not called the 'renewables winning effect' is beyond us.
Variable	Electricity generation technologies that vary depending on the time of day or the weather, particularly solar and wind. While these sources of energy do vary, at a system level they are also very predictable – we know the time of sunrise, we know when a windy weather system is coming, thus we can predict at least a minimum amount of renewable generation that will come from renewables day-in and day-out and the likely amount that will be generated tomorrow and next week. Even when it's cloudy solar PV generates some electricity.
Dispatchable or on-demand	Electricity generation technologies that can 'dispatch' or send electricity into the grid at the request or 'on-the-demand' of the market operator when the energy system needs it. These technologies can ramp up and down quickly and include the likes of hydro, concentrating solar thermal with storage and bioenergy technologies. They're 'electricity on demand' technologies.
Energy Productivity	Energy productivity is the ratio of output of an organisation, economy or process to the energy consumed.

PART 1

REWRITE
THE RULES

1. The electricity market needs a reboot, not just reform

Even if we weren't on a path to 100% renewable power, we'd still need to change how Australia's electricity market works. It is, to put it politely, a shambles. It combines the worst aspects of multiple regimes in the one system, a system that is neither clean nor cheap, neither simple nor sophisticated, neither public and fair nor private and competitive. Every institution in the NEM is enslaved to a vision so blinkered that it has no room for either social equity or the environment. This vision, encompassed in the existing NEO, is far too narrow to fulfil most Australians' desire for affordable, clean power

Imagine a match between a soccer team and a cricket team. Weird game. Who wins depends very much on whether the referee thinks they're supposed to be playing by the rules of soccer or cricket. Right now, the electricity market's referees barely understand what the game is, and they keep sending renewable players off the field because it's just not what they're used to – even as the playing field transforms. That's why the Repower Australia Plan begins with a blueprint for transforming how our electricity system is governed: without sorting out the rules of the game, it is very hard for renewables to succeed.

Our energy system is also showing its age. Its institutions were designed for a centralised, fossil-fuel powered, hub-and-spoke model populated by passive consumers. The difference between that system and the one emerging now is like the difference between an old rotary dial telephone and a smartphone. This means that we need transformative change, not just incremental change, in how the electricity market works.

To have a fast, fair and affordable transition from a fossil-fuelled electricity system to one based on renewables, we need governments to:

- Commit to a comprehensive energy transition, as well as ambitious renewable energy targets
- Make it someone's job, by giving a single agency the responsibility and resources needed to coordinate the transition
- Put 100% renewable electricity in the one sentence that rules them all, that is, by rewriting our NEO
- Make the electricity network act more like the internet, through transforming the business model of network companies.

There are also some immediate actions that should be taken to kick-start this transition:

- Bring in new rules to require network companies to save their customers money by rewarding network companies for bringing down peak demand, and punishing them for overspending.
- Give citizens a real seat at the negotiating table, through a fair, inclusive national process for setting benchmark electricity tariffs.
- Create or coordinate a fair national feed-in tariff (FiT).
- Recognise that baseload is history and redesign the system to reflect the new technology.

Right now, an unstoppable force (the revolution in clean energy and energy efficiency) is meeting an immovable object (the outmoded rules and slow-moving institutions that govern our existing electricity system). The system is broken and needs to be fixed. The question is this: will we get a few quick fixes designed to benefit large power companies that have spent the past decade lobbying against climate action and wasting their customers' money? Or will we get a major overhaul designed to serve the rest of us by saving electricity, cutting bills, and putting us on the path to 100% renewable power?

1.1 Transforming the system: what we've got and what we want

Electricity System 1.0

Our energy system was designed around much less sophisticated technologies than we have access to today. Its design principles reflect a fairly simple, linear model, where a few hundred electricity producers served millions of passive consumers. It is struggling to adapt to a world in which there are literally millions of producers of electricity.

Here's what it feels like to be a modern citizen in an antiquated system. As customers, we turn on a washing machine and it works, but we have absolutely no control over how much it costs us to press that button. Plus, we're usually contributing to climate change while we do the laundry, which isn't a great feeling. If we do something positive ourselves, like upgrading to a more efficient model or putting solar panels on our roofs, unknown suits in power companies change the game and put up our daily charges or try to stick us with penalties like higher fixed fees or anti-solar tariffs (see Box 7). Worse still, when consumer advocates propose changes that would make it easier to go solar or save energy, the national rule-maker (the Australian Energy Market Commission, or AEMC) and the rule-enforcer (the Australian Energy Regulator, or AER) tend to reject or delay their proposals because the rules they are adjusting and enforcing don't take the needs of people or the planet into account.[67] They both have their hands tied by the NEO, which was explicitly designed to exclude environmental and social justice goals.

Electricity System 2.0

Version 2.0 of our electricity system is much more exciting and as citizens and consumer-producers we have a lot more options. Millions of us are sharing the clean, renewable electricity we generate on our rooftops through local distribution networks. Instead of just paying whatever the retailer can get away with charging for our kilowatt-hours, we have the option of buying energy services, such as a mix of heating and cooling, electric vehicle charging and electricity for our appliances, in a way that is tailored to our needs.

"The electricity system is fun and fascinating! The beatings will continue until everyone agrees."

David Roberts, Grist [66]

In the near future, when we flick a switch on an appliance, it might be a smart appliance, one that we can control remotely through our energy management app. Or we might give our power supplier permission to turn the appliance down slightly at times of peak demand to help cut our bills, as well as cutting costs across the whole system. Our retailer might look much the same, but it now buys and sells electricity from wind and solar farms instead of fossil-fuelled power plants. Or we might be part of a 'virtual power company' that supplies us with electricity from a solar farm that we own part of, or from a wind turbine on a nearby farm, or from solar panels on that house down the road that has a better aspect than ours. If there's a big storm and a power line goes down, our local network company may decide to 'island' our town or our suburb, disconnecting it for a few hours or days from the main grid and running it on electricity from solar, batteries and other local renewables, which turns our suburb into a micro-grid and helps us weather the storm's aftermath.

In the future the lines will be more blurred between generators, networks and retailers. As consumers we will also have the opportunity to be power generators and traders, supplying support services to networks and purchasing electricity from and selling to our neighbours. Don't worry if that sounds boring or hard, we can also get someone else to do it all for us as our electricity retailers do now.

If you think this is a long way off, think again. Reposit Power's system, which allows electricity trading from household solar and storage systems, is up and running right now in the ACT. In fact, there are many start-ups now looking at ways consumers, whether homeowners or renters, can play a more active role and cut their bills in the process. In fact, **many elements of Electricity 2.0 have emerged already: the challenge is getting those with the power to change the system to manage the transformation, rather than blocking it or pretending it isn't happening.**

Comparing the two systems

While Electricity 2.0 will be a major improvement on Electricity 1.0, it could be even more complex. There will always be a confusing array of moving parts in a system that includes everything from how many volts come out of the socket in your wall, to the rules governing the minute-by-minute prices that generators receive in the wholesale electricity market. So, let's break it down.

Table 3 puts the elements of the two systems side-by-side.

At this point, if you're already familiar with the history of Australia's electricity system and just want to know how to fix it, you can skip ahead to Section 2: How we get to Electricity 2.0. If you'd like to know more about how the system got into its current state, and where we could be heading if we fail to act now, read on.

Photo: CORENA

Table 3: Electricity System 1.0 and 2.0 side by side

	Electricity System 1.0	**Electricity System 2.0**
What the system delivers	High-cost, low-tech, polluting, historically reliable (but increasingly less so) electricity in a system that is both confused and confusing to consumers.	Same cost or lower, climate-safe, innovative, reliable energy services, where customers are empowered and understand the options they have and how to participate.
National Electricity Objective	"To promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to: (a) price, quality, safety, reliability and security of supply of electricity, and (b) the reliability, safety and security of the national electricity system." [68]	Deliver an efficient, reliable, affordable, safe and fair electricity system that is powered by 100% renewable energy.
Electricity generation	Centralised and polluting, with a mixture of base-load and peak-load generation, with the majority powered by the burning of fossil fuels.	Clean and renewable. A mixture of centralised (large renewable power and storage projects in renewable hot-spots) and decentralised renewables and storage (located close to and where people live and work), powered by clean energy from the sun, wind, waves etc. A mix of variable and on-demand loads (both supply and demand).
Electricity users	Passive price takers who are often discriminated against if they try to play an active role.	Active participants (or passive – it's up to you), who are rewarded for being active. Most will be grid connected, some won't be. Some customers will be connected to smaller micro-grids.
Physical structure	One of the longest interconnected grids in the world.	Skinnier and more nodal grid, with microgrids – some standalone, some grid connected. Makes use of earlier over-investment in grid infrastructure due to expanded demand from electric vehicles.

	Electricity System 1.0	Electricity System 2.0
Role of networks	A natural monopoly, with a business model based solely on building and maintaining poles and wires, and receiving an overly generous regulated return on its capital and operating expenditure. Risk averse, often actively blocking the rise of renewables. Fights against attempts to cut consumers' bills by saving energy instead of building more poles and wires.	A Local Energy System Platform (LESP) Operator, along the lines defined through the 'New York Rev' process: *"An intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources (solar, storage, demand management etc) to meet customers' and society's evolving needs."*[69] Continues to operate the transmission grid.
Role of markets and retailers	The main commodity is a unit of electricity, a kWh. There are two main markets, the wholesale or generation market and the retail or customer market where the retailers sit. Additional markets like the Renewable Energy Certificate and Ancillary services market exist, but they aren't integrated. Retailers sell electricity to passive customers.	Energy services: electricity is less like a commodity and more like information. Services include reliability, pollution reduction, flexibility, increased autonomy, lighting, heating, cooling, avoiding spending on network or distribution infrastructure, etc. Retailers provide energy services to customers both active and passive.
Role of market operator (AEMO)	To manage the wholesale spot market and ancillary service markets. To do long-term demand forecasting – which they haven't done particularly well in the last ten years (see Figure 5).	Active managers of a wholesale market, as well as balancing variable and on-demand energy loads. Near-term and long-term supply and demand forecasting, including regularly updated analysis of the pathways to 100% renewable energy.
Role of regulator (AER) and rule maker (AEMC)	To deliver the NEO 1.0. Mostly run by economists.	To deliver the NEO 2.0. Run by economists, consumer advocates and engineers.
Role of state and federal governments	Passive, no long-term or holistic planning, little governance or oversight of the system and no integration of energy and climate policy objectives.	Active, long-term, holistic planning, managing the transition to 100% renewables, with strong oversight of the system. More active role in securing affordable energy services for vulnerable customers.

1.2 How we got to Electricity 1.0

Once upon a time we had a big, dumb, cheap electricity network, powered mainly by big, dumb, dirty and cheap coal-fired power plants. Politicians, against the wishes of most Australians,[70] deregulated some parts of it and sold off other parts, full of faith that the magic of the free market would make it cheaper still. **Anyone who has opened an electricity bill recently can see that hasn't happened. Across Australia, retail prices rose by 6% in real terms between 2007 and 2017.**[71]

How did we get here? The simplest explanation is that first, spending on electricity infrastructure rose while demand fell, and companies were allowed to recover the rising cost per unit of electricity from their customers' wallets. Then, the gas price crisis caused by exporting Australian LNG overseas has caused electricity price spikes, since gas-fired power stations are setting marginal prices more often than not. The full story takes a little longer to explain.

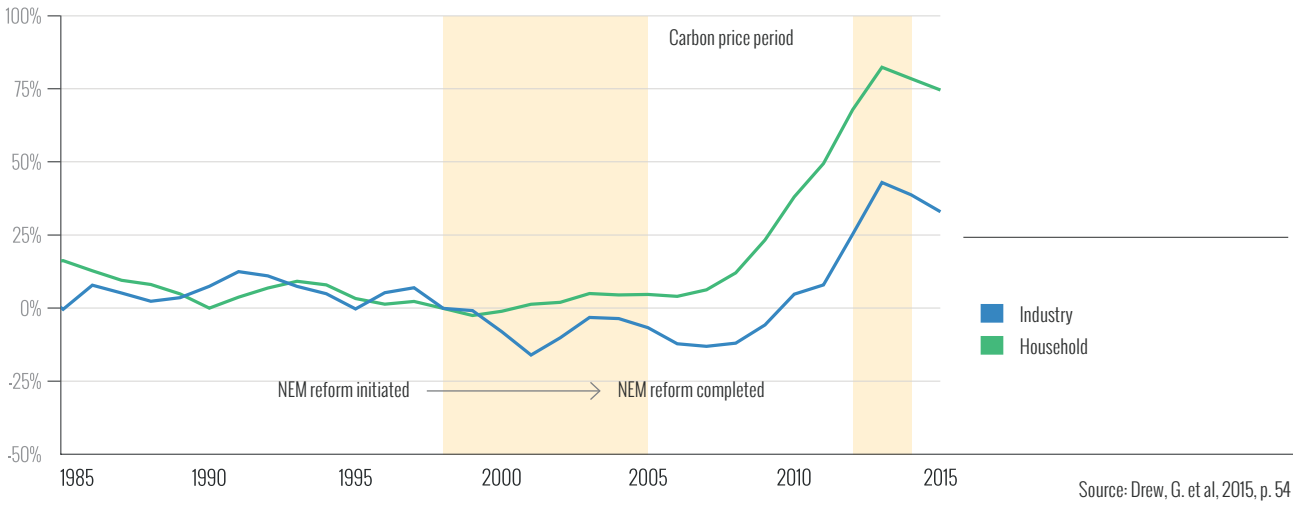
A brief history of the National Electricity Market

In the early days of electrification, a mix of local electricity suppliers was owned by a range of local councils and private companies. Over time, states stepped in and took on most of the responsibility for providing enough electricity to meet rising demand. A series of blackouts mid-century prompted state governments to further expand their investment in the industry.

Most states ended up combining the different elements of electricity supply into one publicly owned 'vertically integrated' corporation.[73] The State Electricity Commission of Victoria, the Electricity Trust of South Australia and similar entities in other states owned and operated the power stations, sent you your bill, and owned and operated everything in between – namely the high voltage transmission lines, switching yards, transformers and low voltage suburban lines that distribute electricity to your home. NSW and QLD had two-part systems, with state electricity corporations responsible for generation and transmission, and a series of regional entities that dealt with distribution and retail.

In the 1990s electricity got caught up in the national push for privatisation, competition policy and 'structural separation'. The idea was to separate the supply chain into its elements – generation, transmission, distribution, retail. The electricity transmission and distribution networks were recognised as natural monopolies, which, if privatised, would need to be regulated to ensure that their new owners didn't under-invest in essential infrastructure or abuse their market power. Generation and retail, on the other hand, were deemed to be competitive. While National Competition Policy didn't mandate the sell-off of public assets, many of its enthusiasts strongly encouraged privatisation.

Figure 3: Electricity prices, 1985–2015[72]



Source: Drew, G. et al, 2015, p. 54

Yallourn coal fired power station. Photo: Doug Gimesy

This has meant:

- There is a growing number of retailers or electricity shop-fronts like Origin Energy, AGL and EnergyAustralia – mostly in private hands, but some remain state-owned in places like WA, Tas and QLD.
- We have one of the longest interconnected electricity grids in the world, running over 4,000 km from the north of QLD down to Tas and west to SA. This grid is run by a handful of transmission companies and distribution companies in each state – again some are privatised while some are state-owned. WA and the NT have their own smaller grids.
- There is a growing number of generators, both renewable and fossil-fuelled. A few of the large ones (coal and gas-fired power stations) are still partially state-owned. Many of the big ones are owned by retailers: these organisations are known as 'gentailers.'

Core to this electricity market reform was the establishment of the NEM. Physically the NEM is the connection of the NSW, ACT, QLD, Vic, Tas and SA electricity systems. Financially, the NEM is based around a wholesale electricity generation 'spot market', managed by the Australian Energy Market Operator (AEMO).

Generators bid to supply electricity at five-minute intervals and the electricity is purchased by retailers. There is a different pool or market for each of the five jurisdictions. The spot market price goes up at times of high or peak demand. To make sure it doesn't go through the roof there is a market cap of $14,200/MWh,[74] although given that the average spot market prices currently range from $70 to $110/MWh,[75] the roof is still pretty high.

The wave of electricity market reforms which began in the 1990s also changed how electricity is governed and regulated. As recently as 2004 the network was regulated by 13 independent bodies. However, in 2005 when the National Electricity Law[76] was passed, network regulatory oversight was taken over by the newly established Australian Energy Regulator (AER), which sits under the Australian Competition and Consumer Commission (ACCC). The AEMC, which is controlled by the state governments, was set up at the same time. As the rule-marker, the AEMC has much of the power in deciding how our energy system is governed.[77]

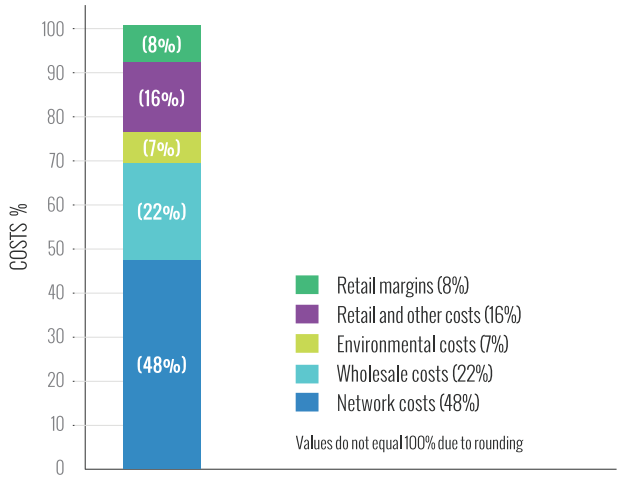
So, what's up with our bills?

Despite all these reforms, Australia has gone from some of the lowest electricity prices in the world to the highest in the past decade. The reasons why are as complex as the electricity markets themselves, which certain politicians have taken as an opportunity to sow confusion about the role that renewables have played in the increases.

The preliminary report from the ACCC on retail electricity sheds some light on the issue. Overall, residential electricity rates increased by an estimated 63% between 2007-2008 and 2016-2017, and electricity bills by an estimated 44%. The ACCC's analysis found that increases between 2007-2008 and 2015-2016 were "primarily driven by higher network costs," while retail price increases since then were "likely driven by higher wholesale prices." The cost increases attributed to 'environmental schemes' – primarily state feed-in tariff programs (which have largely been phased out in recent years) – were minor, despite what some politicians would have you believe.

Let's add some further clarity and break down the reasons why electricity prices are really going up in more detail. It's spread across all three main areas of your electricity bill (see Figure 4): generating electricity (the wholesale electricity price), transporting electricity (known as poles and wires, network, or transmission and distribution costs) and selling electricity (retailing).

Figure 4: Breakdown of your electricity bill [78]



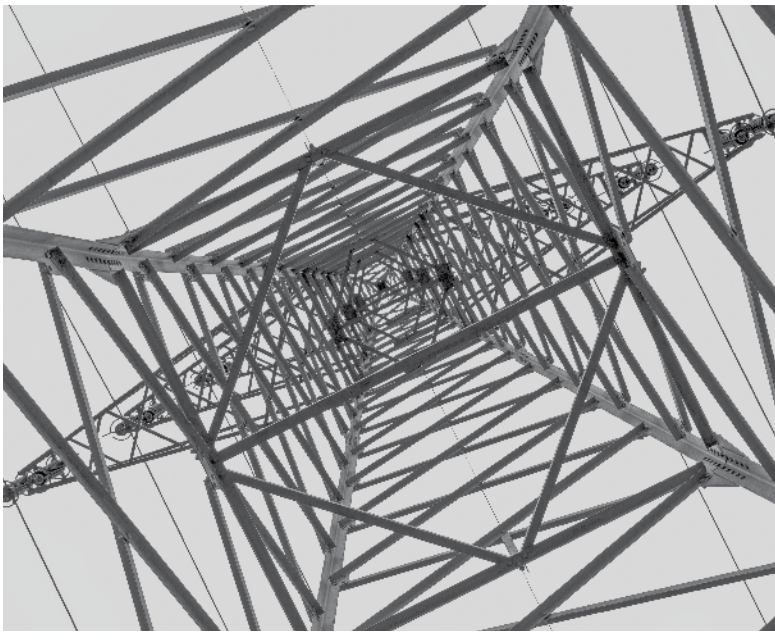


Photo: Andreas Klein

Here's why the cost of each has been increasing:

Generation

The need to replace ageing generators

Much of Australia's generation fleet was built in the 1960s and 1970s. Typically, coal and gas-fired power stations are built to last 35-40 years and if they are looked after they might last 50 years, albeit with more frequent breakdowns. The Hazelwood power station, for example, was expected to be closed by 2000 when it was built in 1964, and was over 50 years old when it closed in 2017.[79] Notorious for being the most polluting power station in Australia and perhaps the developed world, it would have cost $400 million in repairs just to meet basic safety standards.[80] Decrepit generators like this were always going to need replacing with new investments around this time, irrespective of what else was changing in the market.

Ideologues playing politics with our energy system

As discussed in "The RET: Doing the heavy lifting," the one policy driving much-needed new investment (given the ageing generation fleet) was and is the national Renewable Energy Target (RET). After the Tony Abbott-initiated review of the RET headed by renowned climate sceptic Dick Warburton, investment in large-scale renewables dried up overnight, plummeting by 88% in 2014 compared to 2013 and reaching its lowest levels since 2002 (when the RET was first introduced).[81] While investors eventually regained confidence in the policy, the main part of the RET comes to an end in 2020. Instead of extending it the Turnbull Government has proposed a new 'National Energy Guarantee' that would eliminate the RET, potentially throwing investment in new generation into uncertainty once more.[82]

Rising gas prices

Wholesale electricity prices are set by the marginal generator – in other words, the generator called upon to provide the last megawatt-hours of demand in the market. And those marginal prices are often set by power stations burning natural gas – which, as discussed in Part 3, Section 3, has doubled in price over the last few years, putting major upward pressure on final electricity prices.[83] Even more disturbingly, there is evidence that the small number of gas generators are colluding to game the market and increase their profits, driving up prices even further.[84]

Outdated rules of the game

The rules of the electricity system were established for large generators located long distances from major population centres, with passive consumers whose only roles were to use a lot of electricity and pay their bills. Right now, home solar (and increasingly batteries) can give customers better value for their money. Indeed, the ACCC preliminary report notes that the explosion of solar PV has played a significant role in limiting household electricity bills, which have increased more slowly than electricity rates.[85]

Even greater benefits for consumers could be unlocked with a full-fledged distributed energy revolution that took advantage of potential gains from innovative approaches like peer-to-peer trading and demand response. Unfortunately, the rules of the game set by the AEMC are not yet set up to accommodate these business models, although demand response trials by AEMO will allow participation by households. If more of these new decentralised business models were made possible, household bills could be further reduced while increasing competition would also drive down electricity rates.

Networks

Gold-plated networks

As Australians we have collectively spent $75 billion dollars over the past decade building far more electricity network infrastructure than we needed.[86]

If this wasn't driven by a deep and abiding love of transmission lines and substations, then what did drive it? The answer is, frankly, pretty boring and complicated. And that's kind of the problem. If there is a pickpocketing technique based on spouting technical jargon until the victim is too bored to notice their wallet being lifted, then network companies have mastered it.

Australia's electricity distribution and transmission companies are a mixture of publicly and privately-owned, regulated monopolies. Every five years the AER determines how much companies controlling the poles and wires are allowed to spend on new infrastructure and how much of a profit they can then recoup from consumers.

The battles between the network companies attempting to maximise their revenue and the handful of NGOs trying to protect the public interest tends to take the form of 'consultants at 20 paces' – and the big guys have a lot more money to spend on consultants.

This bias of the regulatory process has led to what

is widely called the 'gold plating' of the network, where more assets are built than needed – because the more poles and wires the networks convince regulators to let them build, the more money they make. Way back in 2002, a NSW inquiry found that network companies and regulators were missing out on a golden opportunity to save energy and cut costs by relying on demand management instead of just greenlighting expensive new infrastructure. The inquiry also predicted potentially nasty consequences for power bills if this practice continued, warning that "potentially massive increases in network expenditure to meet demand growth highlight the importance of getting demand management right."[87]

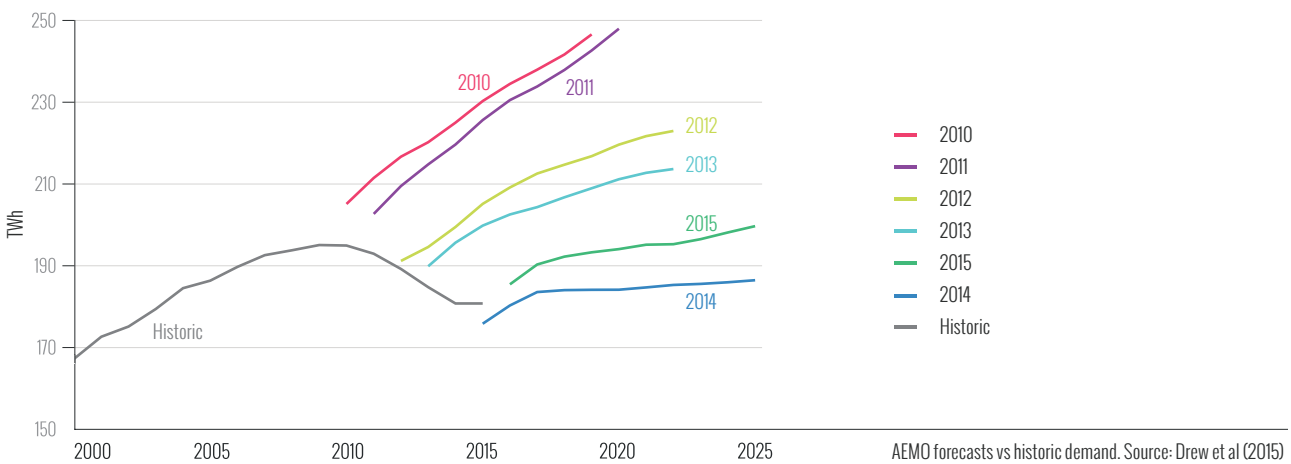
Unfortunately, these warnings were not heeded and the building splurge continued. In the early 2000s, the networks saw rapidly increasing electricity demand – driven by things like the rapid uptake of air conditioners – and decided the answer was, unsurprisingly, to spend more money (and make more profits) on poles and wires. AEMO (and before that NEMMCO) took data collected by the networks[88] at face value, along with their projections that conveniently assumed both energy demand and peak demand would continue to rise. The AER deferred to both AEMO and the networks when making decisions about how much of their customers' money networks should be allowed to spend.

These projections were wrong, as shown in Figure 5. While the initial run-up in peak demand was real, it fell away quickly, thanks to factors including energy efficiency programs, solar photovoltaics (PV) and steeply rising electricity prices.

Instead, this last round of network infrastructure gold-plating was kind of like building a fancy new four-lane bridge across the Sydney Harbour to be used only two days a year. And as noted above, the ACCC preliminary report found that these excessive network costs played the largest role of any factor in driving up rates over the past decade and currently account for 48% of consumer electricity bills.[90] Worst of all, according to the ACCC, "to a significant extent, decisions of the past relating to network investment are 'locked-in' and will burden electricity users for decades to come."

Networks are still about as close to a natural monopoly as it gets. When they are in public hands, we rely on governments to run them efficiently and in the public interest, rather than, say, milking them as cash cows or fattening them up so they'll fetch a higher price when they're sold or leased (we're looking at you, QLD and NSW).[91] When they're in private hands, we rely on public regulators to achieve the same outcome. But when the entire business model is inherently flawed, then it won't deliver the outcomes we need, no matter who owns it.

Figure 5: AEMO got it wrong[89]



AEMO forecasts vs historic demand. Source: Drew et al (2015)

Retailing

Opaque retail markets

In the electricity retailing game, one maxim holds true: confusion = profit. The less consumers understand our electricity bills and the options available to us, the more profit retailers make. Much has been made of the deals retailers offer to attract new customers, but a study by the Victorian Essential Services Commission (ESC) found that 'discounted' rates can result in comparable or even worse costs compared to 'non-discounted' deals – a confusing outcome decried by the ESC chair, who said "I regulate this industry but find it almost impossible to work out what is a good deal and what's not a good deal."[92] ACCC's preliminary report found that both retailer costs and retailer profit margins have helped to drive up electricity costs in the past decade significantly, noting politely that "competition is not driving good outcomes for consumers."[93]

The Thwaites Review focused on Vic's retail electricity markets and found even more damning evidence. Since the removal of retail price regulation in 2009, an explosion of different retailers have been spending more and more money competing with each other – a vicious cycle that has "added additional costs to the market that have not been offset with cost reductions." And because these costs are ultimately recovered from ratepayers, consumers now have to suffer the indignity of paying for the additional costs of retailers spending their money to steal unsatisfied customers away from each other, and then yet more money to lure them back, with no benefits in terms of the actual product delivered. As a result, retail charges now contribute more to Victorian energy bills than the actual cost of generating the electricity.[94]

Gentailers gaming the system

Dodgy deals are not the only way retailers are gouging customers. Too often, the companies that sell electricity in Australia are also the ones who own the electricity generators, creating opportunities for more anti-competitive behaviour. The ACCC preliminary report notes that the biggest 'gentailers' – AGL, Origin, and EnergyAustralia – control over 60% of generation capacity in NSW, SA, and Vic, as well as large shares of the retail market in most regions. This gives them significant advantages over non-vertically integrated retailers in the market, with the ACCC noting that "outcomes for consumers and businesses are being driven by pricing practices that are not consistent with vigorous competition"[95] – in other words, the gentailers are gaming the system to enrich themselves.

This dynamic has played out gruesomely in SA, where gentailers have been able to exert their market power with a particular ruthlessness. As detailed in a case study by Carbon + Energy Markets, in July 2016 wholesale prices reached up to $8,800/MWh due to gas and diesel generators deliberately withholding capacity in order to drive up prices. In technical terms, "the existence of a such a large gap between market prices and the highest plausible estimate of the marginal cost of production, at a time when there was no genuine scarcity, is strongly indicative of inadequate market rivalry."[96] In more common language, the South Australian gentailers engaged in an Enron-style rorting of the market that under current market rules is legal, which is why we need to re-write the rules so in the future we can meet this type of behaviour with Enron-style criminal prosecutions.

How we got into this mess: follow the money

Why have gentailers and network companies been allowed to make such massive profits at the expense of consumers? Partly because the system is set up that way. The energy system and the markets and regulated monopolies that populate it are all set up around one primary commodity: a unit of electricity. Traditionally, selling ever more electricity means making more money.

Generators make more money if they:

- sell as much electricity as they can produce (this is particularly true for coal-fired power stations, which have to keep burning at the same rate, no matter how much electricity is being used. They can't easily be turned up and down, so if they're not selling their power, they are losing money on the fuel and labour costs required to keep them running)
- sell very expensive electricity during spikes in demand from customers or drops in production from other generators (therefore when solar power and energy efficiency lowers peak demand, this eats into the profits of coal-fired generators)
- persuade governments to let them pollute for free (artificially cheap electricity as externalities aren't costed).

Network companies make more money if they:

- build more stuff so they can transport more electricity
- persuade regulators to let them charge customers more for the stuff they are planning to build, or have built already

- charge more for services which consumers are likely to keep buying no matter what the price, like grid connection.[97] They therefore have good reason to convince the regulator to let them charge higher fixed fees for the privilege of being connected to the grid.

Retail companies make more money if they:

- sell customers as much electricity as possible
- charge customers more for electricity than they themselves pay for it. (This is easier if they also own generators, like the big three 'gentailers'. It is also easier if customers don't shop around or demand the best rate from their retailer.)

When you follow the money, it's easy to see why this system is full of well-paid lobbyists, and why a few minor reforms are failing to put much of a dent in most people's power bills. The system design incentivises networks to build more stuff and gentailers to sell more electricity. Despite being warned of the consequences the regulator (AER), which determines how much networks can spend and charge, and the rule maker (AEMC), did next to nothing to stop it from happening.

Our energy system and energy markets don't have to be structured this way. If they had been structured differently ten years ago we wouldn't now be dealing with the consequences of this massive network infrastructure spending spree.

Box 4: Tony Abbott's gold-plated godsend

So, what does this all mean for renewables? Quite a lot, if you consider the political impact of electricity prices rising by 70% over the five years to 2013.[98] The voting public was well aware of the price hike, while being almost completely unaware of its causes. This allowed then opposition leader Tony Abbott to talk his way into the top job on the back of a scare campaign against carbon pricing and renewable energy:

- In 2011, the Gillard Government announced its Clean Energy Future Package, to address Australia's contribution to climate change. The package included a carbon price, which happened to take effect just as consumers had really started to notice the price hikes caused by network overspending.
- Tony Abbott was able to blame the high cost of electricity on the carbon price even before it was implemented. Unlike the massive hike in network charges, the much more modest impact of the carbon price came with a compensation package that left most households better off. But this didn't save it from taking the fall.
- Much of Australia's mainstream media either fell asleep on the job, cheered him on, or found that the lax regulation of network infrastructure spending or arguments about the Weighted Average Cost of Capital didn't make for juicy soundbites.
- 'Axe the Tax' was at the heart of Tony Abbott's 2013 election campaign.
- The rest is history.

The future, however, is still up for grabs.

1.3 Where Electricity 1.0 is headed

Times are changing

Customers have taken notice of rising bills and are installing solar panels and saving energy to cut their bills (and save the planet) and it's having an impact:

- Partly because of the actions of energy-conscious consumers, electricity demand fell by around 8,000 GWh between 2009 and 2013 – a decline of around 4.5%.[99] Demand rebounded by 2% in 2014-2015, due in part to growing off-grid use.[100]
- Peak demand – the usual pretext for spending more on network infrastructure – is also showing signs of levelling off. In 2014-15, peak demand was 20% below its historic high point in NSW, Vic and SA. (QLD was a different story with a seven-day heatwave causing a new record peak).[101] Overall, AER projects that peak demand will remain relatively flat for the next decade.[102]
- There is potential for peak demand to come down further if more houses keep replacing their air conditioners with more efficient models and installing insulation, batteries, solar PV, etc. For example, AEMO projects that electricity from rooftop PV could meet 23% of peak demand by 2030, compared to 5% in 2013.[103]
- Australia already has 1.7 million solar households,[104] and there's room for millions more. In NSW, a rooftop solar system is now cheaper over the course of its life than the price households pay for network services alone (i.e. without counting retail and wholesale generation costs)[105] (see Figure 4 in Part 2).
- Australia now has a National Energy Productivity Plan which includes an (unambitious) target of increasing 'energy productivity' by 40% by 2030 (see Part 2, Section 2.1). This target is fundamentally incompatible with continued network gold-plating or missed opportunities for increasing energy efficiency.

- Network companies used to operate under a regulated 'price cap', which essentially delivered higher profits if consumers wasted energy. Most of the states have now switched over to the 'revenue cap', which is better from an environmental and system-cost perspective, but consumers still don't see the benefit if they save energy. In fact, the networks are allowed to put up prices further to recover *all* of the revenue they would have made had consumers been less careful, which in turn puts more downward pressure on demand. This feedback loop is explained below.

Getting the grid from lose-lose to win-win

People saving energy and putting solar on their homes is a good thing. But it's bad news for network companies, whose high costs are ever more exposed as people take action within the part of the system they have control over: the part 'behind the meter'. Because the network companies' business model is mostly based on getting a regulated return on poles and wires to transport ever more electricity, it is badly affected by household batteries and rooftop PV. This is starkly illustrated in Figure 6, which shows how much more we would have had to hand over to network companies without the rooftop revolution. Anything that happens behind the meter on a customer's property is, by definition, out of bounds for networks. **In other words, the neighbours (us) are throwing a bigger, cooler party next door, and they (the networks) are not even invited. No wonder they're calling in the cops.**

The Australian electricity system is facing a perfect storm, and the potential for mass exodus from the grid[107] is more real here than almost anywhere else in the world. The gold-plating of electricity infrastructure increased power prices at a time when energy efficiency and solar programs were starting to work, which made customers more engaged, which led to more energy efficiency, solar, local energy innovation, and so on.

But the more consumers cut demand, the more networks try to recover that lost revenue by putting up their charges. This creates an even stronger incentive for consumers to reduce their demand. This cycle has been dubbed the 'death spiral' by the industry. While the label is alarmist, it's true that this costly feedback loop isn't much fun for most consumers or for the industry (see Figure 7).

Figure 6: Why networks really hate solar[106]

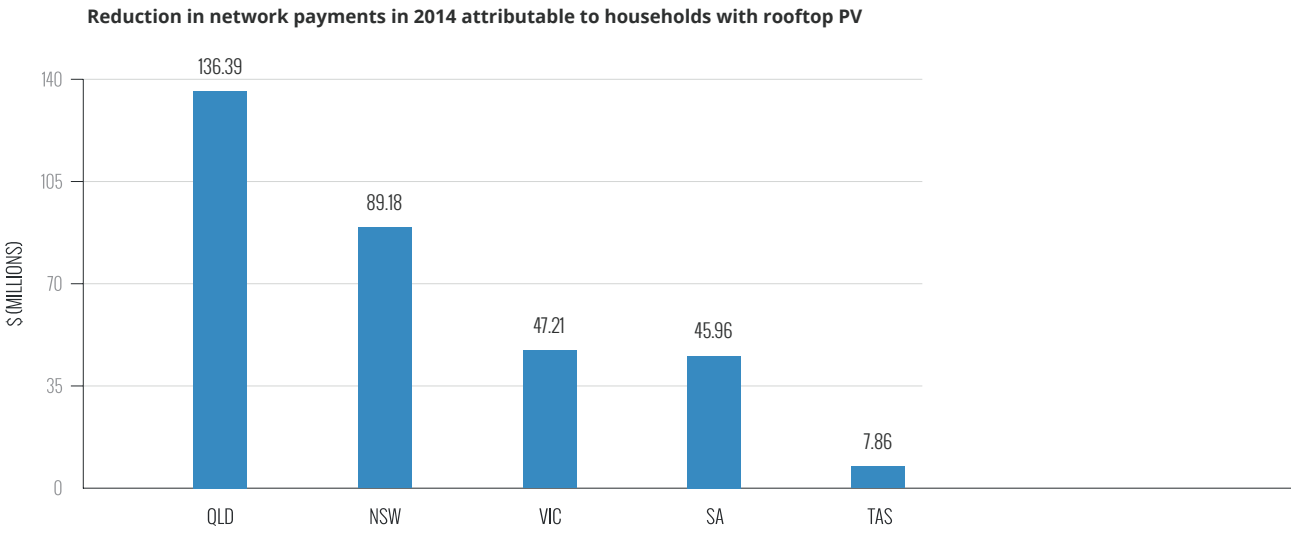
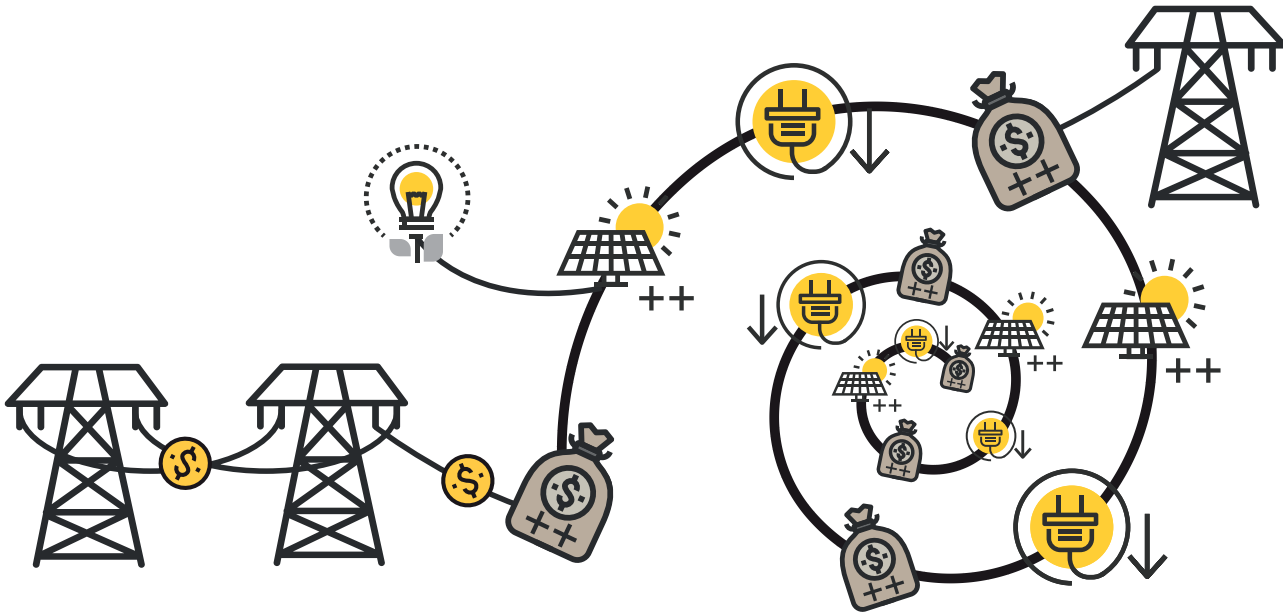


Figure 7: The spiral of rising power prices and falling use[108]



Unfortunately, the response from most network companies has been to push us further down the spiral, unsuccessfully using sticks instead of carrots to try to force people to stay on the grid. They're demonising solar households, creating discriminatory tariffs, increasing fixed charges and generally passing the buck, creating an even stronger incentive for people to leave the grid or use less electricity (see Box 7).

Not all the blame can be laid at the network companies' door: retailers are doing their own share of discrimination and price gouging. For example, in Vic the retail component of a customer's electricity bill has more than doubled since 2008 when there were regulated reference tariffs.[109] There is also a trend for retailers not to offer standard discounts to solar customers.[110]

From the consumer side some people are saying 'bring it on', disruption is good, networks have screwed us so we should screw them back. And to a certain point we absolutely agree. The situation we find ourselves in is not the fault of consumers and consumers shouldn't be penalised for responding to it. However, there are a couple of questions that need to be considered.

- What about low-income households, renters, and people in apartments? They certainly aren't to blame and shouldn't be penalised, but they are having a much harder time responding. They don't yet really have the option of putting solar on their roofs to offset the cost of higher power bills, and they have limited options to change the energy efficiency of their homes. Landlords currently have little incentive to spend money on energy efficiency upgrades to cut their tenants' bills. (This issue, referred to in the sector as the 'split incentive' problem, is discussed in Part 2, Section 3.1).
- Can we get more value out of all this stuff we've built, or should it just be written off as a bad investment?

These are serious questions that need to be answered and there isn't a silver bullet solution. As we outlined in the Introduction, **there is still time to replace the death spiral with a virtuous circle that rewards people for adding value to the grid instead of punishing them until they leave it.**

1.4 Electricity 2.0

In the Repower Australia Plan, we've pulled together many of the pieces of the puzzle to go from a lose-lose situation to a win-win situation in our electricity sector.

Electricity 2.0 below sets out reforms that will help get us there, while PowerAccess and a range of other policies (see Part 2, Section 3.3) show how we can support vulnerable energy consumers to access and benefit from the growth of renewables. To begin with, it's important to acknowledge a few things:

- We can't put the genie back into the bottle. The shift to a much more decentralised electricity system is inevitable, for example CSIRO predicts that in the future up to 45% of our energy needs will come from consumers[111]: it's how we manage it that matters for people and businesses.
- While solar and storage are exciting and a huge part of our energy future, a slick Tesla Powerwall in every home may not be the best outcome environmentally or socially. We need a range of energy technology and business model options at an individual, business, community, regional and national level. We're unlikely to capture the full value of Australia's renewable potential through a mass exodus from the grid.
- Customers aren't to blame and should not be demonised. Solar citizens and energy savers are people acting responsibly.
- Some network companies are trying to do good things, yet they too are constrained by the existing rules.[112]

What Electricity 2.0 could deliver

Electricity 2.0 is a major upgrade on our existing system and, compared to where Electricity 1.0 is taking us, it wins hands-down. By transforming the system, we can:

- protect our planet by powering our homes and business with clean energy that doesn't fuel global warming
- stop network companies from wasting their customers' money
- stop the old fossil-fuel dinosaurs from squashing their cleaner competitors
- break the stranglehold the big three have on our retail market
- replace the much-feared 'death spiral' with a 'rebirth spiral', in which power companies and citizens can share in the benefits of reducing demand and greening the grid
- give community voices a real seat at the table on decisions that affect them.

Not only is the electricity sector our single largest source of carbon pollution, it's also the sector which is cheapest and easiest to decarbonise. In the words of the Grattan Institute's Tony Woods, "developing a credible climate change policy that is integrated with energy policy must be top of the list" for policy makers.[113] In order to meet our climate commitments we must transition to renewables.[114] And to make our electricity system 100% renewable, we also need to make it smarter. The electricity market's current structure is fundamentally incompatible with a decarbonised, distributed, energy-efficient future.

With the right reforms, however, we could be about to enter a period in which a genuinely competitive electricity market is possible. Instead of a few dozen big coal-fired power plants generating the lion's share of our electricity, we'll have a diverse mix of renewable technologies owned by everyone from private investors to public agencies, to community cooperatives to millions of solar households. Instead of just the 'dirty three' fossil-fuel dominated gentailers, we could see a mix of private renewable gentailers like Powershop, community retailers like Enova, public retailers servicing government buildings and public housing tenants, and energy services companies helping residents and businesses to save energy and cut costs, not only for themselves but across the entire system. Even some of the functions provided by the poles and wires can be provided by batteries and remote-control appliances hooked up to smart meters (although the core function of the transmission and distribution network is still a natural monopoly and should be run and regulated as such).

Privatisation and market reform failed to do what it said on the box. But the dream of the 1990s reform era could finally be realised in the form of a more decentralised electricity system, only better. The original vision assumed that householders would be nothing more than passive consumers paying their bills but now people have the opportunity to reshape how they use and produce electricity in a way that helps themselves, their communities, and the planet.

In other words, Electricity 2.0 is not only a more decentralised system – it also has the potential to be a more democratic one. **With the ability to produce and sell electricity dispersed more widely, far more people will have a chance to benefit from and influence a system that has not been run in their interests for a long time.**

Box 5: The Finkel Review: the good, the bad and the ugly

In 2017, the COAG Energy Council commissioned the Chief Scientist Dr Alan Finkel to lead an independent review into the electricity system – the full title *"An independent review into the future security of the National Electricity Market: A Blueprint for the Future"*. This review was in part a recognition by our political leaders that the current energy system design is untenable given the pace of technology change. However, given its narrow focus on energy security rather than the tri-part challenge of affordability, security and sustainability, the review was also an opportunity for many to scapegoat renewables.

The results are a hodgepodge. Of the 50 recommendations, some are good, some indifferent and some extremely problematic.

THE GOOD

The Finkel Review recommended a series of reforms that would help facilitate innovation and make rapid response technologies such as demand management, batteries and other clean energy options a real player in our electricity system. It also recommends a range of measures to improve transparency, data access, planning and forecasting, including a recommended list of priority transmission projects all of which will be needed in a 100% renewables system.

THE INDIFFERENT

The Finkel Review recommended the establishment of a new Energy Security Board – this organisation could be just another layer of NEM bureaucracy or could be a useful institution to drive change (currently it looks like the former).

THE BAD

The Finkel Review also proposed reforms that will slow the transition to clean energy from the sun and the wind. Specifically, Generator Reliability Obligation (GRO) that would require wind and solar projects to contract firm or on-demand capacity as part of getting a licence – making these projects more expensive. Currently the GRO is on the shelf, but it has paved the way for the potentially even more problematic reliability guarantee as part of the proposed National Energy Guarantee or NEG.

THE UGLY

There are two areas for reform that the Finkel Review just completely got wrong. Firstly, there was the recommendation for greater powers around the extraction of gas. More gas is a bad idea for the NEM. It is expensive and polluting (see Part 3, Section 3). Secondly, is how the review deals with climate change. On the surface the review looked promising, recommending that "the Australian and State and Territory governments agree to an emissions reduction trajectory for the National Electricity Market." But when you dig into the detail it becomes clear that the Finkel Review's recommendations are based on our electricity system only doing its proportional share of Australia's completely inadequate Paris climate targets of 26-28% carbon pollution reduction on 2005 levels by 2030 and only fully decarbonising the electricity sector by 2070 – WAYYYY too late.

Experts agree that not only is our electricity sector the easiest sector of the economy to decarbonise, reducing pollution in the electricity sector through deploying renewables, storage and energy efficiency is now a win-win-win – driving down costs, increasing reliability and acting on climate change.[115] Instead, as outlined in the introduction, to get even close to our fair share of climate pollution reduction we need to get carbon pollution out of the electricity sector by 2030. The emissions trajectory modelled by the Finkel Review would act to completely slow down the deployment of renewables – an approach that is being pushed even further by the Turnbull Government with the NEG (more on that in Part 2, Section 2.1).

All in all, one could consider the Finkel Review a step towards a transition to clean energy, with some ideas that need to be aborted. However, this review is far from the 'blueprint for the future' that it claims to be. A 'blueprint for the future' would do what the Repower Australia Plan does and recognise the exciting and dynamic opportunity that transitioning to 100% renewables presents for Australia.

HOW TO REWRITE THE RULES TO **REBOOT THE SYSTEM**

Go the whole hog and completely redesign Australia's antiquated electricity system:

1. Commit to a transition, as well as a target
2. Rewrite the NEO, the one sentence that rules them all
3 Make it someone's job to coordinate the transition
4. Create or coordinate a fair national feed-in tariff
5. Make the electricity network act more like the internet
6. Regulate the gentailers.

Kickstart the transition. While the process of redesigning Australia's electricity system is happening, there are a few things that must be done right now to support energy consumers and the transition to renewables. This is what federal and state governments must do:

1. Recognise that baseload is history and redesign the system to reflect the new technology
2. Bring in new rules to require network companies to save their customer's money
3 Give citizens a real seat at the table on the decisions that affect us
4. Create or coordinate a fair national feed-in tariff
5. Create innovation zones
6. Grid access: connecting people to power.

2. Go the whole hog

2.1 Commit to a transition, as well as a target

Commit to transitioning Australia to 100% renewable energy.

Australia has some of the best renewable energy resources in the world. We have significant land area and a low population. We are one of the best-equipped countries in the world to transform our energy system to 100% renewables.

Transitioning from a centralised fossil-fuelled based system with passive consumers, to a decentralised, fully decarbonised system with empowered consumers and a range of actors and business models, is achievable but challenging. It will not be done through one or two policy mechanisms alone. It needs a whole of government and whole of country approach, with many players doing their bit. For this to happen requires commitment, coordination and inspiration.

As well as moving towards a renewable future, we are also moving away from our fossil-fuelled past. In countries that support the phase-in of renewables without managing the phase-out of coal and gas, the two sectors end up at loggerheads, and the transition is unnecessarily chaotic and unfair to workers. For a just transition, it is essential that workers and communities involved in the fossil fuel sector are well-supported throughout the transition period (see Part 3, Section 2.1 for more on this).

A well-managed transition delivers many benefits. The flow-on effects of Germany's transition policies have led to over 382,000 new jobs in the renewable energy sector and have saved over €3.5 billion in energy costs.[116]

In places around the world that are leading the way to a clean energy future, there is widespread commitment to a transition, in addition to legislated renewable energy targets. Germany has its *Energiewende* (Energy Transition), Denmark has its *Grøn Omstilling* (green-energy transition), and New York has Reforming the Energy Vision (the REV). We need an Australian Energy Transition.

As a first step, federal political parties should commit not only to an ambitious renewable energy target but to an Energy Transition.

2.2 Rewrite the NEO: the one sentence that rules them all

Put 100% renewable energy in the National Electricity Objective.

We need objectives that can drive the clean energy transition and the day-to-day actions of all organisations involved in electricity delivery in Australia – from the federal government and the COAG Energy Council down to the smallest solar provider and everyone in between, including regulators, rule makers, market operators, retailers, network companies, and so on.

Governments in places leading the energy transition globally, such as New York,[117] the UK,[118] Denmark[119] and Germany,[120] have aligned their energy market objectives with their climate and social justice objectives and targets.

In Australia, the recent talk of the trilemma – affordability, reliability and sustainability – opens up the potential for this alignment. However, this has yet to happen and our politicians continue to put sustainability and climate action a very distant third.

In fact, the current debate, continues to perpetuate the thinking behind the current **'National Electricity Objective,' which was explicitly designed to exclude environmental and social goals, even though previous versions included them.**

NEO 1.0

The Australian National Energy Objective (the NEO) as outlined in our National Energy Law states:

The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to –

(a) price, quality, safety, reliability and security of supply of electricity; and

(b) the reliability, safety and security of the national electricity system.[121]

While Australia's energy system is meant to operate in the long-term interests of people, that has been interpreted as having nothing to do with environmental considerations, addressing climate change or even protecting vulnerable customers. According to the NEO every citizen in Australia can be well-served by a system that only considers price, quality, safety, reliability and security of supply.

Where did the NEO come from?

Between 1992 and 1998, before the introduction of the National Electricity Law, part of the electricity objective was to ensure the system was environmentally sound.[122] But when the NEO was first adopted it was argued that:

"The purpose of the National Electricity Law is to establish a framework to ensure the efficient operation of the National Electricity Market, efficient investment, and the effective regulation of electricity networks... Environmental and social objectives are better dealt with in other legislative instruments and policies which sit outside the National Electricity Law".[123]

This is exactly what has happened. NEM reform continues without consideration of the need to decarbonise our energy system, while renewables policies pull our electricity system in a different direction. The result looks like the Pushmepullyou from Dr Doolittle. The system is being pulled in two different directions: it's not leading to efficient outcomes and it's energy users who are losing out.

It's also worth noting that the NEM is not performing particularly well even against the current NEO. It is hard to see how institutions that were truly focused on prices and 'efficient investment' could have allowed the gold-plating of network infrastructure described above. In reality the 'long-term interests of consumers' seems to have been interpreted as 'keeping the lights on' rather than 'keeping the lights on affordably'. The meaning of the word 'efficient' is also crucial here. Economists talk about three different types of efficiency:[124]

- Technical efficiency: doing the work right. Getting 'more for less' or 'value for money' by using the fewest possible resources to achieve a given outcome.
- Allocative efficiency: doing the right work. Allocating resources to goods and services of the highest total value.
- Dynamic efficiency: finding different ways to work, or better work to do, as new opportunities arise. Often driven by the emergence of new needs or new technologies.

Our electricity system falls short on all three types of efficiency, particularly the third. We have little to lose, and much to gain, by rewriting a NEO that even insiders struggle to interpret.

Why changing the NEO would help

While the current NEO isn't doing much for prices or efficiency, it is very effective at sidelining attempts to make our electricity system more fair or sustainable. The organisations tasked with making and enforcing the rules that govern our energy system are required to treat the NEO as their sacred text. And, perhaps because of its history, **they cite the current NEO as a reason not to consider environmental or social justice objectives in their decisions.**

For example, if a new energy rule is proposed that would make it easier for renters or people who own apartments to access renewable energy – through a shared solar array, rather than on their own roof – the rule maker (the AEMC) only considers the narrowest possible financial and technical implications of this rule. No matter that it would help us achieve national and state renewable energy targets. No matter that it would increase equality of access to new energy technologies. If the rule does not invoke the 'price, quality, safety, reliability and security of supply' mantra it won't be adopted.

In fact, these conventional interpretations of the NEO are economically unsound: it is impossible to act in the long-term interests of consumers without considering environmental or social justice impacts.[125] **But the way the current NEO is written lends itself to such narrow interpretation. So, we need to spell it out more clearly.**

Indeed, energy market experts and public stakeholders agree that the NEO is hindering a transition to clean energy calling for its revision.[126] Its wording reveals a huge oversight. In 2017, Australia's Chief Scientist Dr Alan Finkel admitted that "the non-inclusion of any environmental or emissions reduction objectives in the NEO has been a point of contention since its formulation." He also recognised that the Australian energy market currently does not consider sustainability in its decision making.

The results – a lack of progress. Consequently, all attempts to reform the energy market in the last few years were at best grindingly slow but in most cases frustrating, leaving us only marginally less dependent on coal and gas than five years ago.

NEO 2.0

If we want all the players to put people and our planet first when making decisions about our energy future, we need to rewrite the NEO. **Politicians are already supporting renewable energy in their speeches. We need them to put their support where it counts: into the marching orders that drive how our electricity system works.**

And, as the transition builds up steam, we'll need to keep assessing how well our energy system is performing against its objectives and adapt and change course regularly to ensure we are going in the right direction.

Federal and state energy ministers should rewrite the NEO so that it reads as follows: *"Deliver an efficient, reliable, affordable, safe and fair electricity system that is powered by 100% renewable energy."*

Additional subordinate electricity transition goals should also be considered, for example:

- increasing energy security
- increasing energy efficiency
- strengthening local economies and communities
- enabling consumers and communities to play a genuine role in deciding their energy future
- facilitating the electrification of transport and industrial processes
- stimulating technological innovation and the green economy
- ensuring a good balance between technical, allocative and dynamic efficiency (i.e. 'doing more with less', 'doing more of the right thing' and 'figuring out how to do more of the right thing, with less, over time, in light of everything that's changing')
- reducing and ultimately eliminating the health risks from burning fossil fuels.

The COAG Energy Council in 2015 did acknowledge the need for better alignment between energy and climate policy.[127] The recent COAG Governance Review of the NEM also noted that the existing system is struggling to keep up with the rapid changes already underway:

"The pace of change in the energy sector has accelerated to a level that is arguably unprecedented... [particularly] innovative developments in digital and renewable technologies and their applications, and in policy responses to the assessed risks of harmful climate change. Either driver would pose major challenges for the energy sector; when taken together, they have created a policy environment that is more onerous and complex than it has ever been." [128]

Rewriting the NEO is the best way to align energy and climate policy, and the best way to help those running the system to get out in front of this inevitable transition.

Getting started

Going the whole hog and transitioning as fast as possible means going back to the drawing board and rewriting the NEO. However, this requires all the NEM states to agree to change the National Electricity Law and in light of the snail like pace of institutional change we might need to kick things along at the same time.

Mark Byrne, energy expert at the Total Environment Centre (TEC) suggests that there are also some simpler measures that do not require law changes, but could still be quite effective to ensure that key institutions start thinking about how their decisions help or hinder our transition to clean energy. When it comes down to it, the biggest blocker to writing the rules to support clean energy is the AEMC and its interpretation of the NEO.[129]

TEC and 12 other environmental groups and local government bodies proposed a variety of options to do just this in a submission to the preliminary report of the Commonwealth Finkel Review.[130] Their preferred option would be for the COAG Energy Council to issue a Statement of Policy Principles. This statement, already pursuant to the National Electricity Law, can require regulators and rule makers such as the AEMC to consider national climate targets in their reporting and determinations. This means AEMC gets a nudge to internalise decarbonisation costs in their thinking and consider the costs of climate change in its calculation of efficiency.

Sounds rather complex, but the Chief Scientist Dr Finkel considers this approach doable and recommends that *'by mid-2018, the COAG Energy Council should issue a Statement of Policy Principles to the Australian Energy Market Commission to provide further clarification and policy guidance on applying the National Electricity Objective in the rule-making process'*.[131] This is an opportunity for COAG to provide the shake-up in thinking that the AEMC so urgently needs and to ensure they finally start to take the issues of climate pollution reduction and environmental sustainability into account.

While rewriting the NEO is the best way to align energy and climate policy, kick-starting institutional change requires AEMC to recognise that acting on climate change is in the long-term interests of consumers right now!

2.3 Make it someone's job

Transitions of this scale and complexity don't happen by themselves: we need to make it someone's job.

"The electricity system is technically complex and reliability-driven, and transforming it is akin to rebuilding an airplane while in flight."

The Rocky Mountains Institute[132]

One government agency needs to be responsible for the transition to 100% renewables, guided by the rewritten NEO.

Transitions of this scale and complexity do not happen by themselves. The shift to a completely renewable system represents a major structural adjustment to the Australian economy and has significant social implications. New-build renewables are already cheaper than new-build fossil fuels and there is no doubt that, even without further government intervention, the proportion of Australia's energy supply coming from renewables will grow.[133] However, if the transition is to happen at the speed that climate change demands and in a way that maximises the benefits to all Australians, government coordination is important. The countries and jurisdictions that have set themselves the explicit task of transitioning to renewable energy have tasked an agency or a number of agencies to manage and coordinate this transition.

The combined functions of coordinating an energy transition and managing the overall energy system require at least the following functions to be fulfilled:

- governance, including long-term direction, coordination and stakeholder engagement
- market review and redesign
- rule-making
- regulation including pricing and tariff setting
- law and policy-making
- monitoring, reporting and forecasting
- consumer protection
- planning controls
- driving the rapid uptake of renewables
- managing the phase-out of fossil fuels
- market operation.

The recent Governance Review of the Australian Energy Market shows that some of these functions are being neglected, which is causing problems even without taking the need for a rapid renewable transition into account. Specifically, there is a:

"strategic policy deficit' which has led to tendencies towards diminished clarity and focus in institutional roles, particularly in determining priorities, fragmentation and a diminished sense of common purpose".[134]

These roles can be structured in a number of ways with different functions grouped together under different organisations. When looking at how the transition is being managed in Germany, Denmark and New York, it is clear that their governance and operational arrangements are much simpler than in Australia. Even in Germany, where many organisations are involved and the energy system is more complex than Australia's, there is one main point of coordination. The German Ministry for Economic Development and Energy is ultimately responsible for both the governance of the energy market and the delivery of the transition to renewable energy.[135]

Australia's transition to 100% renewable energy will also need to be coordinated by a single public agency: let's call it the Energy Transition Agency. As with the New York REV (see Box 6), this body must be integrated with the day-to-day management and governance of Australia's energy system. It should be tasked with aligning Australia's energy and climate policies, in line with the carbon reduction recommendations made by the Climate Change Authority.

There may also be additional roles, for example handling planning controls for designated renewables zones. In Denmark the Danish Energy Agency acts as a 'one-stop-shop',[136] including granting a range of licences, some of which would traditionally have been the responsibility of the planning authority. An Energy Transition Agency should also be given a remit to work with state and territory governments to harmonise and streamline planning approvals for renewable projects to ensure good community outcomes and engagement, as well as timely deployment.

The most rapid way to set up an Energy Transition Agency would be to give the job to the main existing institutions, namely the AEMC and AER. To fulfil this responsibility, they would need to be given different marching orders through a rewritten NEO. They should also be required to report annually on performance against the new NEO and (in collaboration with Energy Consumers Australia) report on consumer rights and welfare.

However, if by 2020 these organisations continue to be unenthusiastic about rapid change, even with a shiny new mandate, consideration must be given to a complete energy system governance overhaul. This could include establishing new organisations and shutting down or amalgamating existing ones.

2.4 Create the eBay of local energy

Make the electricity network act more like the internet.

Localised and decentralised energy is the way of the future, but it faces many barriers in the present. The first step to overcoming these barriers is to create local energy markets and trading platforms, something like eBay for local energy. Just as eBay enables any buyer to order a pair of shoes, say, from any seller, local energy trading platforms would be websites and apps that enable you to purchase your electricity from your neighbour or get it from the nearby solar garden that you part-own, or the wind turbine at your friend's farm at the edge of town. A growing number of start-ups are working to make this vision a reality, including Australia's own PowerLedger,[137] and the deX platform[138] developed by a number of Australian energy businesses.

New York State is taking this concept to a whole new level. The government there is saying that these local energy trading platforms shouldn't just be about economic exchange for the value of energy, but should recognise that, unlike ordering a pair of shoes, energy trading is very time-specific, location-specific and has other technical system stability issues that need to be managed. Local energy trading is not just a financial challenge and opportunity, it's an engineering challenge and opportunity.

Managing a stable electricity system means balancing the supply and demand of power at every single moment of every single day. Already, we have a wholesale electricity market that balances this supply and demand at NEM-wide level. With increasing local energy solutions there is both an opportunity and a need to balance supply and demand in a timely way at a more local level. There are also other important services associated with managing a local grid, such as managing voltage fluctuations. As such, Local Energy System Platforms should not only be driven by short-term financial incentives, but must reflect the long-run technical realities and benefits of integrating both demand and supply-side clean energy solutions into the local grid.

The role of Local Energy System Platform Operators would be to support a market of distributed or local energy services, including energy efficiency, demand response programs, distributed storage, electric vehicles and local generation that would be called on to deliver not only energy or reduced energy demand, but also other services such as voltage regulation.[139]

In the state of New York (as Box 6 describes) the plan is for networks to take on the role of the Local Energy System Platform Operator (they call them Distribution System Platform Operators). **Their vision of a modern, 21st century network company looks a lot like the 'energy eBay' described above.** Networks are an important part of our energy system and will continue to be so in Electricity 2.0, so it is important that they have a business model that works and enables local clean energy at the same time.

Network companies taking the role of Local Energy System Platform Operator would deliver this outcome, shifting the business model of network companies from delivering electricity to consumers (by building and maintaining more poles and wires) to facilitating (though not undertaking) local energy trading. This local trading would occur between active customers, or organisations such as retailers or energy service companies contracted by consumers to do this trading on their behalf.[140] (In other words, the average consumer in this model does not need to be sitting at their computer bidding in a never-ending eBay auction.) This would in turn challenge retailers to step up with more innovative business models based on helping their customers to save energy, sell

their solar power, and cut costs for themselves and the community, rather than selling them ever more kilowatt hours. Networks would be like the eBay system (website) providers in this scenario (including other technical services unique to electricity) and retailers would be akin to stores within the energy eBay.

The transformation of the networks into Local Energy System Platforms is arguably even more important in Australia than in New York, given our high network costs and rapid uptake of household solar. In recognition of that, we now have one of the masterminds of the New York REV – Audrey Zibelman – heading up AEMO. A great step forward, however, there are going to be many more obstacles along the way.

While the New York REV is a great example to draw on, New York does not have the same degree of structural separation between retailers and networks that exists in the NEM. As such, there are questions about exactly who should play what role and how a transition to a Local Energy System Platform future should play out in Australia's context. It should be the role of the Energy Transition Agency, in consultation with consumer advocates, to answer these questions and ensure that the outcomes are in the public interest. WA, as a state that still has publicly owned retailers and networks, is in a position to leapfrog to a Local Energy System Platform future and could be a test-case for the rest of Australia, as could the combined regional QLD network operator and retailer Ergon Energy (now part of Energy Queensland).

Box 6: New York reforming the energy vision

In the wake of Hurricane Sandy, the New York Governor announced a commitment to 'Reforming the Energy Vision' (REV). The New York REV process has involved extensive consultation, not only with the usual energy industry actors but with energy consumers, start-ups and more. The REV is a strategy to build a clean, resilient and affordable energy system for all New Yorkers.

Core to the REV process is a market redesign that changes the way government and utilities work, to better support the uptake of distributed generation and other distributed and clean energy technologies and business models. There is a particular focus on putting customers first and enabling them to benefit financially from clean energy.

The most major reform is the transformation of the role of utilities (networks) to become Distributed System Platforms (DSPs). DSPs are defined as:

"An intelligent network platform that will provide safe, reliable and efficient electric services by integrating Distributed Energy Resources (DER) to meet customers' and society's evolving needs."[141]
"The DSP fosters broad market activity that monetises system and social values, by enabling active customer and third-party engagement that is aligned with the wholesale market and bulk power system."[142]

The role of a DSP is to:

- develop and implement vibrant markets for distributed system products and services – they are the distributed energy market operator
- undertake enhanced distribution planning
- expand distribution grid operations to better optimise load, supply and other power parameters at the local level, thus orchestrating multi-directional power flows and more
- provide customer and distribution system data to market participants
- establish platform technologies to support the functionalities above.[143]

The market redesign process is complemented by a range of initiatives, including a solar schools program, a government energy efficiency program and the New York Prize (see Box 16).

2.5 Re-regulate gentailers

Create a truly competitive retail market by limiting the power of the Big 3 gentailers.

In an economics classroom (or a government report) you might learn that competition will produce more choice and lower prices in a well-functioning market. Well, as we've covered in Section 1.2, Australia's electricity sector is anything but well-functioning, and the retail segment is where Aussies get to directly experience the worst of it. And this is most true in the deregulated retail markets of Vic, NSW, SA, and south-east QLD; Tas, ACT, and rural QLD still have regulated monopoly retailers[144] (although this has its own set of issues – see Box 15).

Deregulation has been successful in introducing choice in these areas, with at least 19 retailers in each region.[145] However, it has yet to introduce effective competition to Australia's so-called Big 3 electricity companies – AGL, Energy Australia, and Origin Energy. These so-called 'gentailers' became so powerful by buying up the government retail and generation businesses when they were privatised or taking over companies who had done so. Now these three companies serve over 70% of customers in the NEM and own 48% of all NEM generation[146] – and over 60% of generation in NSW, Vic and SA. And, despite all this supposedly vigorous competition, over the past five years the Big 3 have given up only a combined 7.5% of their market share to their myriad of 'competitors' – hardly a major shift.[147]

This wouldn't be an issue if this rather weak competition had managed to lower prices, as intended. But as any Aussie that's opened an electricity bill lately can tell you, this has not been the case at all. In fact, an independent review of electricity pricing in Victoria led by Professor John Thwaites found that the retailing costs paid by ratepayers have *increased* with competition, instead of decreasing.[148] And research by both Thwaites and the ACCC have highlighted several ways in which anti-competitive behaviour by the gentailers is driving these rising retail costs.

- **Increased costs of acquisition:** Credit where credit is due – as smaller retailers struggle to break the stranglehold of the Big 3 on the market, they are coming up with all kinds of creative customer acquisition strategies, from bundled services to frequent flyer miles to confusing-but-appealing-sounding offers like 'all you can eat' contracts. While this may count for 'innovation' of a sort, any benefits to consumers have been outweighed by increasing customer acquisition and marketing costs – which the Thwaites Review found to account for 39% of total operating costs for one Victorian retailer.[149] These costs are expected to continue rising for small retailers in particular, given the challenges of gaining customers from the gentailers.
- **Gentailers turning low costs into high profit margins:** Gentailers have a number of inherent advantages that have helped them achieve lower operating costs than their smaller competitors, including 'self-hedging' between their retailing and generation businesses, economies of scale, and access to cheaper capital.[150] In a textbook competitive market, this would lead to the gentailers lowering their prices to win customers – but in fact, they are simply increasing their profit margins instead.[151] This has helped to drive overall retailer profit margins throughout the NEM to levels higher than in regulated markets, resulting in an additional $60 to $70 in charges per year per customer according to ACCC estimates.[152]
- **Aggressive retention strategies:** One more highly visible way that gentailers use their bigger profit margins to push around smaller retailers and drive up retail costs is their use of aggressive 'win-back' strategies to retain customers who try to escape from their clutches. For instance, after switching to an independent retailer, a customer may receive a call from their original gentailer offering temporary off-market discounts below any advertised price in order to win them back. While individual customers may benefit in the short term, it results in a less competitive market by increasing costs for the independent retailers that can lose 25% or more of their new customers to these ploys according to the ACCC.[153]

What makes matters worse, is that the proposed National Electricity Guarantee (NEG) policy could end up enhancing the market power of gentailers even further, particularly in South Australia where one company – AGL – dominates the sector. In November 2017, ESB's Kerry Schott said the Board was "well aware" of the issue of gentailer market power and that "we'll be looking at it in due course, however this is not something that we can wait to fix – reform needs to start now."[154]

A path to limiting gentailer power

Taking steps to limit gentailer market power would almost certainly put electricity markets on more competitive footing and begin to remedy a situation where retailing costs and margins are accounting for a greater share of your electricity bill than the cost of generating the electricity itself (see Figure 4). But how do we start unpicking this big, tangled knot?

State-level regulated retail offers

A practical first step towards reform was suggested by the Thwaites Review: the introduction of a Basic Service Offer.[155] Under this proposal, state Energy Service Commissions (ESCs) would require all retailers to offer customers an option for transparent, 'no frills' service at a regulated annual price set on a state-by-state basis. Retailers could also provide other types of offers with lower or higher pricing, allowing for innovation with different value-added service packages, but all customers must have access to the Basic Service Offer. Critically, the regulated rate will not take customer acquisition and retention costs into account – so you wouldn't have to continue paying for the privilege of having retailers fighting over you.

This idea has merit, but it would have to be carefully executed to ensure that it does not end up further entrenching the gentailers' market position. As acknowledged by the Thwaites Report, the introduction of a regulated price would likely reduce the number of competitors in the market, which, in and of itself, isn't necessarily a bad thing, so long as there are a sufficient number of remaining retailers to provide actual effective competition. It will also be crucial for the regulated rate to take into account contracts that retailers have already signed under the current market structure, or else it could penalise them for their existing risk management strategies.

Limiting gentailer market concentration

While regulated rates are an action that states can take on their own, robust competition may ultimately require stronger steps by the federal government to limit gentailer market power. One model for this could be Australia's recently-repealed media ownership rules, which sought to prevent too much media concentration.[156] Among other steps, the rules prevented a single company from owning more than two out of three platforms – radio, TV, or newspaper – in any single commercial radio license area. They also stopped any single television broadcaster from owning stations covering more than 75% of Australia's population.

It's not hard to imagine how similar rules could be applied to the electricity sector. For example, retail market participants could be prevented from owning more than a certain percentage of generation in a single state. Or, alternately, gentailers could have a combined maximum percentage of retail plus generation they could own in a given territory. If properly conceived, such limits could potentially yield similar benefits to a more wide-ranging restructuring (e.g. completely forbidding ownership of generation assets by retailers) – but would likely face fewer political challenges.

A big push to fix the Big 3 problem

Addressing gentailer market power won't be easy, but it's encouraging to see this issue attracting attention of the ESB, the ACCC, and other key institutions. Australians already face rising costs from our creaky, coal-fired generators and our gold-plated poles and wires – we shouldn't also be forced to pad the earnings of the Big 3 retail oligopoly. Reducing the gentailers' market power will also open up the market for wind and solar developers, who shouldn't have to depend on contracts with big coal operators that have acted in the past to slow our transition to a 100% renewable future.

So, if all else fails there is an alternative to reform: ask the government to "unscramble the messy egg of failed reform" [157] by renationalising the electricity grid and retail sector, leaving only generation as a competitive segment. However, as suggested by the egg metaphor (coined by University of Queensland economics professor John Quiggin), attempts to reclaim the grid from the private sector may be a messy process given the likely political challenges of a wide-ranging electricity market restructuring. However, if competitive reforms fail to stem the tide of steadily-rising costs, it may be a necessary conversation, particularly if we go back to first principles and remember that electricity is an essential service and should be delivered as such.

3. Kickstart the transition

3.1 Recognise that baseload is history

Redesign the system to reflect the variable/dispatchable paradigm, rather than baseload/peakload.

In addition to market reform for distribution (by creating local energy markets), we also need to reform our wholesale or bulk energy market to ensure system security and system flexibility as we transition towards higher amounts of variable renewables.

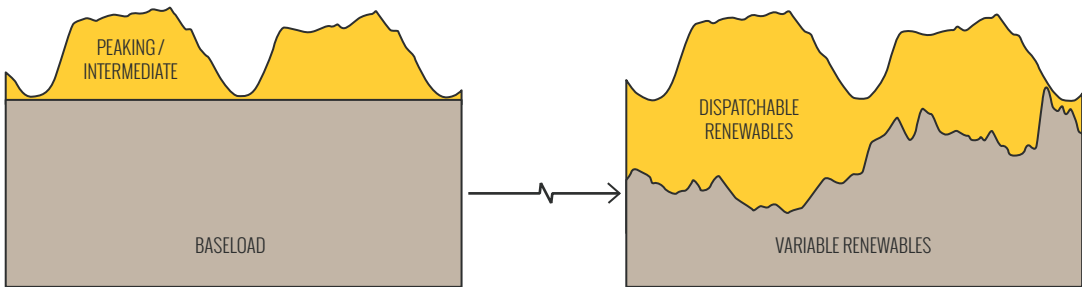
Our wholesale electricity generation market was established at a time when the two main types of energy generation technologies exhibited different and complementary traits, including:

- cheap thermal power stations powered by coal (and uranium in other parts of the world) that were slow to ramp generation up and down and operated most efficiently if they ran all of the time
- more expensive and reactive gas-fired power stations that could ramp generation up and down much more quickly.[159]

These technology traits are the basis of what became known as baseload and peakload. It is important to note that these are not technical concepts – that is, they are not essential to a functional, reliable and secure energy system. They are really "business concepts developed by the traditional power sector over the past decades in order to maximise the amount of electricity supplied by an individual conventional power plant".[160]

In the future, the base demand for energy will be supplied by variable but forecastable renewable energy such as solar PV and wind (see Figure 8) and supplemented by on-demand renewables and storage such as bioenergy, conventional and off-river hydro, concentrating solar thermal, geothermal and batteries. More flexible demand will also play a part, from the traditional demand-shifting practised by water and aluminium companies or encouraged by off-peak hot water prices, to new options opened up by appliances with smart switches (see Part 2, Section 2.3 for more on these).[161]

Figure 8: A new power system paradigm [158]

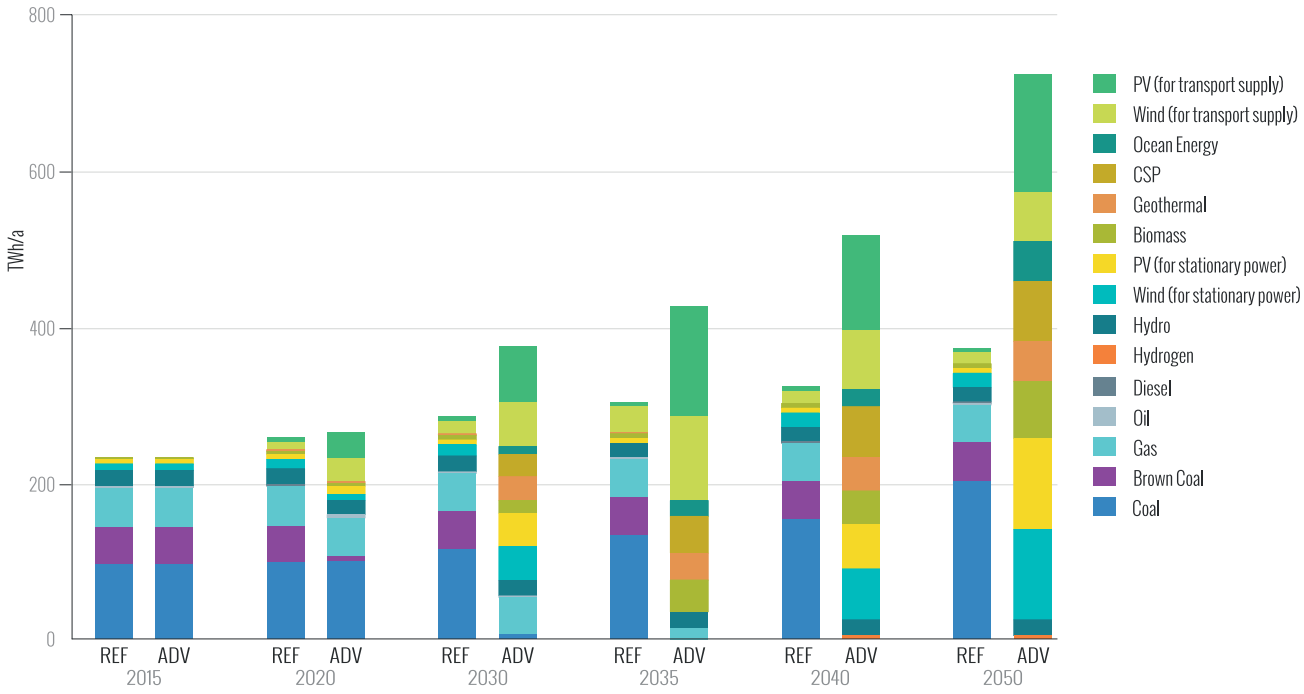


In this new paradigm there will be little to no room for so-called baseload power, as it will be crowded out by renewable energy supply that operates at close to zero marginal cost. There is also little room for peakload power as the traditional peaks when energy demand skyrockets on hot days and generators make all their money are increasingly being met by rooftop solar. As such we need to shift from a wholesale energy market designed around concepts of baseload and peakload to a market designed around the concepts of variable and on-demand energy, where flexible generation is valued at a premium.

These market design challenges are being faced right now by countries like Germany and Denmark with their high share of variable generation. We can learn from them. In particular:

- We need to ensure that our energy market operator, AEMO, is tasked with forecasting both supply (including all forms of renewable supply) and demand over the short, medium and long term. We also need them to ensure that information signals are sent out at the timeframes necessary to ensure that dispatchable generators and loads can address potential shortfalls. This might be monthly, daily, hourly or more frequently. AEMO already does this to some extent. Examples include the long-term 'Statement of Opportunities' and the 'Short Term Projected Assessment of System Adequacy', which is on a six-day basis. However very little of this is currently focused on how to better integrate on-demand renewables, and while AEMO is taking steps in the right direction on wind and solar forecasting, more needs to be done. A COAG Energy Council Directive to this effect would be one simple way to push it further up AEMO's to-do list.
- We need to adjust the system in line with the business case for on-demand and flexible solutions and ensure that planning is undertaken so that these solutions are deployed with sufficient time horizons to be operational when needed. We are proposing clean energy reverse auctions (see Part 2, Section 2.3) with

Figure 9: Electricity generation technology mix



contracts for difference for 'electricity system services' such as balancing power (which could be achieved by a range of clean and renewable technologies). These would be held as needed by the federal Energy Transition Agency and state governments based on AEMO's technical specifications for the types of system services that will be needed. Again, for this to occur in line with what Electricity System 2.0 demands, it is essential that AEMO's marching orders change, through a revised NEO (see Section 2.2 above).[162]

- A day-ahead market where generators are asked to bid in one day ahead and are penalised if they deliver plus or minus 10% of what they forecast is something that is working effectively in parts of Europe and may be worth investigating.
- A strategic reserve approach as is being adopted in Germany[163] and Denmark[164] may be worth considering post 2020, if and only if the first few years of clean energy reverse auctions are not delivering the energy system outcomes required.

3.2 Stop network companies from wasting their customers' money

Make new rules requiring network companies to save their customer's money.

The massive rise in power bills spooked politicians into a string of reviews and inquiries. Since then things have started changing. For example, almost all states in the NEM have finally got around to adopting a version of the 'decoupling' policy that California first pioneered in response to spiralling energy prices in the late 70s.[165] The AER put together the 'Better Regulation' reform package which promised "a new annual reporting on network business efficiency, new tools for assessing businesses' forecasts of the expenditure needed, stronger incentives on businesses to spend efficiently, [and] a better way of determining the return that network businesses can earn on their investments".[166]

Other rules were changed in 2014 to require network companies to charge more 'cost reflective' tariffs, which is proving to be a mixed blessing for consumers (see Section 3.3). The AEMC started talking about the need to "actively support the emergence of new technologies by limiting the market power of incumbents that benefit from historical subsidies and status", and made reforms designed to encourage more demand management. And, as noted above, the COAG Energy Council finally decided to integrate environmental and energy policy, although they are yet to decide on how to do so.

This all feels like a revolution to the insiders, but it looks glacially slow to the outsiders. And things definitely aren't changing fast enough to deliver the results we need. While the regulator and rule maker are finally making some attempts to rein in spending, the process of deciding how much network companies should be allowed to make off their customers is still a consultant-vs-consultant battle on a playing field that is far from level. As Craig Memery, a team leader at the Public Interest Advocacy Centre (PIAC), puts it:

"...the process is like a see saw with an elephant at one end and a mouse at the other. And no matter how many times we jump up and down we can't budge the elephant."[167]

The network companies keep sending their 44,000-page long ambit claims into the fray,[168] and the regulator keeps letting them get away with more of their customers' money than they deserve. In the last round of debates on network pricing, only the QLD government told its state-owned network companies to accept the AER's ruling instead of fighting for more.

The result was that **the regulator is letting networks spend another $50 billion or so of their customers' money over this five-year period**.[169]

The good news is that they won't be able to do it again. In 2017, the Turnbull Government scrapped the extremely problematic Limited Merits Review process – a regulation that has added $11 billion to consumer bills since 2008. Perhaps the most useful intervention in the energy system made by a conservative government in recent years.

The Limited Merits Review process, while intended as due process for networks to appeal decisions by the regulator, according to Craig Memery at PIAC it actually "rewarded those who could throw the most money at consultants"[170] and as such was used by network companies to further gold plate their networks. Just in case that sounds far-fetched, the evidence is damning:

- Networks had appealed 12 of the past 20 rulings by the Australian Energy Regulator
- Most have led to higher allowances for the networks – and increased costs to consumers

- None resulted in lower prices[171]
- In the most recent appeal, the NSW networks – excluding TransGrid – sought an additional $6.5 billion to the $21 billion the Australian Energy Regulator allowed in revenue over five years for the NSW networks. But consumer groups said the networks should receive $3 billion less than the regulator's allowance.[172] The network companies won.

The magic of demand management

There's an alternative to building all these expensive poles and wires, which basically comes down to making better use of the ones we already have. Here's how we can do this:

- We can reduce overall demand on the system by saving energy, for example by replacing inefficient equipment or making houses more energy efficient by adding insulation, double-glazing or sealing drafts
- We can reduce demand at peak times, the holy grail for keeping costs down. Major peak demand events take up less than 40 hours a year, but the spending needed to deal with them makes up around 25% of the average household's bill. Many of us already act to reduce peak demand in small ways, by making use of off-peak hot water prices, but there's so much more untapped potential here. And technology now makes it possible for us to set timers to take care of it for us, or even to outsource the job to third parties.
- We can increase local energy generation at the times and places where the network needs it most, for example by changing the orientation of solar panels so that they produce more energy during times of peak demand, or by installing more solar panels on rooftops in network-constrained areas.[173]

Energy insiders refer to the deliberate, coordinated use of these different techniques to avoid building more expensive energy infrastructure as 'demand management'. **As well as saving energy and saving money, demand management makes a 100% renewable electricity system much easier to run because it's a good match for the variability of the wind and sun.** And demand management doesn't only reduce spending on poles and wires – it can also reduce the need to build expensive generators that sit idle for most of the year, waiting for a demand spike before firing up to supply high-priced power.

The potential savings from demand management in Australia's electricity system have been estimated at $4–$12 billion over ten years. If these savings were passed on to consumers they could cut bills by $120 to $500, every year.[174]

Demand management works, but Australia is lagging behind

Part of the reason these potential demand management savings are so huge is that we're doing so little right now. Demand management schemes have been set up and are working well in dozens of places overseas. A 2013 Institute for Sustainable Futures (ISF) report found that **savings from demand management in Australia are less than half those achieved in the United States**, and much less than in leading US states like California and New York.[175] Moreover, **the bulk of our savings have been achieved in one state – QLD, where the state government still owns the network companies and has actively supported the idea**.[176]

- Network company Ergon Energy saved millions by using demand management to defer the installation of a new power cable to Magnetic Island. It did this by assisting consumers to install solar panels and smart meters and to replace inefficient lighting, reducing peak electricity demand by 44% and overall demand by 40%.
- Another QLD network company, Energex, runs a 'Positive Payback Program' to reward customers for upgrading to more energy-efficient appliances, such as air conditioners and pool pumps. Over 40,000 households have signed up, helping to reduce the network's peak demand by over 100 megawatts and saving tens of millions in avoided infrastructure spending.[177]

So, what's being done to seize this opportunity?

Sadly, not much on the network or rules side of things. In a heroic attempt to work within a system designed to make public participation nigh impossible, non-profit groups like the Total Environment Centre have ventured into the labyrinthine world of AEMC rule changes. In 2013, TEC stepped in where the COAG Energy Council failed to act and proposed a 'Demand Management Incentive Scheme' based on the AEMC's own 2012 report, which acknowledged that effective demand management could deliver up to $12 billion in savings over ten years.[178] This fairly modest rule change was designed to combat the strong incentive for distribution businesses to build

ever more stuff, by rewarding them for "implementing relevant non-network options that deliver net cost savings to retail customers".[179]

The AEMC's response? First, they dragged their feet for over a year on responding to the TEC's proposal. Then they decided to put this minor reform on hold until the next round of five-year plans get negotiated, in 2019-2021! The excuse? "Reopening regulatory determinations to apply the incentive scheme and innovation allowance during the current regulatory control periods would be costly with unclear benefits".[180] In other words, they've agreed that the rule change is needed, but they can't be bothered sending the AER back to the negotiating table to revise its latest rulings (the ones locking in around $50 billion in spending).[181] **Sorry people, no proper demand management incentives for another five years – it might save you too much money.**

The TEC pointed out that **the only submission which unequivocally opposed the idea was GDF Suez (Engie), the owner of the brown coal-burning power plant Hazelwood.** Why? Because brown coal generators make a lot of their profits from charging very high prices when demand peaks, so they stand to lose out from effective demand management.[182]

AEMO and ARENA to the rescue

In 2017, worried about power shortages during peak demand periods in summer, AEMO and ARENA got together to seriously kick-start the demand management sector in Australia. With additional funding from the NSW, SA and Vic governments they ran a tender (or auction process) for "200 megawatts (MW) of [demand response] capacity by 2020, with 143 MW to be available for the 2017-18 summer."[183] Eleven tenders were successful, covering a mix of dedicated demand response companies such as EnerNOC, gentailers such as Powershop, AGL and EnergyAustralia, network companies such as United Energy, clean energy providers such as Zen Energy and one large energy user directly – Intercast & Forge.

This simple tender process has done what years of rule-changes have failed to achieve – kicked demand response into mainstream thinking about energy provision and supported old and new actors alike to make demand management a viable business proposition. One that will help make electricity more affordable and the grid more dependable.

Lock it in

Currently, AER is finally consulting on the design of the Demand Management Incentive Scheme (DMIS). A good DMIS design includes both sticks and carrots – specifically the rules should specify that distribution network businesses are required to set demand management targets, and then publicly report on what they're doing to meet these targets and what the outcomes are. While financial disincentives are a large part of the reason network companies avoid demand management, cultural inertia is also a big part of the story. Compulsory targets and reporting would help normalise demand management, and give consumer advocates useful information on just how big the potential savings are.[184]

Then over time as a benchmark is established, network companies would be required to meet demand management targets based on the savings delivered by the best-performing network companies (as revealed through the target and reporting rule change proposed above, or through comparison with the average savings achieved through equivalent schemes internationally). Companies that fail to meet these targets should be fined, with the fines being added to the pool of funds currently allocated to the Demand Management Innovation Allowance.[185]

This is unfortunately not the approach that the AER is proposing, rather it continues to be a voluntary scheme, based on carrots without a stick. This should change over time. However, in the short-term it is essential that the DMIS be locked-in, with the rules of the game known, so that network companies are encouraged to drive a market in demand management solutions as part of the next round of network price determinations that start in 2019.

3.3 Give energy users a real seat the table

Create fairer fees through an inclusive nation-wide process for setting benchmark electricity tariffs.

The current system neglects the needs of everyday Australians

We need people to have a place at the table. The culture of the entire electricity system – public and private, the companies and their regulators – is inflexible, backward-looking and neglects the needs and desires of ordinary citizens. The old energy system was centralised and hierarchical in its technology, and this has influenced the culture of its institutions. The new system has the potential to be far less centralised, but also far more complex. It is important that confusion doesn't take the place of culture in locking ordinary people out of decisions that affect them.

We also need to put an end to the highly unequal and expensive three-way battles between network companies, the AER and consumer groups. It's costly enough for each individual network service company to have to develop its own tariff and fee proposals, and what's costly for networks is downright prohibitive for consumer groups. **A process that kicks off with network lobbyists' claims as the starting point and inches backwards from there is never going to deliver the best results for consumers.**

How could this work?

But how can government stop industry incumbents from fleecing consumers or introducing anti-solar tariffs (see Box 7), given that tariffs are set by networks, retailers and state regulators? One option is to set national 'model' or 'benchmark' tariffs that any company (or regulator) can be judged against.

The federal government should establish a level playing field for consumer, community and industry representatives to deliberate and negotiate on fair national benchmark tariffs for network and energy services. If the federal government won't do it, state governments could step up and at least provide benchmark tariffs for their jurisdiction.

National model tariffs would have the following advantages:

- A national benchmarking process would make it much easier to compare the tariffs charged by different businesses, and could place some downward pressure on prices in its own right
- Anyone, from the federal government to consumer advocates, from a fair-minded network company to an individual solar household, would be able to name and shame companies that ignored the benchmark
- The same process could also be used to set a fair national model for solar FiTs (see Section 3.4 below).

UnitingCare Australia, in their project reviewing consumer engagement in network tariff-setting, initially set out to recommend a fair and efficient tariff structure, but ended up concluding that it was more important to make changes that would make a lasting impact on the power imbalance between consumers and network businesses:

"...it is the structure of energy markets, the performance of individual businesses, the preferences of consumers, and the circumstances of disadvantaged customers in each market that should determine these tariff structures. These circumstances can vary from market to market, and over time." [186]

UnitingCare proposed a process of 'deliberation, negotiation, and agreement' (DNA), involving elements of deliberative democracy to help a representative panel of consumers get their heads around the different factors involved in setting fair tariffs. Instead of having the networks kick off the process of tariff negotiation (which forces all other players, including the regulator, to fight defence from the start), they proposed that the AER[187] start a DNA process by inviting all stakeholders to deliberate on questions that might include the following:

- "what trade-offs consumers want between reliability and price
- what major capital works could be considered and why they are needed
- levels of support for grid connection to remote sites
- what level of support there should be for demand side management
- introduction of smart meters and/or time-of-use pricing
- costs and benefits of remote-control of appliances to manage peak demand
- proposals for undergrounding." [188]

In February 2016, perhaps in response to the backlash against their anti-solar stance, (see Box 7) SA Power Networks (SAPN) initiated a deliberative process similar to that set out by UnitingCare. Through this process, consumer and community representatives developed a set of 'Customer Impact Principles', based on the question *"when we make decisions about network charges, what are the impacts on customers that we need to consider?"* The principles are designed to ensure that SAPN puts customer impacts on an equal footing with their existing pricing principles when setting network tariffs. While the proof will be in the pudding, this small example of deliberative processes informing network decisions indicates that there may just be an alternative to consultants at 20 paces.

Principles for pricing electricity

To get the most out of our shared investment in the electricity network, **we need electricity prices to reward people for improving the system, not for leaving it.** This means we need to stop power companies from punishing solar households with discriminatory fees and tariffs. We need clear, understandable price signals and technologies that allow all households to reduce their demand and, where possible, increase their supply when the system needs it most.

The trouble with high fixed fees

We also need to bring electricity bills back to Earth. More than half of households (56%) say that utility bills are their top concerns for household budgets and expect that bills will keep rising.[198] An electricity connection and the first few kWhs is enough to fulfil the most basic needs of most households, like lights at night and a refrigerator to keep our food safe. Fifty watts of LED lighting and a modern

Box 7: Who wants to block out the sun?

- The South Australian network company, SA Power Networks (SAPN), has led the charge in its attacks on rooftop solar. In May 2015 the company pushed for an additional charge for all solar PV households of $100 per year.[189] This was rejected by the AER on the grounds it was discriminatory. The network fought back through the Federal Court where it again lost. Undeterred in its attempts to penalise solar owners, the network company is now proposing a new tariff structure that it estimates will halve the uptake of solar over the next five years.[190]
- NSW electricity networks (Ausgrid, Essential and Endeavour) canvassed changes in September 2015 to impose special charges on households with rooftop solar, batteries or electric vehicles.[191] They've since backed away from this, but their proposal for 'declining block' tariffs could be just as bad for solar, as well as being unfair to low-income households.[192]
- Network fees have gone from being about one-fifth of a typical Queenslander's bill in 2007 to nearly half the cost.[193] These network fees are increasingly being shifted to fixed costs, which effectively punishes those who would save energy from efficiency measures or installing solar. In just the last few years Queenslanders have seen their daily fixed network charges rise from 27c a day in 2011 to $1.16 in 2015.[194]
- The WA government-owned network Synergy proposed introducing a 'solar tax', similar to SAPN's idea, which would have resulted in additional fees for solar households.[195] Following weeks of sustained pressure the WA government has ruled out specific anti-solar fees for now.[196]
- Vic networks wants to put households on demand tariffs that are really anti-solar tariffs in disguise (for example, in Vic AGL Energy's 'peak' lasts all the way from 3pm-9pm, which isn't really peak demand).[197]

200 litre refrigerator use no more than two kWh a day. Beyond that, there is more discretion over how much we consume and more opportunity for substitution. Most people can survive without a coffee maker or a beer fridge. If we have central heating or air conditioning we have control over our thermostat, and we may choose to upgrade our insulation. The more electricity we use the more choices we have, which means that suppliers can't take our demand for granted.

The commercial incentive is therefore to set a high price for the first few units, then charge less per unit the more we use (known as a 'declining' tariff). This is a pretty common pattern in industries where fixed costs are high and marginal costs (the cost of producing one additional unit) are low. **In the electricity sector it is leading to high fixed charges and price structures (tariffs) that reward people for wasting electricity rather than saving it.**[199] **The result is bad for middle- and low-income households and bad for the environment.**

What about 'cost-reflective' pricing?

There is broad agreement amongst most key players that existing electricity tariffs are badly designed. One of the changes that came out of the AEMC's 2012 'Power of Choice' review is a move towards more 'cost reflective' network pricing, to be implemented by 2017. At this point the consensus breaks down, because everyone has their own idea of what 'cost reflective' means. Some network companies think it means they should be able to increase fixed fees to cover their costs when households cut consumption or go solar. Others point out that this lets people with air-conditioners off the hook for the costs they add to the grid. And it seems a little strange to be talking about more cost-reflective pricing when over-inflated estimates of networks' capital costs are still such a big factor in pushing up the prices paid by consumers.[200]

The real question is, costs to who? Currently, if you have air conditioning you may be adding more costs to the system than you're paying for. If you're in the bush your access to the grid costs a lot more to maintain than if you're in the city. If you're a large business consumer with the clout to negotiate a good deal with your retailer, you may be letting household consumers pick up more than their fair share of the system's fixed costs.[201] If you have solar you're helping reduce overall costs in the system, but you may also be adding some costs, depending on where you live.

None of this is the real problem. Completely cost-reflective pricing is a mirage for essential services. If hospitals charged everyone the true cost of saving their lives when they've just had a heart attack, we'd see a lot of preventable deaths. The real problem is that current electricity pricing structures are incompatible with providing an essential service to all Australians in the most cost-effective, fair or sustainable way. There is obvious room for improvement. To begin with, the national tariff benchmarking process should look at:

- lowering fixed charges
- stopping network companies from charging any more for their borrowing costs than they actually pay in interest (i.e. bringing the 'Weighted Average Cost of Capital' back in line with real capital costs)
- broadly, charging more for using more, instead of charging more for using less (moving from declining to inclining block tariffs)
- ruling out discriminatory anti-solar fees and tariffs (see Box 7)
- designing tariffs to reward actions that cut the overall costs of the system by increasing the prices charged and paid for electricity during times of real peak demand[202]
  - This means that solar households should pay the same for the electricity they consume as non-solar households with the same peak demand.[203]
  - It also means that solar households should receive a price for the electricity they produce which reflects the benefit of avoided demand for transmission and distribution lines, and avoided electricity loss along those lines.
- bringing in a national feed-in tariff that aligns with these principles
- ensuring that customers are able to understand and act on the tariffs that come out of the process (in most cases, for price signals to be smart they must also be simple).

3.4 Set a fair national feed-in tariff

Ensure the price paid to households and business reflects the many benefits of local renewables.

Rooftop solar (and other local renewables) create a huge range of technical, environmental, and social benefits. Unfortunately, it's not in the old energy industry dinosaurs' interests to pay prices that reflect these benefits. The clean, local power that solar households feed into the grid is worth more than 5c/kWh, and it's certainly worth a lot more than nothing, which is what NSW retailers are currently allowed to pay.

Once we transform our electricity market (Electricity System 2.0) to deliver 100% renewable energy, the value of these network, environmental and energy benefits will be automatically included in the prices we receive. But in the meantime, the federal government should step in and either create or coordinate a fair feed-in tariff (FiT) that is harmonised across all states and territories. Let's break it down.

Distributed generation: the goose that lays a thousand golden eggs

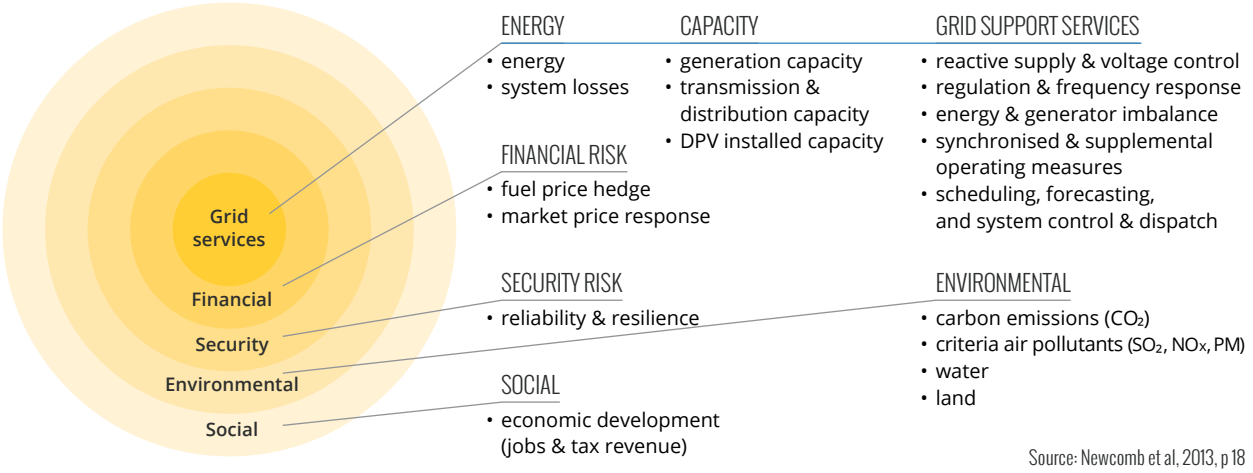
Benefits of distributed generation such as solar, storage, and sustainable bioenergy include:

- reducing peak demand and deferring network investment – for example, at least seven network companies, including Ergon, Energex and Ausgrid, have stated that solar decreases peak demand below what it otherwise would be [204]
- only using part of the electricity network, thus increasing network efficiency
- technical things like reactive power, voltage control etc.

A report from the Rocky Mountain Institute suggested there are 14 separate benefits of storage alone [205] and that the electricity system provides 18 different benefits (Figure 10). Unfortunately, it's practically impossible in the current market structure (Electricity System 1.0) to get paid for the value of these benefits. The only things distributed generators like solar households get paid for (outside of Vic) are:

- the wholesale value of the electricity itself (the wholesale price that retailers pay to generators, not the retail price that consumers pay)
- the renewable nature of the electricity (for solar for example) through STCs (<100 kWs) or LGCs (100 kW +).

Figure 10: Electricity system value chain[206]



Source: Newcomb et al, 2013, p 18

What does this mean in practice?

Case 1 – Household solar

For an average household that is looking to go solar, you pay more than 20c/kWh for electricity on top of the daily standing charges, but if you export electricity to the grid from your solar array your retailer will only credit you with anywhere between 5-14c/kWh. Some retailers in NSW pay nothing at all. The result is that getting the best value out of your solar array requires:

1. scaling the solar array to the size of your daytime electricity use (that is, making it smaller than you could) and
2. consuming as much of your own electricity as you can, which could also include coupling it with battery storage and other demand management strategies.

Case 2 – An 'embedded network'

An embedded network, or embedded micro-grid, is where a shopping centre, an apartment block, a new development or even a whole village installs a single connection point to the grid – 'a head meter'. Then a micro-grid operator installs sub-meters for all the apartment or shop owners. A shared solar array or even batteries can be installed behind the head-meter and then the solar electricity generated is credited to the various members of the micro-grid. While embedded networks have been around for decades, Stucco Housing Cooperatives was one of the first organisations to use this approach with solar and batteries. An embedded network approach stacks up financially because all the participants in the micro-grid share the external grid costs (you know the network part of our bill that accounts for almost 50%). As long as the cost of running the micro-grid isn't too expensive, the participants win. This is basically a way of lots of people going behind the meter together and while it works, it is another example of the rules of the game encouraging people to leave the grid (or at least use it less), rather than use the infrastructure we already have.

Case 3 – Sharing solar with your neighbour

Many households have inappropriate roofs for solar – they may be shaded or have structurally unsound or heritage roofs – but they may live right next to a house that has a large and sunny roof. Doesn't it just make sense that in situations like these the neighbour with the sunny roof could offer part of their roof to put solar on for the shady roof neighbour and then have that solar credited against the shady neighbour's electricity bill? It's right next door, you're only using say 20 meters of the electricity network between one house and another.

Great idea, but unfortunately it doesn't work in practice. As soon as you transport electricity from the customer side of the meter to the grid side, you have to pay the full cost of the network, no matter whether you're transporting that electricity 20 metres (or less) to the house next door or hundreds of kilometres from the large coal generators in your state. In other words, under present regulations this economically efficient and responsible proposal doesn't stack up financially for the consumer.

Case 4 – Local government solar on one building using at another

What about an organisation like a local council? A lot of them are looking to lead on clean energy, and they have a lot of buildings. However, most of the office buildings that use a lot of electricity have small roofs compared to their depot buildings that have large roofs but don't use a lot of electricity. What councils (and similar organisations) would like to do is put as much solar as possible on their large depot or car park roofs and then use it at their nearby office buildings.

Great idea, but again the costs to the consumer are prohibitive. Even though the council would only be using a few kilometres of the network they still have to pay for the whole system! Many councils are getting fed up with this and are starting to just trench their own private wires. It's frustrating that Electricity System 1.0 forces them to do this, as it duplicates existing infrastructure, which is extremely economically inefficient and wasteful.

Case 5 – Solar gardens

Some households can't put solar on their own roof because they rent, can't afford to or live in apartments. In situations like these it makes sense to create a shared solar garden. Solar gardens work by installing a central solar array (or another type of renewable technology) close to where people live – think a field at the edge of town, perhaps next to the town landfill or a big warehouse roof. In a solar garden:

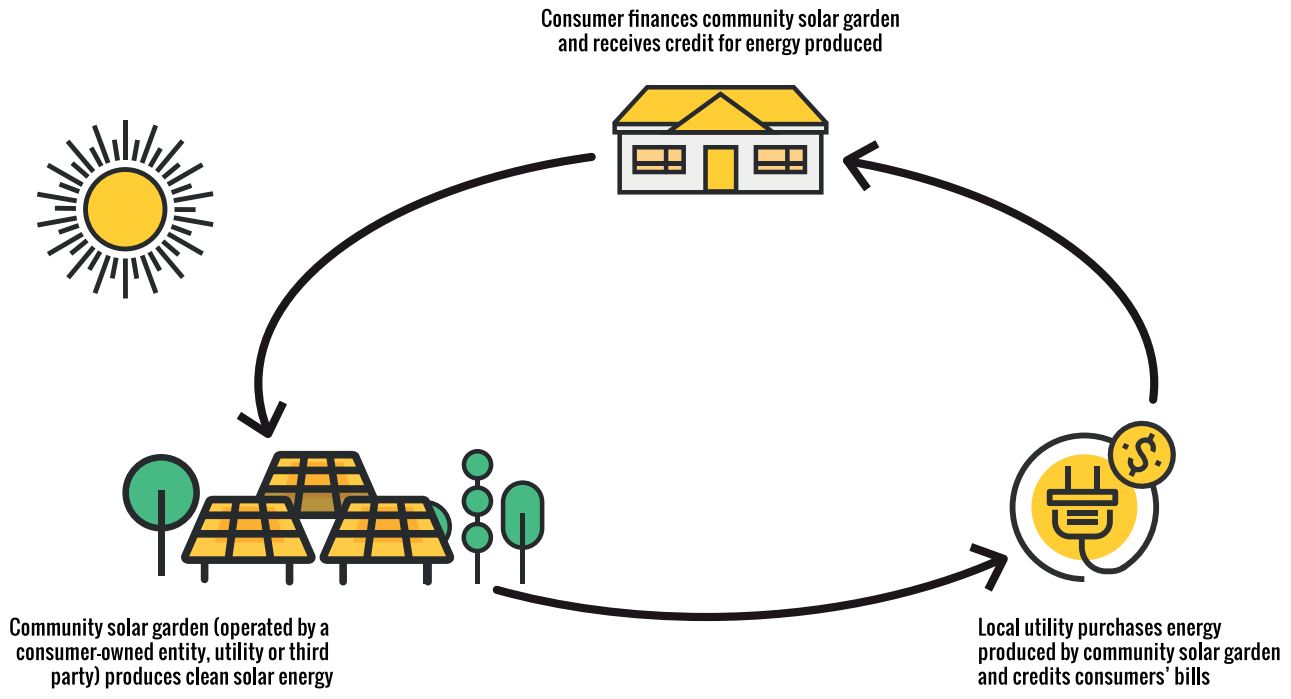
1. the customer owns (or leases) a share or a number of panels in the central solar array
2. the electricity generated by the customer's share or panels is credited on their electricity bill (see Figure 11).

Solar gardens would open up new sites and provide clean energy access to whole new groups of people that are currently locked out of the benefits of small renewables. In the US, research indicates that up to half the population can't do behind-the-meter solar on their own roofs, so they've put policies in place to make solar gardens mainstream. There are now 101 community solar programs spanning 26 states, with 108 MW installed to date.[207] While this is still a relatively small sector, it is growing quickly; new solar garden installations in the US are expected to surpass 400 MW in 2017 and 500 MW in 2019.[208]

Again, solar gardens, while blooming in the US, aren't happening in Australia because of the cost of the network.

Cases 3-5 are all examples of Local Energy Trading (see Box 8), which allows people and groups to generate and use energy locally in a small part of the grid, but not behind the meter. Case 2 really exists because we haven't yet properly cracked the nut of Local Energy Trading. Local Energy Trading is already legal – all you need is a retailer who's willing to facilitate it. So why isn't it happening already? Because, as described above, the finances don't stack up. As these cases illustrate, the moment that generation is transported from your premises (behind the meter) into the grid, no matter how small the distance, you are automatically slugged with the full network charge.

Figure 11: How a solar garden works



Box 8: Local energy trading

Local Energy Trading is an arrangement whereby generation at one site is 'netted off' at another site on a time-of-use basis, so that Site 1 can 'sell' or transfer generation to nearby Site 2. The exported electricity is then sold or assigned to another site for billing purposes. Local Energy Trading can take place in a number of ways:

- A single generator-customer can transfer generation to another meter(s) owned by the same entity (for example if a local council has space for solar PV at one site and demand for renewable energy at a nearby facility)
- A generator-customer can transfer or sell exported generation to another nearby site
- Community-owned renewable energy generators can transfer generation to local community member shareholders
- Community retailers can aggregate exported electricity generation from generator-customers within a local area and resell it to local customers.[209]

So, what do we do?

The easiest and most straightforward thing to do is to legislate a fair FiT that is harmonised across all states and territories. This should take into account network and other benefits as well as the energy value of local generation. The fair FiT shouldn't be limited to small solar, and should instead be opened up to shared solar arrays of at least a few hundred kWs in size.

Already a few initiatives are making steps in the right direction. Three state governments have reviewed the value of solar and other local generation technologies: Vic, QLD and Tas. Of these state reviews, only Vic has come up with different results to the various previous state reviews that concluded local solar is only worth the value of the wholesale energy price and avoided energy losses from transporting electricity hundreds of kilometres – previously 5c/kWh, now we have high wholesale electricity prices it's closer to 12-15c/kWh.

This is because regulators who set FiTs generally only take into account the costs that can be avoided by retailers. No regulators, other than the Essential Services Commission of Victoria, take into account health and environmental benefits of distributed renewable energy in setting a FiT and few consider network benefits.

Fast facts: the achievements of Feed-in Tariffs 1.0

In Australia:

- There are now over 1.7 million homes and businesses with solar PV on their premises, with over 6.2 GW of total capacity.[210] This has empowered more than 4.4 million people to take control of their power bills during a time of steeply rising prices
- FiTs have created a whole new sector and more than 11,150 solar jobs [211]
- They have helped increase electricity market competition by increasing the number of electricity products and services available to consumers
- They have decreased peak demand at a time when peak demand was rising sharply
- They have acted as a market phase-in scheme, boosting initial uptake to the level needed for economies of scale to kick in and bring down costs (particularly installation costs) for those who came later
- They have made Australia a leader in rooftop solar. At a time when Australia has become an international laughing stock around climate change and renewables, our solar achievements should be celebrated.

In Germany, the home of feed-in tariffs, they:

- helped commercialise and then drive down the cost of solar for the whole world
- created a new export industry for German services and companies, with over 100,000 people in Germany employed in the renewables export industry and an estimated annual export revenue of €10billion[212]

- allowed households, farms and small businesses to participate in and benefit from the renewables revolution – now, approximately 140 regions, towns and communities with a combined population of 20 million have plans to meet 100% of their electricity from renewable sources[213] (many have already met or exceeded this target)
- led to €14-18 billion in new investment annually,[214] by providing certainty to investors and thus unlocking the huge investment potential of renewables.

Feed-in Tariffs 2.0

Feed-in tariffs (FiTs) between the late 2000s and now have played an extremely important role in establishing a robust solar industry in Australia. However, the role for FiTs going forward is different, and as such their design will be different. We need FiTs 2.0.

Electricity System 2.0 should fix the fact that you can't sell solar to your neighbour, creating a market platform through which solar owners and other local renewables projects can deliver a whole range of services through a range of innovative business models – but Electricity System 2.0 is still a while away. In the short term we need fair FiTs that approximate the value of these different services and provide a guaranteed minimum price for solar and other local renewables.

FiTs are sometimes called anti-competitive because they set a price, rather than letting a market determine the price. However, when there is no market a consumer can access, then the situation is even more anti-competitive. This is not a niche situation, but one affecting millions of Australian consumers. Currently, state governments (other than Vic) are allowing incumbent companies to legally undervalue the product that millions of households are selling.

FiTs 2.0 is not about stimulating a new industry or driving down the cost of a new product (as FiTs 1.0 did so successfully), it is about providing an approximate value for solar and local energy based on the full range of benefits FiTs provide in the absence of a competitive market which solar actors can participate in.

As such, the fair feed-in tariff (FiT 2.0) should be phased in as soon as possible and maintained until Electricity System 2.0 is established.

Principles for a fair feed-in tariff

In 2013 COAG agreed to a set of National Principles for FiTs, which states that:

"...market participants should provide payment for exported electricity which reflects the value of that energy in the relevant electricity market and the relevant electricity network it feeds in to, taking into account the time of day during which energy is exported." [215]

We believe that, while the National Principles have been more honoured in the breach than the observance, they are a good starting point. However, in establishing a harmonised FiT across all Australian jurisdictions, the fundamental guiding principle should go further:[216]

FiTs should reflect the long-term benefits to the whole electricity system and the wider social and environmental benefits of distributed renewable energy generation.

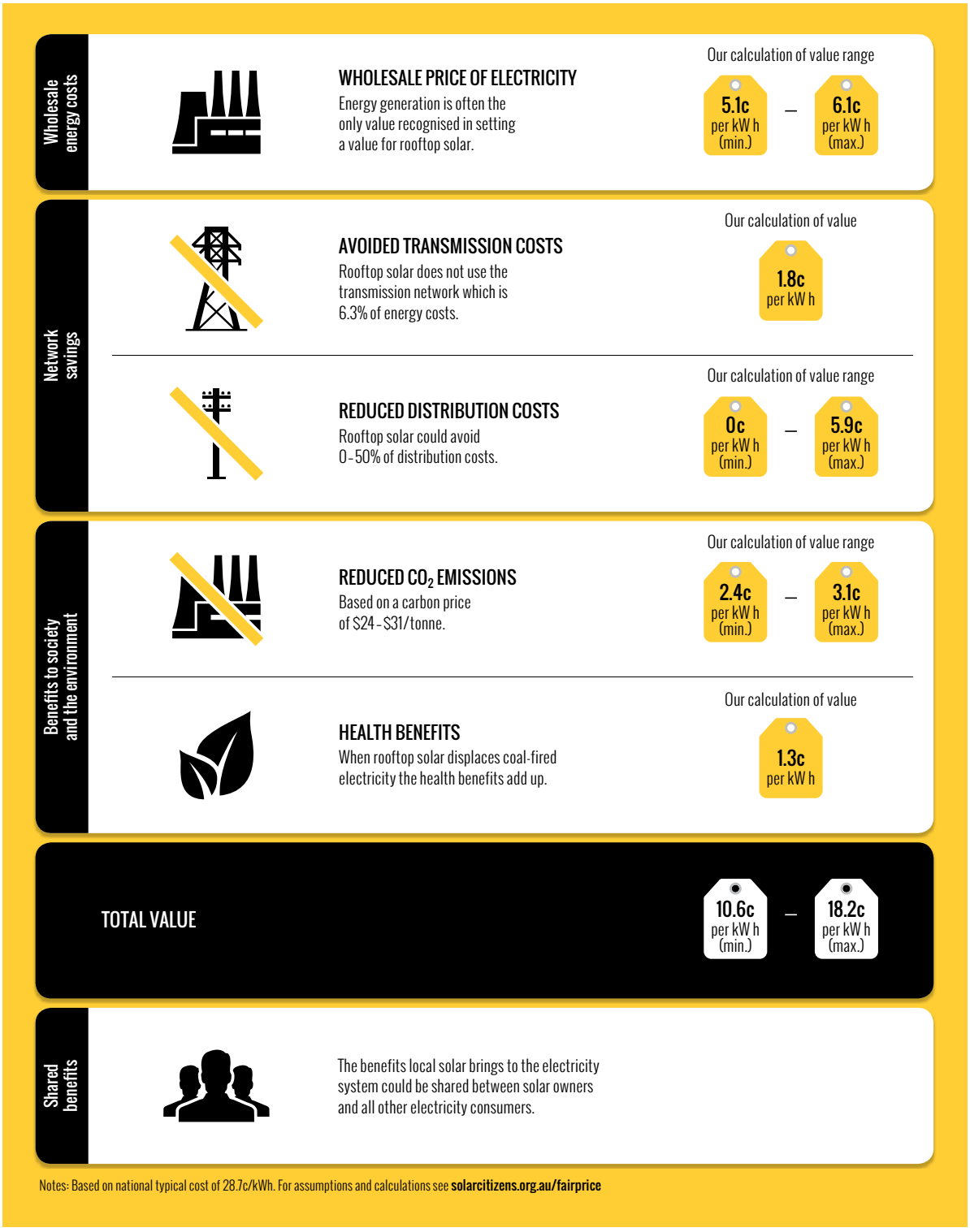
Consideration should also be given to the definition of fairness used in setting FiTs, including:

- fair treatment of people who have already invested in solar PV
- as much certainty as possible for people and businesses making future investment decisions
- avoiding sudden changes in policy which undermine the growth of a solar industry that is able to deliver a quality product to the public.

Recent research by the consultancy Backroad Connections (funded by Energy Consumers Australia) outlines what factors a fair FiT policy should consider, as well as a range of values corresponding to each factor.[217] As shown in Table 4 these factors include the cost of the electricity in the wholesale market, avoided network costs (since solar is usually consumed on the same local distribution system where it is produced), the value of avoided CO_2 emissions, and avoided health costs from fossil fuel pollution.

All in all, this adds up to a range of 10-18c/kWh of solar – less than what most households pay for retail electricity, but significantly more than FiTs based solely on wholesale electricity costs.

Table 4: What is rooftop solar really worth?



Source: Solar Citizens

Victoria sets an example

In early 2017 Victoria became the first state to introduce a FiT that meets at least some of the criteria for a fair FiT or 'FiTs 2.0,' with a value of 11.3c/kWh – more than double the previous 5c/kWh in 2016.[218] At the core of the new FiT is an updated wholesale electricity price that is also weighted to reflect the hours of the day that solar generates, which comes out to 8.1c/kWh.[219] Avoided network costs, along with avoided market fees and ancillary services costs, adds up to another 0.7c. Crucially, the Victorian FiT is the first in Australia to also include a calculation for the avoided social cost of carbon, which it prices at 2.5c/kWh – less than a cost of carbon commensurate with Australia's Paris Agreement commitment, but still a step in the right direction.[220]

Notably, while the Victorian Essential Services Commission (ESC) considered including a value of avoided health costs in the new FiT, it was unable to because "the necessary data to quantify those benefits with sufficient reliability are not available at present."[221] The Backroad Connections report cited earlier used an estimated value of 1.3c/kWh for these health benefits, based on 2009 research by the Australian Academy of Technological Sciences and Engineering that itself adapted European research to the Australian context.[222] While this figure provides a good starting point, it also clearly points to the need for more research into the health costs of fossil fuel pollution in this country – along with more transparent, real-time monitoring of the amounts of pollution being emitted, as discussed in Part 3, Section 2.3.

In December 2017, the ESC issued a draft FiT for 2018-2019 that would take another big step towards providing rooftop PV owners with a tariff that more accurately reflects solar's value to the grid. For the first time, Victorian retailers would have a choice between offering a single rate FiT similar to the existing program and a time-varying FiT that has different values depending on whether the PV system is generating power during peak, off-peak, or 'shoulder' periods of the day (between peak and off-peak hours). While this proposal would slightly reduce compensation for solar generation during shoulder and off-peak periods before 3PM, generation from 3PM to 9PM on weekdays would receive a much higher rate of 29c/kWh to reflect higher wholesale energy prices during these hours.[223]

The overall effect of such a time-varying tariff on the bills of solar customers remains to be seen, and the fair calibration of this structure will undoubtedly be the subject of ongoing, annual debate at the ESC. However, time-varying tariffs will unequivocally serve as an incentive for solar homes to add battery storage to their systems, which will allow solar PV captured during off-peak and shoulder hours to be sold back to the grid during high-value peak times – a development which, on balance, should lead to a more dynamic, renewable, and people-powered electricity system.

State or federal leadership

While FiTs are an area where states have historically had the jurisdiction and willingness to lead, they have recently been held back by myopic Productivity Commissions that take a narrow view of the value of solar. The federal government could rectify this by passing a law setting a national FiT 2.0 that fully reflects solar's many benefits, which would greatly increase certainty and put all Australians on a level playing field no matter where they live. In doing so however, care must be taken to ensure that a national program doesn't end up becoming a race to the lowest common denominator, with a FiT set as low as the least ambitious state.

Alternatively, the federal government could legislate a shared FiT 2.0 framework based on factors such as those outlined by Backroads and require the states to implement FiTs that fairly reflect all of these values. Simply establishing an overarching methodology and shared framework for setting fair FiTs would greatly benefit Australian households in states that aren't yet inclined to follow Vic's example.

3.5 Create energy innovation zones

Work with leading communities to pilot completely different ways of running an electricity market.

The process of turning Australia's electricity market upside down will be difficult, and potentially quite slow. Indeed, outdated market rules and perhaps more importantly a lack of market rules for new clean energy technologies, products and services, has slowed innovation down.

A more nimble approach, would be to learn what new rules are needed by 'doing'. Governments could work with willing communities to trial different approaches from the ground up. Specific local regions could be declared temporary no-go zones for existing rules and regulations or 'regulatory sandboxes'. This would allow regulators, networks, retailers, generators, consumer representatives and community groups to collaborate on

developing new market structures – ones better suited to the system of the future, such as distributed generation and storage, demand management, micro-grids, etc.

Rob Murray-Leach of the Energy Efficiency Council, one of the experts pushing for this proposal, points out that some government funding would need to be allocated to support these energy innovation zones. Governments would also need to safeguard existing consumer protections, ensuring that participating consumers are effectively insured so that they are no worse off as a result of the trials, and potentially much better off.

Already, the NSW government[224] and even ASIC[225] have created regulatory sandbox programs, where organisations testing new ideas can receive short-term exemptions from regulations. We need to ensure that these powers are used for the benefit of consumers and are not used as pathways by big corporations to erode environmental or consumer protections.

Photo: Doug Gimesy

3.6 Grid access: connecting communities to power

Make sure network companies play fair in connecting renewables to the grid.

The grid is a very important part of our electricity system. It provides a relatively efficient way of transporting electricity to millions of energy consumers.

But as the paradigm of the electricity system changes, the grid is becoming one of the biggest roadblocks. There are a few problems that we need to fix to even get close to 100% renewables.

This section looks at connecting renewables to the grid, rather than the role network companies play in the cost of the energy system, or the way that prices and tariffs for electricity consumers value renewables. These issues are covered in the Part 1 of this report.

Connecting renewables to the grid: what's in the way

Networks in Australia were set up both technically and commercially to transport electricity from very large centralised generators to far away consumers. Network companies were quite content building and maintaining their poles, wires and substations. They were not set up to connect millions of small generators, let alone tens of wind or solar farms. They quite literally didn't know how to do it and have had to learn rapidly in the last ten years, with little in the way of culture, systems, processes and skills to support this learning. Most (though not all) network companies have learnt the bare minimum begrudgingly but network businesses remain highly risk averse and have not had to innovate for decades.

Networks are a natural monopoly, which calls for regulation at the consumer end of the electricity system (such as through network pricing determinations), and at the generation end of the system, when connecting generators to the grid. Of course, with the rise of decentralised renewables, a growing number of consumers are also generators. **Generators have little power or control over the cost and process of connecting to the grid, which leads to high costs, uncertainty and a lack of transparency.**

In a survey of grid connection experiences, the Clean Energy Council found that:

"65% of respondents who had connected commercial-scale generators stated that they were unable to manage their risks and costs effectively during the connection process. In addition, 85% stated that they did not believe the connection process meets their requirements in a fair and certain manner and as quickly as reasonably possible." [226]

This situation is further compounded by both culture and skills gaps. As a result, pioneering clean energy projects have to pay for networks to learn how to connect them, which benefits subsequent projects but places an unfair burden on the pioneers.

Moreover, the grid is a complex beast, and what is needed in one location is often different in another. What's needed to connect a 100 MW wind farm is different to a four MW wind or solar farm, and is different again to a 150 kW commercial solar array or a three kW household solar array, in part because they will be connecting to different levels of the grid.

As a result, renewable energy projects have no control over how much grid connection will cost or how long it will take. As the Clean Energy Council explains [227] the grid connection rules and processes are predicated on the idea of a negotiation; but in a monopoly situation, **generators have few effective channels of recourse, have no power in the situation and are generally forced to agree with the connection terms set by network companies.** If the developers of new renewable projects choose to go to the Australian Energy Regulator (AER) to make a complaint, any goodwill by network staff will be lost and the proceedings take on a much more legalistic and expensive quality.

Further, privatised network businesses are for-profit enterprises, and those that remain in public hands have been encouraged to act as much like private businesses as possible. They are driven to maximise profits from their monopoly services, including through the network connection process. This results in cases of **over-inflated network connection prices, which make it far more difficult for new renewable generators to connect to the grid.**

In Germany, renewables have been given priority access to the grid since the early 1990s. Moreover, the German Renewable Energy Act of 2014 states that grid operators have to respond within a maximum of eight weeks with the following information: time plan, technical data for the connection, including relevant network compatibility tests data, and costs of the connection.[228] This is a much quicker turnaround than in Australia.

In Australia, some steps have been taken to try to address these issues:

- For small-scale generators, the AER regulates network connection fees
- For medium-scale generators (<5 MW), a rule change was made to create Section 5A of the electricity rules, which mandates timelines for different steps in the connection process and requires more detailed cost breakdowns. This sounds good, but unfortunately it doesn't go far enough. Medium-scale generators still find it particularly hard.

The grid's in the wrong places

In Australia, we have a few electricity generation hubs with multiple power stations near each other, typically in locations where the most accessible coal resources are to be found, including in the Latrobe Valley in Victoria, the Hunter Valley in NSW and Collie in WA. This makes sense in a centralised electricity system; locate as many plants as possible as close to each other as possible, and build a grid to that area.

While an Australia powered by clean energy will involve a much more decentralised electricity system, there will still be a role for large-scale renewables like solar and wind farms. The efficiency of having a few electricity generation hubs in locations where the best clean, renewable resources are makes sense.[229] However, **our best renewable resources are not located in the same place as our best coal resources, which in turn means the grid infrastructure needed to serve renewable energy hubs will often be different to that serving fossil fuel hubs.** In some cases, our high capacity grid is simply in the wrong places for transitioning to renewables.

When most of our current electricity generators were built, all electricity assets were owned by state governments. State governments used low-cost public debt to fund the high-capacity grid infrastructure to connect these generators to population centres and were repaid over time, mostly through consumer bills. The costs of building all the grid infrastructure to and from the Hunter Valley and Sydney or the Latrobe Valley and Melbourne were not factored into the cost of an individual coal fired power station. That is, **old centralised generators have effectively been given a massive subsidy in the form of high-cost grid infrastructure that all new and more decentralised generators are now being asked to pay for.**

For new large renewable generators trying to connect to the grid there are two possible scenarios:

- The first project in an area has to pay for the grid infrastructure upgrade or extension if one is required. This could involve building whole new lines or substations, or at the very least expanding the capacity of existing lines and substations. This makes the first project in an area extremely expensive and possibly not cost competitive, with future projects potentially benefiting from this upgrade.
- There is existing capacity in the network and the first project across the line gets up, but the rest are locked out as further cost-prohibitive grid infrastructure upgrades are needed.

There is, therefore, either a first-mover advantage or first-mover disadvantage depending on the local situation, which in turn is one of the many transmission network market failures noted by the Garnaut Review.[230] Either way, a model that forces the cost of grid infrastructure upgrades to be covered by a single project significantly hinders the growth of renewables.

To start addressing this, the Australian Renewable Energy Agency (ARENA) is currently funding Transgrid to develop a transmission hub for wind (and other renewables) in the New England region of NSW, as an area with significant wind and solar potential and a large number of projects in the pipeline. The QLD government has also provided funding to establish a new transmission line to a renewable hot spot in north-west QLD. However, these two examples on their own are not sufficient.

How do we fix the problems?

Bringing grid integration into the 21st century requires a number of complementary solutions. The most essential changes are proposed below, although this list is by no means exhaustive.

Establish an independent grid planning authority

Put the task of planning the grid in independent hands

As noted in Reboot the System and stated by the Clean Energy Council it is "increasingly apparent that policymakers, regulators and market operators need to take a more strategic approach to prepare for future electricity system needs".[231] One such need is to establish a national, independent, non-profit grid planning authority. Ideally this authority should sit within the Energy Transition Agency (see Section 2.3).

The independent grid planning authority would undertake inter-regional planning of grid infrastructure to ensure that the grid is in the places we need it to be and that there is the optimal level of grid interconnections between locations and regions. In some cases, this will mean advising that new transmission infrastructure be built to maximise the use of some of our best renewable resources (renewable energy hot spots) and achieve market benefits across regional/state boundaries. In other cases, this will be supporting network companies to identify locations that are best disconnected from the grid and serviced by local renewables and storage instead. This planning role requires integrated technical and economic expertise.

Currently, AEMO plays a limited version of this role, however, its powers and current transmission planning process is woefully insufficient for the task of repowering Australia with 100% renewables. The need for better transmission planning was recognised by the Finkel Review, which recommended that AEMO should have "a stronger role in planning the future transmission network, including through the development of a NEM-wide integrated grid plan to inform future investment decisions." Further, it recommended that "significant investment decisions on interconnection between states should be made from a NEM-wide perspective, and in the context of a more distributed and complex energy system."[232] In response, AEMO is working on its first Integrated System Plan for the NEM, due to be released in June 2018.[233]

Whether AEMO or a new independent grid planning authority plays this role in future, any recommendations for major transmission infrastructure projects to improve access to renewable energy zones or hot spots should be referred to Infrastructure Australia and considered for funding via the Building Australia Fund.[234] Any taxpayer funding for new transmission infrastructure needs to be carefully ring-fenced to ensure that transmission companies can't then charge consumers through the nose for the same investments. If this does not work, governments should seriously consider re-nationalising the transmission infrastructure.

Make connection processes fair and independent

Set fair national standards for grid connection and audit network companies to make sure they play by the rules.

It is essential that the connection process, particularly for medium and large renewable generators, be made fairer and more transparent. There are many actions needed to be undertaken to do this. However, in the short term the following five actions are recommended as significant steps in the right direction:[235]

1. Establish **consistent national standards for grid connection** to ensure the rules are not applied in different ways by different network companies. This would include having standing offers for solar installations up to at least 100 kW.
2. Direct the AER to undertake **compliance audits of network companies for 10% of grid connections** undertaken by each Distribution Network Service Provider (DNSP) under Part 5A: Electricity Connection for Retail Customers of the Electricity Rules. This would help ensure that network companies are complying with both the rule and the spirit of the rule when connecting embedded generators less than 5 MW. This takes the quality assurance responsibility away from generators applying for connection, who risk losing a good relationship with the network company if they report non-compliant practices.
3. Require DNSPs to publish **grid connection opportunity maps** like the ones produced by the ISF,[236] which show where there is capacity in the grid to connect new generators.

4. Establish **a national template grid connection agreement** with standard terms for commercial-scale embedded generators. This would increase the power of generators in the negotiation process and make it easier for network companies.
5. Make the grid connection service contestable: **enable renewable energy proponents to choose who undertakes the physical connection process** as long as they are accredited and compliant with standards. There is no reason why solar installers can't do the assessment and connection process for small solar arrays (<100 kW). For large renewable generators third party providers could often do a more affordable and faster job than networks in connecting a project to the grid from the project side. This would reduce costs to proponents and thus customers and reduce the monopoly power of networks. It would be consistent with the principle of 'open access' regulation of other monopolies, such as Telstra's copper wires.

Photo: Sue Murray

PART 2

REPOWER WITH **CLEAN ENERGY**

1. Introduction

As the world's sunniest continent,[237] Australia has a lot going for it as the world moves to power homes and workplaces with clean, renewable energy. By strengthening existing renewable energy policies and adding a few missing pieces, we could repower our country with 100% renewable electricity by 2030 and 100% renewable energy across the whole economy by 2050 – everything from hauling freight to the way we power our industries.[238] We can also ensure that this transition is affordable and fair, creates great local jobs for people struggling to find work in regional Australia, and empowers everyone to bring down their electricity bills, no matter where they live or what they earn.

With the right policies in place, our future looks sunny. We'll see a lot of big renewable power plants in the places where the sun shines longest and the wind blows strongest, along with many smaller installations close to where people live and work.

The past five years has seen a revolution in the economics of renewable energy. Wind and solar are now cheaper than building coal and gas. Solar is cheaper for a household than grid electricity and this trend will continue. The transition to renewable energy is now inevitable. What is not inevitable is that this transition will occur quickly enough for Australia to play its part in slowing down and preventing dangerous climate change. And without deliberate action by our representatives in Parliament, we could miss out on the chance to maximise the benefits of this rapid growth in renewables to the Australian economy and to all Australians.

We already have some of the key policy architecture we need. The Australian Renewable Energy Agency (ARENA) is helping innovative new technologies make their way out of the lab and into the market. And the Clean Energy Finance Corporation (CEFC) is playing a crucial role ramping up renewable investment. The 2020 Renewable Energy Target, which has done a lot of the heavy lifting to build big and small renewables, is currently on track to be met two years ahead of schedule. That is, there are already enough renewables either operating, under construction or under contract to comfortably achieve what's needed to meet the RET.[239]

To repower Australia with 100% renewable energy quickly and efficiently we are going to need to turbo-charge these existing policies and institutions. We are also going to need a few extra policy levers to get the job done, and done right.

In this chapter we set out the policies needed to:

- drive the cleanest and cheapest energy of them all
- create a clear and thus bankable price signal for large renewables[240]
- ensure that local residents have an opportunity to benefit from investment in their neighbourhoods
- get the right mix of renewable energy technologies installed, delivering a reliable and affordable energy system
- support innovation and drive renewable energy technologies further down the cost curve
- help households, organisations and communities lead on renewables
- ensure no one is left behind and
- make the most of Australia's abundant renewable resources to help drive jobs and decarbonise our industries, transport and our region.

These policy outcomes are complementary to those set out in the Rewrite the Rules and Replace the Polluters sections. To unleash the full potential of renewables it is also important to:

- reduce excess capacity from old coal-fired power plants operating past their use-by date; no new-build generation, whether fossil-fuel or renewable, can compete with a written-off plant in its final years of existence, and there are significant barriers to exit (see Part 3: Removing the Roadblocks) and
- ensure easy access to the grid (see Part 3: Removing the Roadblocks).

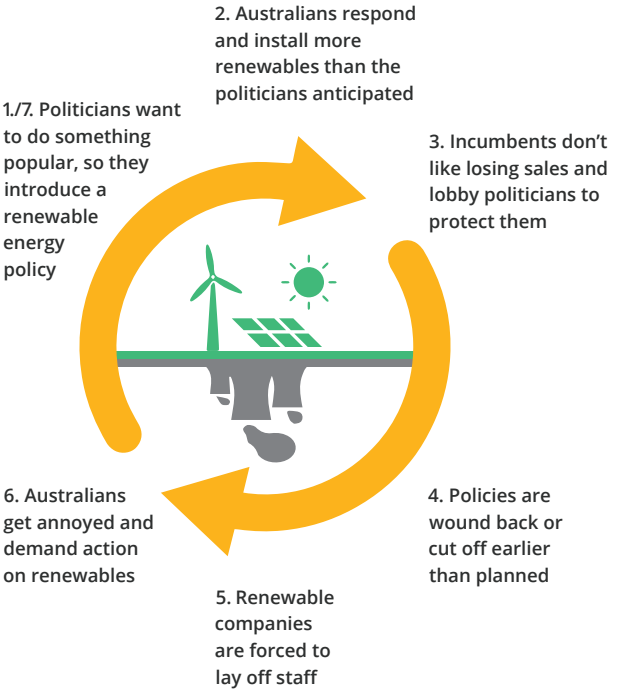
1.1 Renewable energy in Australia – the story so far

Boom, bust and uncertainty.

Boom and bust policy

Australians love renewables, there's no doubt about it. Our country is perfect for solar, wind and wave energy. In fact, we have some of the richest clean renewable energy resources in the world.[241] Unfortunately, political responses to this fact have been problematic, to put it mildly. While we have had some good renewable energy policy, it has lacked consistency, creating a boom and bust cycle.

Figure 12: Boom and bust policy cycle



Indeed, every time Australians have set a target for renewables we have achieved it ahead of schedule. The 2.5% Mandatory Renewable Energy Target (MRET) was achieved four years ahead of schedule, SA's target of 50% has been met eight years early, and the current national RET will be achieved at least two years ahead of schedule even though attacks on the RET caused the whole industry to stall for two years.

We have been on this boom-bust merry go round for over a decade. If it's allowed to continue, this cycle could prevent us from achieving 100% renewable power and it will certainly reduce Australia's ability to benefit economically from the transition.

The RET: Doing the heavy lifting

Between 2000 and 2014, the Australian renewable energy sector grew rapidly. The majority of this growth was simulated by the introduction and expansion of the Renewable Energy Target (RET). The RET was first introduced by the Howard Government in 2001. The initial target was very unambitious; it was set for renewable energy to make up just 2.5% of Australia's electricity generation. Yet it unlocked an explosion of investment in wind energy and the target was exceeded by 2006. In 2009 the Rudd Government expanded the target to 41,000 GWh by 2020 or approximately 20% of our then projected annual electricity usage in 2020.

The Rudd Government also split the RET into two parts, to support both household-scale and large renewables through the Small-scale Renewable Energy Scheme and the Large-scale Renewable Energy Target. Other important state and territory policies include feed-in tariffs for small and household renewables, state renewable energy targets and, most recently, the renewable energy reverse auctions.

The Abbott years: Lack of certainty and winding back the RET

With the RET and complementary policies in place, Australia was starting to benefit from the world's next great industrial revolution. At least $6.2 trillion was invested in the global green economy between 2007 and 2014, of which 70% was in renewables and energy efficiency.[242] Unfortunately, former Prime Minister Tony Abbott's two-year war on renewables didn't just disappoint the vast majority of Australians who prefer wind and solar to coal and gas. It also brought investment in large-scale renewable projects to a grinding halt due to extreme levels of uncertainty. Large-scale renewable energy saw an 88% drop in investment in Australia during a huge year for the sector worldwide.[243] It was a concerted campaign fuelled by big power companies and vested interests in the fossil fuel industry, and the damage to renewable jobs and Australia's climate commitments was enormous.

How did it happen? The RET legislation included a two-year review period that was originally intended to allow an increase in ambition, however it was used by the Abbott Government to create uncertainty and ultimately cut the RET from 41,000 GWh to 33,000 GWh by 2020. **The only positive thing that came from the mess was greater certainty, partly because the two-yearly reviews were removed from the legislation.**

The RET is a market-based mechanism, but for two years the market was not allowed to function (see Box 9 for a more detailed explanation). The combination of the review and a concerted war on wind power by Tony Abbott and other senior government ministers made many existing renewable energy projects less viable, unnecessarily pushed up the cost of energy and delayed the construction of new renewables needed to replace ageing coal plants.

Resistance to renewables from gentailers

The review was also used as an opportunity by energy gentailers (particularly EnergyAustralia, AGL and Origin Energy) to lobby for a reduction in the RET and as an excuse not to sign Power Purchase Agreements (PPAs) for new renewable energy projects. PPAs are usually essential for any energy developer, renewable or otherwise, to secure finance to build a major project.[244] If retailers aren't signing them, finance is hard to find, which means no new large renewable projects.

After the reduction of the RET it became a more certain, if less ambitious policy, given the removal of the two-year review period. However, even then there were long, costly delays before retailers started signing PPAs. Retailers may have been reluctant to take on the financial risk attached to PPAs, given that wholesale prices and consumer demand are unpredictable. But there was another factor at work. In 2015, the electricity market was oversupplied with polluting power from coal and gas, as noted in Part 3: Replace the Polluters. Big gentailers that still own fossil-fuelled power plants also have a direct interest in slowing down the expansion of renewables. So, even though retailers are required by law to purchase a certain number of Renewable Energy Certificates (RECs) each year, they have an incentive to cop the fines rather than meet their REC obligations, because more RECs equates to less demand for their coal-fired power. The proposed National Energy Guarantee also has this design flaw – the inclusion of offsets means that gentailers can opt to buy their way out of the obligation to back renewables, rather than undercut their coal profits.

Box 9: How the Renewable Energy Target (RET) works

The RET is delivered through a market of renewable energy certificates. The RET legislation has two main functions:

1. setting a target amount of electricity to come from renewables by a particular date
2. establishing a market for renewable energy in addition to the wholesale electricity market.

The commodity in the renewable energy market is renewable energy certificates (RECs) – either small technology certificates (STCs) for projects smaller than 100 kWs or large generation certificates (LGCs) for projects bigger than 100 kWs. These certificates represent one MWh of renewable energy generated. Every year electricity retailers are required to buy a certain number of certificates, depending on the amount set out in legislation and the amount of electricity they sell to customers in a year. Currently, the amount of electricity to come from renewables is set at 33,000 GWh by 2020, with the REC market legislated to continue until 2030.

The RET legislation also sets out annual GWh targets – that is, how much renewable energy has to be generated at least through the LGC component of the RET each year until 2020. In this way, it sets out in black and white the obligations of electricity retailers by specifying how many LGCs they have to purchase over the course of a year and surrender in February at the beginning of the following year. If a retailer does not surrender enough LGCs, they have to pay a penalty price that is set out in the legislation of $93/MWh. This penalty price also effectively puts a ceiling on the market price for LGCs, because if the market is regularly going above $80, the retailers may as well pay the penalty. This is a reasonable safeguard, though it should be noted that like any market the REC market is subject to being gamed.

Box 10: Financing major infrastructure projects

Large energy generation projects (tens to hundreds of megawatts), no matter how they are powered, are significant infrastructure projects. Financing major infrastructure projects is challenging. Historically, much large-scale infrastructure has relied on government involvement to be viable.[245] Examples range from network infrastructure being underwritten by a guaranteed rate of return (see Part 1, Section 1.2) to broadband internet and road funding. When debt-shy governments withdraw from their role as investors in essential infrastructure, the result is what we see today: a widespread infrastructure deficit.[246]

One of the current problems with financing new renewable generation projects is that, without a PPA, anyone building a new power plant has nothing to bank on but the ever-changing prices set via the wholesale spot market and the REC market.

Only two coal-fired power stations have been built by the private sector since the NEM was introduced. One of these, Redbank, only operated for 12 years largely due to higher financing costs than its state-developed competitors. The rest have been built by government-owned entities. It is unreasonable to think that renewable energy projects should be able to do what coal cannot.

The extent to which the private sector has managed to build large-scale renewables despite such roadblocks, is largely thanks to government de-risking investment through the RET, ARENA, CEFC and state-based reverse auctions.

Another upsurge

In 2016, the political conditions were again ripe to put the past behind us and to get on with the job of building renewables projects. However, if we'd built more renewables faster we would have softened the impact of the closure of Hazelwood and Northern power stations on communities and households.

When conditions are right, the Australian renewables sector can deliver extraordinary results. In the space of just one year it took off from a virtual standstill to make 2017 Australia's biggest year for renewables ever. Approximately 4.5 GWs of renewables were installed, including one GW of rooftop solar.[247] And for the first time large-scale solar farms are being deployed commercially, as well as wind-farms. This is in significant part thanks to the competitive grants round for large-scale solar that ARENA undertook,[248] which successfully cut the costs of solar to the point where it's now able to compete with wind and is signing PPAs at less than current wholesale prices.[249] Despite this achievement, the federal government tried again in 2016 to scrap ARENA, successfully cutting $0.5 billion from their budget.[250]

NEGative future ahead?

The success of renewables and the realisation that the private sector isn't going to build another coal fired power station, ever, has ramped up the anti-renewables campaign significantly. SA, which achieved its 50% clean energy target in 2017, eight years ahead of schedule, has been a particular target.

In July 2016, when the interconnector between Vic and SA was down for maintenance, electricity prices spiked in SA. Not to let facts get in the way of a good story, conservative commentators used it as an excuse to blame renewable energy, despite evidence that the real reason was largely a concentration of market power which meant a handful of gas and diesel generators were able to game the system to the tune of $42 million in just one day.[251] Three months later, SA was swept by seven tornados that snapped transmissions lines like twigs. Within 30 minutes of a blackout occurring even more conservative commentators piled on to blame renewables, even though it was the power of cyclonic winds, not wind turbines that were to blame.

These moments, capitalised on by hard-right ideologues, particularly on the Turnbull Government back bench, opened the most recent chapter of the climate and energy stalemate. A stalemate that led to:

- Prime Minister Malcolm Turnbull rejecting an Emissions Intensity Scheme (EIS) one day after it was proposed by the Chief Scientist
- the SA, Vic and QLD governments joining the ACT in showing real renewable energy leadership

- the Finkel Review (see Box 5) and proposed Clean Energy Target, the only recommendation of the fifty resulting from the review not to be adopted
- the back of an envelope thought bubble – the National Energy Guarantee (NEG), which as originally proposed by the new Energy Security Board would bring the large-scale renewables industry to a screeching halt as soon as the current RET is met. Based on what has been revealed about the NEG so far, it could well be worse for clean energy than doing nothing at all.[252]

If we don't find a way through, the future is again looking bleak.

What to do about the climate and energy stalemate?

Millions of Australians have been demanding action on climate change and to drive clean renewable energy since at least 2007. During this time, the far right has continually had its way – from killing the carbon price ('Axe the Tax' campaign), to getting the ALP to agree to reduce the RET and ARENA funding. Most recently it has been forcing a discussion of a terrible energy policy – the NEG – as supposedly our only policy option. We know these ideologues will lose eventually, as the global commercial and environmental impetus for renewables are now unstoppable. However, they only have to slow things down by creating confusion and blocking progress for us all to lose on climate (see Box 11 for the top barriers renewables face).

But despite these barriers, we should not lose hope. Firstly, because the overwhelming weight of public opinion is on our side. Secondly, because the momentum behind renewable technologies is so great that it can only be slowed, not stopped. Technologies such as solar, wind and batteries are being deployed much more like mobile phones than coal-fired power stations. Globally they are on an exponential growth curve, similar to the rise of computers. However, if we'd asked politicians in 1990 to set a target for how many computers there would be by 2010, most of us would still be using typewriters. Exponential growth creates a future quickly that we can't even imagine now.

Futurist Ray Kurzweil notes that the installed capacity of solar PV is doubling every 2-2.5 years. So while it currently only accounts for 2% of global electricity generation, it would only take six doublings or a bit over 12 years to power the whole world with solar.[253] That's how powerful exponential growth is.

Now that doesn't mean we can all head to the beach because exponential growth in renewables has us covered. That's only possible if we remove the roadblocks and put the right incentives in place – those are two big jobs. What we need is to set policies that let renewables rip, rather than smothering what is possible.

Box 11: Top barriers to renewable energy

1. Whether it's because it's bad for their business (hello coal and gas companies) or because it ruins their perfect enactment of neoliberal market theory, or because they haven't yet caught up with the times that renewables are now cheaper to build than polluting generators like coal and gas – renewables have their opponents, and they aren't going away anytime soon. This is a challenge and it is a challenge that will continue for as long as coal-soaked politicians have any degree of control over our national and state politics and policy agenda.
2. The disproportionate influence of the coal lobby on Australian politics means that the dream of bipartisan agreement on meaningful climate action is unlikely to become a reality in the next few years. Many key players in our energy debate are still holding out for that dream, rather than embracing the many other important policies that can be implemented today, even without any kind of climate consensus in Canberra.
3. The rules of the electricity game are stacked against renewables or don't exist. Read Part 1: Rewriting the Rules for a lot of info on this.
4. The bumpy boom-bust transition brings its own challenges, including higher financing costs, lack of a stable workforce, and inability to do long-term planning and proper community engagement.

Becoming the big kid on the block

So does this mean we shouldn't set targets? No, it means our targets should act as a floor (a minimum), not a ceiling (a maximum), and that the millions of Australians working for clean, renewable energy need to keep fighting the good fight.

It also means we need to look at the levers we have at our disposal. We suggest there are four:

1. Government purchasing, which includes governments doing energy efficiency and renewables for themselves, as well as reverse auctions and public ownership
2. Household, small business and community action
3. Large energy users making direct investments, putting solar on their roofs, getting into the renewables game and/or purchasing the electricity directly from renewables projects
4. Policies that require retailers or generators to take action, for example an EIS, NEG, RET, CET, White Certificate (energy efficiency) schemes and more.

A lot of focus of energy policy makers is spent on the fourth option – a central mechanism of some sort. For a central mechanism to work effectively requires bipartisan support to ensure there is policy stability, prod retailers or generators to do what they are supposed to do, and give investors confidence that a renewables investment is a safe bet. However, as the climate and energy wars continue to rage, a central policy that would actually enable rather than stifle the growth of renewables and other clean energy options currently looks unlikely.

Meanwhile, state and local governments, households, communities, farmers, and businesses large and small are getting on with the job of repowering Australia with clean, affordable energy. The going is unnecessarily tough, as the rules of the game are stacked against them, but progress is happening.

For a central mechanism to do all we want it to achieve, the clean energy sector needs to become so big it cannot be slowed, squashed or sidelined. We need it to become so big that it cannot be ignored. The good news is, the more we turbocharge business, industry, community and household renewables, the more we tear down the barriers. We demonstrate that renewables work, that they have public and political support and that they are cheaper and more reliable.

So, when we think about repowering, let's think about all the options big and small that can get and keep us on the right track. And that can create a renewable future that is fair, prosperous and good for people and our planet.

Photo: FatCamera/Getty images

HOW TO **REPOWER AUSTRALIA**

Unleash clean energy

This section is about driving the clean technologies we need to repower Australia.

- Go big on wind, solar PV and energy efficiency and make sure local communities can benefit
- Don't let offsets displace pollution cuts from clean renewables
- Build the right renewables and storage in the right places with reverse auctions and public ownership
- Get innovative by turbo-charging ARENA and the CEFC
- Create a clean energy service agency to help the federal government cut its own energy waste and switch to renewables.

Power to the people

This section is about making the transition fairer and faster by empowering everyone to be involved, no matter where they live or how much they earn.

- Expand Indigenous communities' access to affordable and clean power
- Secure a just transition for fossil fuel workers and communities
- Support low-income households through access to funding and by setting up PowerAccess, a public-interest retailer for people who need it most
- Empower renters through solar gardens and making rental properties less of an energy nightmare
- Empower everyone through the Smart Energy Communities Program, increasing access to storage and ensuring everyone has the protections they deserve.

Make Australia a renewable superpower

This section is about ensuring that Australia capitalises on the huge opportunity presented by the whole world heading to clean energy.

- Using our superpowers for good
- Power Australia's transport and industry with renewable electricity
- Develop a renewable export industry
- Make the transition job rich
- Make Australia the world's leading knowledge bank on renewable energy
- Support our region to benefit from the renewables revolution.

2. Unleash clean energy

2.1 Go big on the low-cost stuff

Introduce policies that drive energy efficiency, solar and wind, big time.

According to the Institute for Sustainable Futures (ISF) there are three clean energy options that will supply the bulk of Australia's electricity needs. Unsurprisingly they are the cheapest option – negawatts,[254] wind turbines and solar PV. To transition Australia to 100% clean power we are going to need to build some big renewable power plants in clean energy hot spots: places that have the best renewable resources or are close to population centres. However, the biggest source of clean power will be the energy we save through efficiency measures.

We already have a key policy in place that is helping us to build big renewables – the RET– but in the last few years politics has gotten in the way. To get to 100% we need the right mix of policy levers that can stimulate the uptake of big renewables and are as 'politics-proof' as possible.

We need to go big on energy efficiency, large-scale wind and solar. The best way to do this is to set policies that create a clear, bankable price signal and remove the roadblocks to action.

The cheapest energy of them all

Double Australia's energy productivity by 2030

Energy efficiency should be a holy grail for policy-makers. It saves lives, saves money, creates jobs, strengthens the economy, makes life more comfortable and reduces carbon pollution – what's not to like? In 2015 the federal, state and territory governments agreed on a National Energy Productivity Plan (NEPP), with a headline target of improving Australia's energy productivity by 40% by 2030.[255] The NEPP adds up all the dollar-saving gains that can be made from a wide range of energy efficiency improvements. Yet it recommends that we adopt just a little over half of them – a missed opportunity on an enormous scale.[256] And with no additional federal funding provided to achieve the NEPP's goals, it looks a lot like an empty promise.

In 2013, the Energy Efficiency Council, CHOICE and the Brotherhood of St Laurence commissioned a survey which found that electricity was households' biggest cost-of-living concern. Helping homes and businesses save energy was by far the most popular option to lower energy bills, with net support of 76% compared to the next most popular option ('time-of-use' pricing), with net support of just 24%.[257]

There's no shortage of evidence that Australia can go further than is proposed in the National Energy Productivity Plan. ClimateWorks and 2XEP, for example, have both demonstrated the potential for Australia to double its energy productivity by 2030. With so much to gain from more efficient use of energy, there's no reason to hold back. There's really no question: the federal government should commit to doubling Australia's energy productivity by 2030.[258]

To begin with, federal and state governments should lead the way on the changes outlined in Table 5.

Table 5: Doubling Australia's energy productivity: first steps

What	Why
On the road	
Introduce mandatory emissions standards for all light vehicles, and either a) index those standards to the performance of the cleanest and most efficient vehicles worldwide or b) align them with European Union standards. The standards could be based on an average across a manufacturer's or importer's fleet. (Alternatively, this measure could be rolled into a National Air Pollution Control Act.)	To give us the cleanest and most efficient cars in the world, and to prevent Australia from becoming a dumping ground for inefficient and polluting models that other countries have rejected.
Invest in rail freight for heavy transport and incentivise freight transport fleet renewal.	Australia's freight and rail fleet is significantly older and less efficient than that of other developed countries.[259]
In the home and office	
Introduce a streamlined process for increasing appliance efficiency standards under the 'Greenhouse and Energy Minimum Standards' program, and link those standards to international best practice.	To protect customers from shonky products that are polluting and use too much energy to run, and revive one of Australia's best-performing and lowest-cost carbon reduction policies.[260]
Toughen energy efficiency standards for buildings and enforce those standards properly.	To bring energy independence within reach of more households and businesses, along with lower bills and more comfortable, healthy homes and workplaces.
Introduce minimum energy efficiency standards for rented homes and offices (see more on this in Section 3.4).	To prevent landlords from offloading sub-standard properties that waste electricity and drive up their tenants' bills.
Require mandatory disclosure of the energy efficiency of homes at the point of sale.	To make it easier for homebuyers to assess the true value of a property. In the ACT, homes are required to have energy efficiency ratings when sold. Homes with higher ratings now have higher market values.[261]
On the factory floor	
Reinstate and enhance the Energy Efficiency Opportunities program, requiring major energy users to identify cost-effective ways to save energy and publicly report on them (see more on this in Section 4.2)	The previous Energy Efficiency Opportunities program helped heavy industry find hundreds of millions of dollars in energy savings ($178 million a year), and was closed in 2014 for no good reason.[262]

What	Why
In the field	
Support farmers to improve energy productivity, focusing on the water and energy nexus, diesel use efficiency – including farm vehicle efficiency – and supporting on-farm renewables such as solar water pumping.	Agriculture was the only industry where energy productivity dropped significantly in last six years, according to the NSW Farmers Federation.[263]
Economy-wide	
Support and strengthen existing state-based energy efficiency funds and schemes and encourage expansion to other states, or potentially harmonise schemes into a nationwide program, and ensure these schemes support major industrial energy users to improve their efficiency.	A number of states place small surcharges on power bills to pay for energy efficiency programs that cut bills by more than the surcharges. NSW, Vic, ACT and SA also have 'retailer energy efficiency obligations'. Harmonising these schemes would create a consistent, clear, economy and nation-wide incentive to cut energy waste.

Price signal to drive big wind and solar

Ideal world

In an ideal world we would have agreement from all sides of politics that we need deep cuts to carbon pollution by 2030, which in turn would mean that we need to remove all climate pollution from our electricity system by 2030. Just imagine the ALP, LNP and Greens side-by-side announcing that 100% renewables is 100% doable and 100% better for Australia.

If we successfully campaigned and got this situation to occur, the good news is we have just the policy to implement to achieve this necessary goal of 100% renewable electricity by 2030. It is a 100% Renewable Energy Target (RET), complemented by policies such as clean energy auctions to get the right renewables in the right places (see Section 2.3 below for details). In Version 1 of the Homegrown Power Plan, we outline in detail how a 100% RET underpinned by an extended Renewable Energy Certificate (REC) market could work.[264]

Alphabet soup

Unfortunately, we don't live in an ideal world. That's why over the past decade we've had an alphabet soup of energy policies, a veritable plethora of TLAs (three letter acronyms), from the ETS, to the RET, an EIS, a CET and now the NEG. All of these policies have aimed to do one primary thing – send a price signal to investors and businesses, that they should invest in the clean stuff and not invest in the dirty polluting stuff in our electricity system. All of the mechanisms work in slightly different ways, some create a stick making pollution more expensive, others create a carrot establishing or incentivising the low-emissions, clean and renewables sources of electricity. Table 6 below outlines how each of the main policies work and assesses their relative merits and pitfalls.

Table 6: Alphabet soup: market-based climate policy options

Policy	How it works	Pros	Cons
Emissions Trading Scheme (ETS)[265]*	A series of tradable permits each representing a tonne of pollution are created. The total number of permits equals the amount of pollution allowed to be created. If you generate more pollution than permits allocated, you have to buy more, if you generate less, you can sell yours. The number of permits reduces each year in line with an emissions reduction pathway.	Makes polluting more expensive, while also incentivising cleaner alternatives. If implemented well can reduce emissions in an orderly but flexible way.	Permits create a property right to pollute. Complex and easy to game by the gentailers. If the number of permits is too many, makes the scheme useless.
Carbon price	For every tonne of carbon pollution created, the polluter (e.g. coal fired power station) has to pay a particular price.	Straightforward, easy to understand and implement. Worked to reduce Australia's emissions from 2012-2014. Raises revenue that can be used to eliminate any extra costs to households through direct payments. This was done in 2012.	Even if the revenue raised is returned to households, it still increases the cost of electricity, so is vulnerable to scare campaigns.
Emissions Intensity Scheme (EIS)*	A target emissions intensity is set for the electricity sector and then ramped down from the current baseline overtime. Any generators above the target emissions intensity (e.g. coal) can purchase credits from less emissions intensive generators such as wind and energy efficiency to meet the target.	Makes polluting more expensive, while also incentivising cleaner alternatives. Doesn't cost as much as either an ETS or carbon price.	Complex, which means it is open to gaming by the gentailers. Doesn't guarantee overall emissions from the electricity sector reduce, if the amount of electricity increases. Doesn't raise any revenue to help households with their power bills.
Renewable Energy Target (RET)	A target for the amount of renewable electricity in a particular year is established. A certificate market for renewables is created to ensure that retailers purchase enough renewables to meet this target.	Is directly about building the cleaner alternatives. Helps lower wholesale prices and drives more competition. Has already proved itself as Australia's most successful and long-lived climate policy for the energy sector.	Doesn't put a cost on pollution. Still open to being gamed by retailers.

Policy	How it works	Pros	Cons
Clean Energy Target (CET)	Like a RET, but the eligible generators are 'clean' rather than renewable. Where clean means they emit less than a particular threshold of carbon pollution. The value of the certificate earned by each clean generator is proportional to how emissions intensive it is.	Is directly about building the cleaner alternatives. Helps lower wholesale prices and drives more competition.	Doesn't put a cost on pollution. Still open to being gamed by retailers. Considers generators that create emissions clean. Could potentially be used for existing generators, not just new ones, making it less effective in putting downward pressure on prices.
National Energy Guarantee (NEG)*	The National Energy Guarantee includes two requirements on retailers: to purchase electricity from a portfolio of generators that delivers a set level of reliability and a set emissions intensity. The scheme would be delivered through contracts, which would be assessed by the AER every year.	Too many uncertainties about the design to say what pros could be.	Lack of transparency and the ability for gentailers to game the system are serious concerns. This article outlines a further 30 concerns.[266]

*All of the starred mechanisms propose or allow the use of offsets. See below for why we should rule out offsets.

Which mechanism should we choose?

Getting a good price signal to drive the deployment of low-cost clean energy is actually a function of two things:

1. the level of ambition: what is the outcome that the policy is trying to achieve?
2. the mechanism: the process by which the outcome is being achieved.

The federal government's carbon pollution reduction target of 26 to 28% by 2030 was first adopted by Tony Abbott in 2015. The Finkel Review then modelled the application of that target to our electricity sector, rather than assuming that pollution would be cut faster in that sector than other sectors, which experts agree would be a much better option. As a result, Finkel's proposed policy – the CET – was set to deliver only slightly less pollution than business as usual.[267] This still didn't satisfy the Turnbull Government's backbench, so it was ditched in favour of the NEG, which is currently set to deliver *even less clean energy than if his government continued to do nothing.*[268]

If the target is wrong, then it really doesn't matter what mechanism is used to reach it. This is really the crux of the issue: while ideologues who hate renewables have any degree of power then there will not be any long-term bipartisan or cross-party agreement on an outcome to decarbonise our electricity sector. Addressing this barrier should really be the focus of efforts to rescue Australian energy policy from the climate wars.

When it comes to a mechanism, many people say we shouldn't let the perfect be the enemy of the good, rather we need a mechanism that we can 'ratchet up' when a sensible government comes to power. The question is what is a good mechanism? Each mechanism, as outlined above, has its pros and cons – some are better than

others. The best way to test whether a mechanism is a good one is to think about the outcomes we ultimately want it to achieve. These outcomes should become the principles by which we assess any proposed price signal or central energy policy mechanism.

Principles for success

A good clean energy price signal policy should:

1. enable the electricity sector to lead the way in cutting climate pollution, consistent with Australia's Paris commitment to 1.5-2 degrees
2. speed up the replacement of polluting coal power with clean energy
3. distribute the benefits and costs of the policy fairly, without handing unearned profits/windfall gains or more market power to the three big energy companies that already dominate the market.

Innovation not capitulation!

Getting a big infrastructure project across the line takes a fair chunk of cash. So it's not surprising that investors want to have some confidence that they are going to get their money back. The best way to do this would be for a cross-party agreement. However, any deal approved by the coal-loving faction within federal Parliament will lock us into a climate catastrophe, so we need to look for other options.

The boom-bust policy cycle of renewable energy policy has created a hostage-like mentality within the renewables industry, where most companies are willing to beg for scraps, rather than stand up for what is needed. Given the very real need to secure investment to justify hundreds of thousands of dollars in project development, it's unfortunately not that surprising. To break the cycle, we need to stop playing their game and think outside the box.

With most of the commercial ducks now lined up in a row, any business or financial analyst worth their salt should know where Australia's electricity sector is headed. They should know that Australia's coal-fired power stations are old and in need of replacing, that renewables are now the cheapest form of replacement, particularly since gas prices are not coming down. They should also know that after Paris the vast majority of the world is committed to getting out of carbon-polluting industries like coal and that Australia has some of the best clean energy resources in the world. All of this should mean that, despite some short-term politicking, the future for Australia is renewable and that projects, particularly if they have someone to purchase the electricity, are a sure bet.

That means our big challenge is matching clean energy projects with consumers who want to buy their power. We are currently seeing the rise of innovative new business models that are allowing small and large energy users alike to buy their electricity directly from renewables. While we are just at the start of this journey, change is happening rapidly in this space as we outline in the Power to the People and Renewable Superpower sections.

A carbon budget

This doesn't mean we should give up on the idea of a 100% RET (or similar price signal mechanism). What it does mean is that we need to look at the best opportunities to go big on low-cost wind and solar, and that may be through other means right now. Nevertheless, we should also put in place the pieces of the puzzle that would make any price signal deliver the outcomes we want. The biggest piece of this puzzle is to create a carbon budget for Australia's commitment to keeping climate change to below 1.5°C and then a sub-budget for Australia's electricity sector.

It's also important to note that a price signal by its nature is a signal to a market. In turn, a perfect rational market responds by investing in the least-cost low-emissions options available. This means that these mechanisms are designed to incentivise the lowest cost technologies. Unfortunately, as we outline in Figure 13 below, an energy system full of the least-cost technologies is not the same as the least-cost energy system, because it takes the right mix of technologies to keep prices low over time. Other policies are therefore needed to drive other technologies and address a range of market failures.

We need action – not offsets

You've probably heard of carbon offsets, and maybe you've even bought some yourself. In theory, offsets make up for the pollution created by an individual or a business with pollution reductions achieved elsewhere – whether in developing countries[269] or from domestic projects generating Australian Carbon Credit Units (ACCUs).[270]

Money used to purchase these offsets can fund a very wide range of initiatives, such as reforestation, landfill gas capture, purchasing cleaner cookstoves, replacing inefficient light bulbs, and even renewable energy.[271] That's how you can achieve 'carbon neutral' status for a flight with just a $1 surcharge – and, potentially, how the government could let dirty fossil fuel generators make up for their carbon pollution under a range of mechanisms, whether the National Energy Guarantee, an Emissions Intensity Scheme or an Emissions Trading Scheme.[272]

Box 12: Do we actually need subsidies anymore?

People often ask – if renewables are now cheaper than new-build coal and gas, why do they need subsidies?

There's a few things to unpack in this question. Firstly, people often confuse government support with subsidies. Subsidies are the provision of cash or the absence of costs such as tax for a particular technology, person, organisation or project. Subsidies are just one form of support that governments can give to clean energy projects, regulation, obligations, coordination, information removal of legislative barriers are just a few other forms of support.

So why do renewables need government support? Well, firstly, while our coal generators are getting old they are not going to shut down by themselves in time to avoid dangerous climate change. To shut them down in time will need government intervention. Secondly, there isn't a level playing field. As we outline in Box 10, the vast majority of coal-fired power stations that were built with public money and fossil fuels still receive a massive amount of government support (see Part 3, Section 4). No matter what the energy source, new generators are major public infrastructure investments with long lifespans, and clear government policy is needed to keep the costs of finance under control. Thirdly, there are a huge number of market barriers for renewables and where markets fail, governments have a responsibility to act – that's what the Repower Australia Plan is all about. Finally, electricity is an essential service. While much of it is privatised, governments hold the ultimate responsibility for a functioning electricity system, and we cannot let them abdicate this responsibility.

It sounds great in theory – but unfortunately offsets are a lot more complicated and hugely problematic in practice. Here are five reasons why:

Verification challenges: It should go without saying, but step one to ensuring that offsets actually have an impact is making sure the projects generating them actually occur. Unfortunately, since these projects often occur overseas, and because the ultimate product – carbon emission reductions – is invisible, verification can be a real challenge. And, because there's a lot of potential money to be made, there have been numerous cases of multi-million dollar fraud from selling offsets in the forestry sector in particular.[273] Once projects actually occur, they must be monitored on an ongoing basis to ensure that they are *permanent* – in other words, emission controls can't just be removed after a year or two.[274]

Mismatch between land and fossil carbon: A significant share of carbon offsets come from reforestation or other projects that rely on the ability of plants to naturally sequester carbon as they grow. This can be helpful for offsetting emissions from excessive deforestation and land clearing, but these short-term natural cycles are a fundamental mismatch for burning fossil fuels and releasing carbon that had been geologically sequestered for *millions* of years. Similarly, land carbon sequestration in plants is inherently less stable than geological sequestration, as reforestation projects can be destroyed by natural events (such as wildfires) or changes in government policy and thus cannot be relied upon for the long term.[275]

Additionality and leakage: Even when actions are verified to have taken place, for offsets to be effective they must be proven to have 'additionality' – that is, that these emission reductions are additional to what would have taken place without the purchase of offsets.[276] The Australian Carbon Credit Unit program has a poor record on this front, with a 2016 report finding that nearly $200 million in offset revenues had gone to landfill gas capture projects that were already receiving incentives under the RET, raising serious questions about their additionality.[277] Similarly, projects must avoid 'leakage' – that is, a farmer paid to preserve land can't just clear a different plot of land instead.[278] As you can imagine, these attributes are very tricky to demonstrate conclusively, creating a significant risk that offsets end up not doing much of anything to reduce emissions.

International offset prices set to rise: While international offsets have historically been a cheap way to (theoretically) balance rising domestic emissions, that won't be the case for long. Much of the lowest hanging fruit – for instance, elimination of the production of HCFCs, a refrigerant that doubles as a potent greenhouse gas[279] – has already been picked. And as countries around the world start work in earnest to meet their Paris climate commitments, growing demand for international offsets will put long-term upward pressure on prices. Thus, in addition to missing out on much-needed domestic investment, and letting big polluters off the hook, a climate strategy built around action overseas won't even save money.

Postpones needed climate action: By providing a means for governments and businesses to shift the burden of reducing emissions, offsets recall St. Augustine's famous plea: "Lord, make me chaste – but not yet." The influential climate scientist James Hansen makes a similar analogy to the medieval practice of buying indulgences, writing that "anybody who argues for offsets today is either a sinner who wants to pretend he or she has done adequate penance or a bishop collecting moola."[280] And it's clear that certain Australian politicians think offsets can be used to avoid the need to close down polluting coal plants.

The fact is, Australians *need* real climate action in our energy sector – including both ramping up renewable energy and cutting down on pollution – and we need it now. Delaying action today means more abrupt and expensive steps to steeply reduce emissions tomorrow,[281] and increases the risk of investments in new fossil fuel assets that could become stranded. In the meantime, pollution from burning fossil fuels is killing thousands of people and destroying the environment; our antiquated energy system has homes and businesses paying the highest power prices in the world; and we're missing out on billions of dollars in renewable energy investment and thousands of jobs.

Simply put, a sensible and responsible climate policy shouldn't be seeking to avoid cleaning up our energy system. It's our duty – and it's also a massive opportunity to cut energy bills and empower communities. In short, **whatever policy suite is adopted to repower Australia with clean energy, offsets should not be part of it.**

2.2 Share the benefits of large-scale renewables

Make it easy for communities to share in the benefits of renewables in their backyard.

In order to transition to a clean energy system as fast as possible we need large-scale renewable energy projects. However, to avoid the trap of simply replicating the traditional approach of a large centralised electricity production in the hands of a few, local communities should have an active stake in these developments. The reason is simple: local support and involvement can ensure that large wind and solar projects get off the ground more quickly and benefits are more equally shared all the while stimulating regional economic development. Wind energy for example gives farmers a more stable source of income to rely on through the year, creates jobs for local technicians and electrical engineers, and some wind farms are even becoming tourist attractions for regional communities.

In fact, research has shown that successful community involvement in large-scale clean energy projects has two dimensions – the fair sharing of financial benefits and including locals in the decision making processes of the projects.

A mechanism that has proven successful nationally and internationally is to allow community members to have a part ownership stake in large renewable projects. In fact, studies from the US and Germany have shown community co-ownership increases the local economic benefit of such projects by 3.5 to 8 times.[282]

Providing avenues for local communities to get informed, have a say and have an ownership stake in their local renewable energy project helps spread the benefits of clean energy more widely. It also comes with an added bonus: communities who have been properly consulted and who stand to benefit directly from local renewables are likely to be less open to the influence of Australia's small but vocal anti-wind lobby.

Unfortunately, partial community ownership of large renewable projects like wind and solar farms is not yet standard practice in Australia. However there are some pioneers of genuine community engagement and benefit sharing. For example the approach of the 270 MW Sapphire Wind Farm in NSW is focussed on building long-term support through providing community infrastructure, creating a community benefit fund and testing appetite of the community to co-invest in the wind farm.[283]

Australia's renewable energy sector operates in a highly competitive market, and has had to overcome resistance from well-funded vested interests, not to mention the institutional inertia described in Reboot the System. So, it is fair to say that for the majority of large-scale renewable energy developers, community ownership, which goes hand-in-hand with higher levels of community engagement, is likely to be seen as a hassle and not core business.

How to incentivise co-ownership and community engagement?

To change the industry culture, activate latent community support and increase the local economic benefits of clean energy, there are four levers governments can and should use:

- national / state renewable energy policy
- local development or planning policies
- tax regulations
- information provision and capacity building support.

Valuing community action in renewable energy policy

Co-ownership in renewable energy means the local community has a stake in the projects, therefore it is interested in their success and so ultimately contributes to the achievement of national and international efforts on climate change. To meet their national renewable energy targets, governments in countries such as Denmark and the UK have incentivised co-ownership by requiring renewable energy developers to open up a certain percentage of a project's ownership to the local community.

In Australia, the ACT Government introduced specific assessment criteria for large-scale wind projects in their Renewable Energy Reverse Auction policy. Developers who put emphasis on community participation, the use of local contractors and contributing to trades training increased their chances of winning the bid by 20%.

We need renewable energy policies at federal and state level that incentivise local co-ownership and support genuine community engagement. This could be for example strict assessment criteria in policies such as reverse auctions for all large-scale renewable energy projects to include 10 or 20% co-investment of the local community and demonstrate strong community engagement processes.

Local governments as facilitators for community benefits

As the tier of government closest to the people, local governments have a special role in facilitating community interest and needs. In Germany and Denmark local governments play an important role as planning and approval authority for large-scale developments. Their ability to influence local renewable energy development is strengthened through national and regional planning laws, and they are required to actively engage and facilitate the siting process of wind and solar farms and ensure that the local community supports any large-scale developments in their area.[284]

In Australia, local governments are stepping up to the expectations of their communities and increasingly request an evidence base of good community engagement practices and strong social outcomes before signing Power Purchase Agreements (PPA).[285]

To ensure that all Australians benefit from the clean energy revolution, local councils should be enabled to play an active part in facilitating large-scale renewable energy developments and support their community in the process. All local governments should adopt the practice to sign PPAs only with a strong evidence base of active community engagement.

Tax incentives for large scale developers

In the US, federal tax incentives such as the Production Tax Credit, Investment Tax Credit, Residential Tax Credit and Bonus Depreciation have been critical to driving the uptake of renewables. With a Federal RET and Clean Energy Auctions we see less need for tax incentives at this scale.

However, tax incentives specifically targeted at spreading the benefits of Australia's renewables expansion to local communities would be smart policy. A tax incentive in the form of accelerated depreciation should be made available to renewable projects that have a minimum local community ownership of 10%.

Build capacities of local communities

There is no 'one size fits all' approach to community engagement around renewables – every community is different. So, research emphasises that the engagement and benefit-sharing initiatives must be tailored, diverse and long lived.[286] An important factor is that the communities know what they want.

Hence, it is important to increase the capacity of the local communities and equip them with the right tools and knowledge to articulate their expectations and needs towards large renewable developers. A fruitful approach was introduced by the NSW Government to encourage the establishment of Community Consultative Committees (CCC) in November 2016. The purpose of the CCC is to provide a forum for discussion between a proponent and representatives of the community, stakeholder groups and local councils.[287]

Australian federal and state governments should support capacity building of local communities through, for example, the distribution of existing knowledge and information on best practice. For example, the Victorian government's guide for renewable energy developers[288] is a great resource for large-scale developers. In addition, guidance and training should be established for local governments, landowners and their communities while the establishment of local stakeholder committees to support the process of project development should be encouraged. This could be done through the Smart Energy Communities program (see Section 3.5).

2.3 Right renewables in the right places

Kick-start storage and on-demand flexible renewables.

It is important to plan to get the right mix of clean energy. A 100% renewable electricity system will require a portfolio of different technologies powered by different renewable energy resources and storage to back it up. ISF's modelling,[289] along with that undertaken by AEMO,[290] UNSW[291] and others, shows that solar PV and wind – the cheapest clean energy technologies available right now – will supply most of Australia's electricity under 100% renewable scenarios (and under less ambitious scenarios). But other technologies are also needed to get the job done.

In the Punter's Guide to Jargon we introduced the concept of variable but predictable renewables such as wind and solar PV, and 'on-demand' renewables and storage such as sustainable bioenergy, concentrating solar thermal with storage, batteries and pumped hydro. 'On-demand' basically just means that they're on call, ready to feed additional electricity into the grid at a moment's notice. Experience from places like Denmark, Germany and SA show that it is possible to get to very high proportions of variable renewables without additional action.[292] But once a certain percentage is reached (a percentage that varies depending on location, the state of the grid, and so on), on-demand renewables and storage are needed to balance the load and ensure that supply is reliable around the clock.

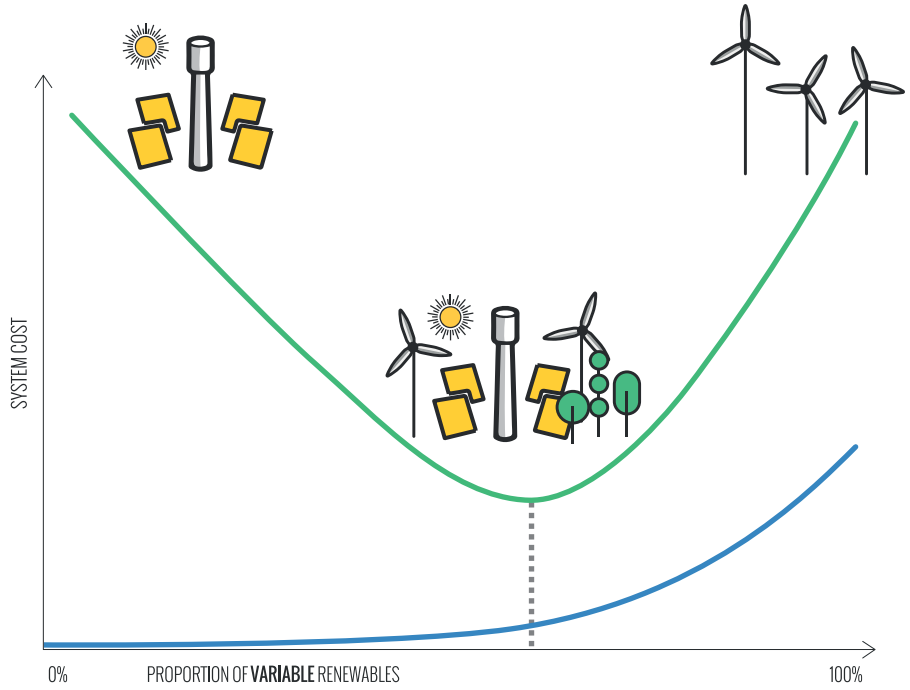
And it's not just technologies on the supply side that have a role to play – demand response is also critical here. Of all the clean energy solutions discussed in this report, demand response might just be the most rapidly deployable. In its most basic form, demand response requires the installation of no new technology – only a contract with an energy consumer (usually a large one, like a manufacturing plant) to ramp down their electricity use when called upon. In exchange, they get paid – just like an electricity generator, but for reducing demand instead of providing supply. A 2014 study by ClimateWorks Australia and the Australian Department of Industry found that demand response from industrial users could reduce their peak demand by 42% – enough to meet 10.5% of total peak demand on the grid,[293] and the equivalent of two Hazelwoods.[294]

A recent trial of demand response by ARENA, AEMO and a series of state governments looks to be incredibly cost-effective. In the words of ARENA's Chief Executive Ivor Frischknecht, "We've been able to build a virtual power plant the size of two of Tesla's giant 100 MW batteries in a matter of months for a fraction of the cost of building new supply". Perhaps because of this cost-effectiveness – or perhaps just because of common sense – a poll by the Australian Institute found that two-thirds of Australians thought demand response was a better solution to meeting peaks than building new generation, and four in five were interested in participating in demand response programs themselves.[295]

Demand response offers a combination of rapid deployment, low costs, and across-the-board popularity, which gives this once-wonky subject the potential to become one of our best weapons for fighting fossil fuel-driven price spikes and emissions in the near term and for cost-effectively getting to 100% renewables in the longer term.

Research from UNSW (illustrated in Figure 13) shows that a least-cost energy system powered by clean energy includes a mixture of variable and on-demand clean energy. If the system is skewed towards mostly on-demand renewables (left of the graph), this sees

Figure 13: Optimising the generation mix



high generation costs as the technologies are more expensive. If the system is skewed towards 100% variable renewables (right of the graph), it requires much more capacity to be installed across larger areas and there are greater grid integration costs. The right mix of both on-demand and variable clean energy leads to a least-cost outcome across the system.[296]

Indeed, in the future the price-setters in the market dominated by variable (but predictable) renewables that run at very low marginal cost will be the suppliers of on-demand energy that can fill in the gaps around cheap wind and solar. So far, that's been a handful of privatised gas companies (and corporatised Snowy Hydro) who've been gaming the market, Enron-style, to maximise their revenue.

However, with storage prices coming down and gas prices going up, any government that really cares about wholesale power prices should be looking to intervene to stimulate the deployment of new on-demand clean power.

Currently, Australia's policy settings do not provide a clear price signal to stimulate the uptake of on-demand renewables and storage alongside solar PV and wind. This needs to change. There are currently a number of options being floated about how to best do this. Two have the potential to work in the public interest by driving down climate pollution and increasing competition in Australia's electricity market to dampen wholesale prices. They are clean energy auctions and public ownership.

Box 13: What's the story with storage?

Household-scale electro-chemical battery systems like the Tesla Powerwall are hitting the headlines. A range of other energy storage technologies are also available at different scales, from pumped hydro to flywheels, and from molten salt thermal energy storage to grid-scale chemical batteries such as flow batteries.

As battery costs continue to fall, and particularly if they go the way of solar PV in the last decade, it makes a lot of sense to install grid-scale battery storage, particularly when this helps defer expensive network upgrades.[297] The CEO of network company Ergon has said that battery storage could cut grid upgrade costs by one-third.[298] Batteries would be especially handy to help us make as much use as possible of the energy that falls as sunlight across Australia. Battery storage could enable much more solar PV generation, with the energy generated at the sunniest times stored and used at other times.

The big Tesla battery in South Australia is already proving its worth, beating fossil fuel generators to the task of supplying extra power to the grid when a coal plant failed in Victoria.[299]

Batteries will help, but it's worth noting that modelling has consistently shown that a reliable and affordable 100% renewable electricity system can be achieved even without battery storage.[300] The right geographic and technological mix of wind, solar PV, concentrating solar thermal and bioenergy can supply enough 'firm capacity' to keep the system stable. There are also other ways of introducing flexibility into the system, including demand side management options, which are extremely cost effective.

Clean energy auctions

Why is it needed?

The existing RET is a great way to deliver today's cheapest renewable technologies in the places where it's currently cheapest to build them. In the future, other policies such as the proposed CET or an EIS would likely play a similar role. Reverse auctions are a complementary policy that are a great way to attain the lowest possible price for on-demand/dispatchable renewable energy and storage projects and services that can keep our energy system reliable, sustainable and affordable over the long term. This also has the benefit of being a bankable policy that increases investor confidence.

This approach has proved very successful at keeping down costs for the ACT government, which has used reverse auctions to secure a 100% renewable supply at prices lower than current wholesale electricity prices.

Why this will put downward pressure on power prices:

- **There's zero incentive to price gouge because auction winners don't make any more money by doing so.** If companies charge prices above their fixed contract-for-difference price, they must hand that extra revenue straight over to the government.
- **It's easy for auction winners to bid in at the bottom of the market and push out higher-cost competitors,** since governments will pay the difference.

Policy mechanism

A 'reverse auction' turns the concept of an auction on its head – that is, the typical role of the buyer and seller at an auction are swapped around. Instead of buyers bidding high enough to win, sellers bid low enough to win the chance to supply what the buyer wants. In this case the buyer is a state or federal government and what it wants is megawatt hours of on-demand clean electricity supply. The SA, Vic, QLD and ACT governments as well as ARENA have recently undertaken reverse auction processes. They have also been used successfully in other parts of the world (see Box 14 for reverse auctions around the world). While ACT pioneered the process, Vic is leading the way with a 650 MW tender for large wind and solar. Some governments are using the process to procure generation to meet their own electricity needs.

However, reverse auctions for new generation don't need to be backed by a specific electricity demand (or load) to be useful, as we explain in the Contract for Difference section below.

The implementation of this policy involves the following three steps:

1. **Choose and publish selection criteria for successful bids.** The criteria should include:
   - **Responsiveness** – the ability to supply electricity in a short response or dispatch time of less than five minutes
   - **Location** – based on analysis undertaken by AEMO or ARENA, projects should be in areas that most need both on-demand electricity and additional ancillary services such as frequency control, fast frequency response, and/or inertia
   - **Public interest** – an indication of how the ownership and operational strategy of the infrastructure would increase competition in the wholesale electricity market to keep prices lower and reduce the number of price spikes. In addition, this could include local community ownership, job creation, content requirements, and other potential benefits to the state such as investments in research and training.
2. **Companies and organisations tender** for a certain capacity (MWs) or volume (MWhs) of renewable generation and/or storage.
3. **The lowest-price bids that meet the criteria win a power sale contract that is locked in** for a period of at least 15 years. In this way, reverse auctions provide the bankability and certainty needed to secure finance at competitive rates (one of the factors that keeps down the cost of the policy).

One of the key innovations in the design of reverse auction policy is the structure of the contract. Governments should offer the winning proponents a 'Contract for Difference' (CfD). A CfD works whereby the successful renewable energy project sells energy on the wholesale electricity market and the federal or state government agrees to top up the contract price offered by the winning bidder when the wholesale price is lower than the contract price. When the wholesale price is greater than the contract price, the generator agrees to pay back the difference to the government.[301]

However, a CfD for on-demand renewables and storage will need to differ slightly from existing CfDs for variable renewables to incentivise the export of electricity at times when it is most needed. One way to do this would be to structure the CfD around cap future contracts rather than wholesale electricity contracts. One of the ways that retailers manage risks of high spot prices is to enter into cap contracts with generators, where firm generation guarantees to be available when needed at a pre-agreed price. For an 'on-demand' reverse auction, the contract could be structured around participating in this existing market practice. This was proposed as one approach by the Melbourne Energy Institute as part of the Victorian Government's Renewable Energy Auction Scheme consultation.

An alternative approach could be to specify in the contract conditions that the contract price is only paid during demand spikes, supply drops, or price spikes. Note this doesn't prevent the contracted generators from exporting electricity to the NEM during other times, it's simply that the government contract would not cover that period. The contract could also include a minimum annual revenue guarantee to make it more bankable.

Holding a national clean energy reverse auction every year is a smart and cost-effective way to get a head start on the essential elements of a 100% renewable grid. The first auction should be held in 2018 and they should be held regularly to 2030.

Publicly owned on-demand renewables and storage

Australia's energy sector lacks generators that operate in the public interest. It also lacks regulators who are willing to stand up for the public interest in the face of fierce lobbying by cashed-up private companies. Given that energy is an essential service, this would be a problem at any time, but it is particularly problematic during a time of rapid and disruptive change.

In the early days of electrification, a mix of local electricity suppliers were owned by a range of local councils and private companies. Over time, states stepped in and took on most of the responsibility for providing enough electricity to meet rising demand. A series of blackouts mid-century prompted state governments to further expand their investment in the industry. In other words, they did what responsible governments often do when the market is failing to provide universal access to an essential service – they stepped in and provided it themselves.

The problems we are seeing in the energy market today are like those we saw in the middle of last century. Ten of Australia's ageing coal fired power plants have shut down in five years. In the absence of long-term climate or energy policy, too few investors are willing to build the new generators we need to drive rising prices back down, especially in the face of the federal government's attacks on the lowest-cost technologies available, wind and solar

Box 14: Reverse auctions around the world

Reverse auctions are becoming the preferred policy tool for supporting deployment of large-scale renewable energy projects around the world. By the end of 2015, at least 64 countries had held renewable energy auctions, with record bids in terms of both low price and high volume seen across the world's developed and emerging economies.[302] The policy shift to auction schemes in the last three years has enabled dramatic and sustained price decreases and increased competitiveness of renewable energy generation technologies.

Most new tenders in the last year have been for solar PV projects, which saw new record low bids of USD 0.03 per kWh achieved in some markets in 2016. In Australia the ARENA large-scale solar PV competitive round achieved a significant drop in grant funding needed for this new technology. When the projects currently under construction are complete, installed capacity of large-scale PV will total 262 MW in Australia.

In ACT the first Request for Proposal was issued for 40 MWs of large-scale solar installations in early 2012. The ACT government found its Solar Auction a huge success, providing a "simple and effective way of attracting large solar projects to the territory". Reverse auctions are the ACT's primary policy mechanism to reach its 100% renewable energy target by 2020.

In Europe, offshore wind power saw record low bids for tenders in Denmark and the Netherlands, bringing the region's industry closer to its goal to produce offshore wind power more cheaply than coal by 2025.

Germany provides the most prominent example of shifting to a reverse auction approach. The country changed its Renewable Energy Act in 2014 from a feed-in tariff approach to reverse auctions. Usually three to four rounds of auctions are held each year. In 2017, two rounds of successful tenders with a total capacity of 1.2 GWh for both large-scale solar and onshore wind energy were conducted with lowest bid for solar achieving AUD 8.03c/kWh (noting Germany's solar resource is nowhere near as good as Australia's) and wind generation AUD 6.31c/kWh.[303] This shift to reverse auctions has also increased collaborations across nations, further helping to integrate the European energy market. Specifically, Germany and Denmark have entered into a pilot partnership arrangement to launch a cross-border solar PV tender.

– noting of course that wind coupled with storage or other firming capacity has been modelled as cheaper than building new gas generators.

If profit-driven companies can game the market to drive up prices, it follows that public-interest companies can work to drive them down. All that is required is to run new publicly-owned clean power assets in the public interest – that is, to dampen wholesale prices rather than maximise revenue and in the process, accept a lower return on investment (which governments are well-placed to absorb since they also have lower borrowing costs).

As such, state governments should establish a new public entity to own and operate a fleet of on-demand generation assets, such as batteries, concentrated solar thermal with storage, and pumped hydro. It could purchase pre-developed on-demand energy projects from commercial developers, based on advice from AEMO about what level of on-demand capacity is required and what energy services are needed in what locations. In the longer term, this entity could also start to develop its own projects. The federal government could support states to do this by providing interest free loans.

It is essential that each new entity be established with the requirement that its assets are run in the public interest – that is, to increase competition and keep costs low and in so doing drive the on-demand renewables and storage we need in the system. Currently, both public and private owners of energy infrastructure are operating to maximise profits at the expense of energy consumers, but this need not be the case (see Box 15).

Getting the markets right

A lot of energy insider conversations are currently being had about whether the energy-only market in the NEM is up to the job. Nominally, we have ancillary service markets for other technical services that most of us don't

Box 15: Public vs private ownership: good and bad behaviour

Australia's electricity companies can be publicly or privately owned. In NT, all are publicly owned. In SA and Vic, all are privately owned. In some states, it's a hodgepodge. Looking at the behaviour of electricity companies over the past decade, each type has shown both good and appallingly bad behaviour.

Gouging customers

As we outline in Part 1, Section 1.5 private gentailers, particularly in South Australia, have been playing the electricity market Enron-style – withholding supply to push up prices. While not technically illegal, it's bad behaviour and it comes at huge expense to customers. While in Part 1, Section 1.2 we show evidence that it was the publicly owned network companies in NSW and QLD that were most responsible for network gold plating. Treasuries of these two states used networks as cash-cows again at huge expense to customers. On the positive side private networks in Victoria spent a lot less of customers' money. While in 2017 the Queensland Energy Minister was able to instruct government owned generators to make lower profits ensuring a better outcome for consumers.[304] Privately owned companies could be sued by their shareholders for doing that.

Climate action

Government owned generation companies such as Macquarie Generation in NSW (privatised in 2014)[305] and Stanwell Corporation in Queensland have done nothing in the past decade to add new renewable assets to their businesses and lower their carbon pollution, while almost all privately owned generators companies now own renewable generators. That said, AGL likes to proudly state that it is the largest owner of renewables in Australia, while that is true they are also the largest owner of coal generation and as such one of the biggest polluters in Australia.[306]

In thinking about how we should proceed in the future, there is no doubt that in a time of rapid disruption, governments cannot sit back and 'let the market fix it.' The market is broken and not fit for the future. So what to do? When considering the right mix of public and private ownership in our electricity system, there are three factors to consider:

1. **Corporatisation.** The practice of gouging customers has come in the age of corporatisation. Whether publicly or privately owned, corporations are set up to make money. Electricity is an essential service, it shouldn't be delivered by profit-making enterprises. We need more organisations participating in the electricity system that actually put customers first; not-for-profits, public agencies with the right directives and cooperatives all have the ability to do this – it's part of their governance structure. If we had more of these actors in the market, others would have to change their behaviour to compete.
2. **Customer choice.** One of the main arguments those leading the charge on privatisation made in the 90s is customer choice. When we had regulated, vertically integrated monopoly energy companies, customers had only one choice of who to get their electricity from. The thing is that while many people like the idea of choice, when the product – some electrons – is exactly the same, we find that many people don't bother to switch retailers, and are thus getting a bad deal – see Part 1, Section 2.5. When the product starts to get more interesting, such as solar and energy services, a lack of choice of energy provider can be an issue, though it doesn't have to be. In parts of the US, publicly and privately owned monopoly energy companies have prohibited households from getting solar. Fortunately, that hasn't been the case here in Australia and we need to keep it that way.
3. **Risk aversion and innovation.** At a time of rapid change, it's essential that we have organisations who are innovating, providing new, cleaner, more customer orientated ways of doing things. Typically, government organisations are risk averse, the opposite of innovative. However, this does not need to be the case. Already we are finding that partnerships between governments, private actors and new social enterprise and community actors are delivering the innovative clean energy and customer outcomes we need. See the Moreland Energy Foundation Box for examples of this.

know about – things like frequency, voltage control and black start. These markets don't function very well and, to ensure that much needed entrants such as battery storage, pumped hydro and CST can deliver the services we need for a functioning electricity system, they urgently need reforming.

There's also an idea that we might need a day-ahead market. This is where generators bid in what they will dispatch to the market one day in advance. It would reduce the amount of Enron style gaming and with good forecasting technologies could support – not hinder – wind and solar, as well as battery storage.

Then there is fixing our existing energy market – with the five-minute rule, which would see our market settled every five minutes rather than every 30 minutes. This would favour new fast-response technologies, such as batteries and pumped hydro, over our old slow dinosaurs such as coal. It's no wonder that coal companies have successfully lobbied their long-term supporters at the AEMC to delay the introduction of this change until 2021.

Other ideas, such as capacity markets and strategic reserves, can be done well or badly. These are ways to keep some capacity in the system as insurance – for example, just in case it's needed over summer – while also supporting more demand management. If done badly they can be ways of paying old polluting coal power stations to keep polluting. We need to make sure that any market reform works to support the right renewables, storage and demand response and doesn't prop up the polluting incumbents.

How *not* to build a reliable, low-cost electricity system

We've covered a lot of ground on the right ways to go about building the right renewables in the right places across Australia. But we should also say a few cautionary words about the wrong ways to build the cleaner, more reliable, lower-cost electricity grid of the future.

2017 saw noteworthy policy proposals using the buzzwords 'energy security' and 'reliability', but in each case there were serious flaws likely to result in perverse – and expensive – outcomes. Policymakers need to make sure decisions based about how to enable Electricity 2.0 are informed by up-to-date, real-world experience – and not out-of-date information and arbitrary targets.

- **The Energy Security Target** (EST) proposed by the SA state government would have required retailers to purchase up to 50% of their power from 'clean' (non-coal), on-demand resources that can provide fault current and real inertia – essentially, natural gas, along with limited amounts of certain types of renewables like solar thermal, bioenergy, and pumped hydro. As proposed, this target would function like a bizarre natural gas-centric version of the RET (the 'GET'?). Instead of encouraging the lowest-cost, lowest-emission technologies – wind, solar, and batteries – it would help increasingly expensive and polluting fossil fuel generators stay in business.[307] Fortunately, the EST proposal has been delayed until 2020 – and it would be best if it were scrapped altogether.
- **Finkel's Generator Reliability Obligation** (GRO) proposed to require all new variable renewable generation over a certain level to procure a certain number of GRO certificates from on-demand sources of energy.[308] This would be another arbitrary target with the practical impact of making wind and solar more expensive. It would also particularly disadvantage smaller, community scale solar installations, which are likely to have less access to capital and expertise needed to integrate battery storage or other dispatchable solutions. While this approach is an improvement over the EST because it helps to promote battery storage, it suffers from a similar impulse to micro-mismanage. However...
- **The reliability target in the NEG** would take the award for 'most counterproductive mismanagement', if such an awful thing existed. Instead of allowing the experts at AEMO to be fully responsible for ensuring the security of the grid, the NEG would have this responsibility shared with the retailers. That's right, the same retailers who spend most of their creative energy devising deceptive new ways to steal unsatisfied customers from each other would suddenly be determining the least-cost mix of different types of dispatchable and non-dispatchable responses needed to operate a reliable grid. What could go wrong? In fact, this approach would add needless complexity to energy markets and undermine AEMO's ability to do its job.[309]

2.4 Get innovative!

Turbo-charge clean energy innovation.

The transition to clean energy is fundamentally an innovation challenge. Across the world energy systems are changing at an unprecedented pace. This hasn't happened by accident; the countries leading the charge are doing smart things to support innovation by new and existing players in the energy sector.

Innovation is occurring not only in the field of clean energy technology, but also in the design and implementation of new clean energy business models – business models that create even greater value for customers, governments and grid operators. From new battery storage technology and improved solar cells, to virtual power stations and rates-based financing for low-income solar, it is an exciting time to be involved in energy. We are moving from a system where consumers are passive price takers, to a system where consumers, small businesses and social enterprises as well as existing energy players are active in delivering energy services and taking the lead in the renewable transition.

Embracing innovation is important, because to perform the ambitious but achievable task of transitioning to 100% renewables will require taking some risks (small risks compared to the huge risk of dangerous climate change), trying new things, learning and adapting. Australia's energy sector is notoriously risk averse, apart from its high tolerance for the risks of climate change! This needs to change. Governments need to set policies that can help change the culture of our energy system. One way to do this is to lead by example and use government operations as a test-bed for innovation.

Two of the major institutions driving innovation in Australia's energy system are ARENA and the Clean Energy Finance Corporation (CEFC). Established by the Gillard government through the Clean Energy Future Package, ARENA is Australia's main clean energy R&D funder and the CEFC is our clean energy bank. Both organisations play a critical role in supporting clean energy innovation through research and development, commercialisation and deployment.

Until recently, it was the policy of the Abbott-Turnbull Government to abolish both the CEFC and ARENA. After the CEFC abolition bill was twice knocked back by the Senate, in March 2016 the Turnbull Government announced it would keep the CEFC and introduce a Clean Energy Innovation Fund (more on this below). After successfully stripping ARENA of $500 million, the Turnbull Government finally decided to take ARENA off death row in September 2016 and has been enjoying the numerous ribbon cutting ceremonies ever since.

Turbo-charge ARENA

ARENA plays an essential role in clean energy innovation and Australia would be even further behind the global effort to cut pollution if it did not exist. ARENA's remit is "to make renewable energy solutions more affordable and increase the amount of renewable energy used in Australia".[310] It has a strong track-record of identifying the most important steps needed to unleash renewable technologies and it designs its funding programs around the needs it identifies. For example, in 2016 ARENA undertook a competitive grant round to support the deployment of large-scale solar PV projects, helping to bring 'big solar' down the cost curve. Then in 2017, in partnership with AEMO it undertook a competitive round for demand response. It also has a Research and Development program for new renewable energy technologies and an Advancing Renewables program that helps remove barriers to uptake.

Recently, ARENA has added new priorities. Its A-Lab program (based on the Rocky Mountain Institute's E-Lab)

Box 16: The New York Prize[311]

"The NY Prize helps communities reduce costs, promote clean energy, and build reliability and resiliency into the electric grid... It is a first-in-the-nation $40 million competition to help communities create microgrids – standalone energy systems that can operate independently in the event of a power outage."[312]

The NY Prize offers support for feasibility studies (Stage 1), audit-grade engineering design and business planning (Stage 2), and project build-out and post-operational monitoring (Stage 3).

Stage 1 was completed in 2016, with 83 feasibility studies across New York State, each funded to the tune of $100,000. During Stage 2 Design, it is expected that up to $1 million in funding will be approved per project proposal for approximately ten detailed designs. For Stage 3, $5 million per project is expected to be awarded for build-out and construction of approximately seven projects.

brings together a diverse range of energy industry stakeholders to help tackle tough challenges – looking at how to enable peer-to-peer energy, be more consumer focused, unlock edge-of-grid microgrids and more. Using design thinking and a rapid incubation process, A-Lab is driving energy business model innovations that are exciting and needed. Another priority is investigating renewable exports (see more on this in Section 4.2).

An idea that ARENA should consider is adapting the successful New York Prize model (see Box 16). This could be called the 'Race to Renew', and be used as a real-world testing ground for addressing some of the biggest energy transition challenges.

Originally, ARENA was funded to the tune of $2.8 billion, but a $439 million cut was snuck in as part of the Abbott Government's Carbon Price repeal bill and a further $370 million of its funding was pushed way out into 2019-2022.[313] A further $500 million was cut by the Turnbull Government, with the support of the ALP. The Abbott Government also tried unsuccessfully to completely abolish ARENA but was knocked back by the Senate. Then the Turnbull Government tried to tell ARENA to finish what it's doing and go help CEFC with its loan and investments instead.[314] Thankfully the second attempt to abolish ARENA in all but name was defeated by a strong community campaign and ARENA continues to this day.

ARENA's innovation-focused grants are just as important as the CEFC's loans. It's innovation 101: new technologies don't just emerge from nowhere, fully developed and ready to deliver great returns from day one.

Without ARENA's grants, there would be no funding for:

- renewable technology R&D, like funding research into printable solar panels
- early-stage commercialisation of renewable energy technologies, like the Carnegie Wave energy pilot project in Perth[315]
- other important research and capacity building that fills data and knowledge gaps, such as the Australian Renewable Energy Mapping project,[316] which shows where the best wind and solar resources are in comparison to where the grid is.

Australia needs more grant funding for renewable energy, not less. **To ensure that ARENA can continue its good work and to scale it up in proportion to the challenge of decarbonising Australia's entire energy system (including transport and industry), the federal government should return all the cut funding to ARENA's budget and extend its mandate beyond 2022.** This restored $940 million in funding would cover additional priorities and programs outlined in Table 7.

State governments also have a role in supporting R&D. State funding programs should look to fill in gaps not prioritised by ARENA or work to amplify ARENA priorities.

We note that while extending ARENA's mandate to include energy efficiency is a great idea, renewable energy should remain its primary focus, and nuclear and fossil-fuel based technologies should continue to be excluded from the ARENA funding remit.[317]

Table 7: Suggested priorities for additional ARENA funding

Program or focus area	Funding 2018–2022
Driving on-demand renewables such as CST and bioenergy down the cost curve (complementing clean energy auctions – Section 2.3)	$300m
A program similar to the New York Prize (see Box 16)	$40m
Research, development and commercialisation, with priorities drawn from the modelling of 100% renewable energy systems by the ISF and others, such as renewable fuel sources for transport and industrial processes including sustainable synthetic fuel and hydrogen production, industry fuel switching opportunities and renewable aluminium.	$600m
Total	**$940m**

Turbo-charge the Clean Energy Finance Corporation

The CEFC plays an essential role in clean energy innovation in Australia, helping to lower the cost of finance for clean energy projects and working with the finance industry to help de-risk clean energy projects. In the Abbott era, CEFC had difficulty getting finance out the door due to the industry uncertainty sparked by attacks on the RET (as discussed in Section 1). This uncertainty was compounded by the Abbott Government commitment to abolishing the CEFC.

The Turnbull Government thankfully saw the light and scrapped plans for its abolition. Given that the CEFC is making a profit,[318] the government gets a nice budget boost from the decision as well. Under the current Investment Mandate, the CEFC Board targets an annual return on investment of 4% over the government bond rate – which the CEFC itself considers "unrealistically" high,[319] effectively constraining it to act much like any other investment bank.[320]

Along with shelving the plans to dismantle the CEFC, Prime Minister Turnbull has also pulled a rabbit out of his hat with a '$1 billion Clean Energy Innovation Fund'. But as with any magic trick, the reality is less impressive. (Hint: the rabbit was in there all along).

So what is the Clean Energy Innovation Fund?

The Clean Energy Innovation Fund (or CEIF if you can bear another acronym) is $1 billion of the money already allocated to the CEFC. $100 million a year of CEFC funding will be redirected into the CEIF, which will at least function differently, and better, than its parent fund. This is mainly because they've lowered the CEIF target rate of return to 1% over the government bond rate. This will allow it to invest in projects that are less likely to rake in a lot of revenue in their early years, which will give it the freedom to help more innovative projects get off the ground.

The CEIF will be managed jointly by CEFC and ARENA, but with final sign-off by the CEFC board.

What now?

Now that the CEFC's death sentence has been lifted, the government should go further and lower its overall return target to the rate that now applies to the CEIF (the bond rate plus 1%). A difference of 3% might not sound like much, but it's the difference between the CEFC being able to do its job properly, and being forced to act much like any other commercial bank. It can do this by issuing a new Investment Mandate.

In addition, there are two finance challenges facing the renewables sector that the CEFC is currently unable to deal with. They are:

1. Many renewable projects are decentralised and small in both physical scale and the level of financing required and are thus below the threshold for commercial project finance
2. Market failures prevent renters from gaining access to the benefits of renewables.

The CEFC could play an important role in addressing these challenges. To achieve this, 10% of the CEFC's funds should be allocated to a microfinance and interest-free loan division. (Interest-free loans should only be provided in situations where a strong social return on investment can be demonstrated.) This change to the CEFC's operations and investment mandate would allow it to fill a crucial gap in the availability of finance between household solar and large-scale commercial projects.

2.5 Government leading by example

Embrace clean energy innovation.

To avoid "falling behind by example"[321] federal and state governments must embrace renewable energy innovation in the way they do business.

In 2011-12 (the last time they reported) the federal government used 1738 GWh of electricity, the equivalent of around 300,000 households. All up, it used 22 million gigajoules of energy across all its operations including transport fuel.[322] While the federal government does purchase Greenpower, it only covers 8% of its electricity use. Much more must be done to put the federal government's own house in order. In the new National Energy Productivity Plan (NEPP) negotiated between the federal, state and territory governments, the federal government has agreed to come up with a plan to increase its own energy productivity[323] (see Section 2.1 for more on energy productivity). With the scale of energy used through government buildings, land and vehicles, this represents a major opportunity for government to become a test-bed for clean energy innovation. As the NEPP states:

"Action undertaken by governments on their own energy productivity can have benefits to the economy, not only through energy and cost savings and emissions reductions, but through leadership and driving market development in related services and technologies."

Already state governments are walking the talk. For example, the NSW government has created a Government Resource Efficiency policy,[324] as well as a Sustainable Government Team, and has just gone out to tender to power the new North-West rail link with 100% renewable energy.[325] The SA government issued a Low Carbon Electricity Supply and Services Expression of Interest[326] to service up to 100% of government electricity needs (or 481 GWh a year) through innovative low carbon supply and demand management measures. The winning bid – Australia's first CST plant in Port Augusta. The Victorian government held a tender for its own Large-scale Generation Certificate liability to ensure that between 100 MW and 170 MW of large-scale renewables were built in its own state and has done the same for some of the Melbourne tram electricity demand.

The federal government in combination with the states should:

1. Establish a Government Energy Services Agency. The agency would initially operate primarily as a procurement centre, consolidating and disseminating knowledge and skills in purchasing energy efficiency services and renewable energy. It could also work with building managers, energy providers and innovative energy start-ups to trial a range of approaches to clean energy in government operations. These could include:
   - energy efficiency and demand management strategies
   - battery storage
   - electric vehicles
   - new renewable technologies
   - innovative approaches to purchasing off-site renewables, along the lines of SA and Vic
   - handling all other electricity and gas contracts for government operations.
2. Meet all its own electricity needs with 100% renewable energy by 2022.

The Commonwealth Energy Services Agency could be an in-house organisation sitting under the Energy Transition Agency or a publicly owned government business enterprise like Australia Post or could be tendered to a non-profit. In time, it could be combined with PowerAccess (see Section 3.3).

3. Clean affordable energy for all

3.1 It's about people!

Enable a people-powered energy revolution where everyone benefits from clean, affordable energy.

Like health and education, electricity is an essential service that is critical to almost every aspect of our lives. Think about how often you use electricity: when you wake up in the morning and turn off your alarm on your phone, have a shower powered by electricity or a cup of team from an electric kettle, work using electric machinery, travel home at night under the light of electric streetlights – the list goes on. That means, just like health and education, energy and particularly electricity is fundamentally about and for people: it should be universally accessible.

When you hear insiders talk about energy on the news, it often seems like they've forgotten the basic fact that energy is about people. We hear a lot about technologies – coal, wind, solar – and we hear a lot about money, markets and different organisations. These are important, but so too are the people those technologies, markets and organisations serve and we hear very little from them. When we do, they are used as political footballs, rather than treated as fully rounded human beings who are energy consumers, workers, citizens, community members and increasingly owners of electricity generation. This must change. In this section we outline the policies that help put people back at the centre of the transition to clean energy and celebrate the many examples of where they are leading the way.

Clean energy is empowering – literally!

Gone are the old days of passive electricity consumers unable to do anything but accept the decisions of governments and companies about their energy future. The old days saw some of the most polluting electricity in the world and a 70% hike in electricity prices over five years due to network gold plating.[327] A new energy future is afoot – an exciting, people-powered energy future!

People + clean energy + the digital revolution = an empowered, democratic energy system that doesn't pollute the air we breathe.

In the late 1990s Germany passed the Energiewende – a law that has changed the world. It was made possible by many people, one of whom is a guy named Herman Scheer. Herman Scheer talks about how an energy system based on renewable energy is fundamentally different from fossil fuels and nuclear energy. Where fossil fuels and nuclear power are based on a market of fuel, where the fuel is finite and extracted from the ground creating huge ecological and social impacts, with renewable power the fuel is free and abundant – it's

Photo: Karl Goodsall/ACF

the sun, the wind and the waves. Where historically our electricity system has depended on markets for fuel – coal, oil, gas and uranium, the future electricity system is based on markets for technologies – wind turbines, solar panels, mirrors and more – that harness the abundant renewable resources.

This means that renewables are innately more accessible, as Hermann Scheer puts it:

'Renewable energy are common goods. It is impossible to privatise sun and wind. The deployment of those energy resources will lead to more equality in the global economy.' [328]

The technologies that harness these resources can be highly sophisticated and proprietary, such as solar photovoltaic cells, or they can be simple and made in a backyard like a solar cooker. Even the proprietary technologies are much more modular and scalable than coal-fired power stations, which means owning the means of electricity production becomes a possibility for everyone. It's the difference between a few media barons owning TV stations, and everyone owning a mobile phone.

Renewable energy literally has the potential to empower billions of people (see Box 17). This is why worldwide we're seeing exciting initiatives to democratise energy such as Trade Unions for Energy Democracy[329] and REScoop.[330]

Here in Australia, a combination of energy efficiency, solar PV, demand management and battery storage are the best ways for households to take control of their energy future, lower their electricity bill (see Figure 14) and in the process contribute to stopping dangerous climate change. Furthermore, improving household energy efficiency also makes homes more comfortable and healthier to live in, while also representing one of the quickest and cheapest ways to cut climate pollution.

We know the bad news – a cluster of factors (outlined in Part 1, Section 1.2) has led to really high electricity prices for us all, which is severely affecting Australia's most vulnerable people (see Section 3.3 below for more on this). The good news is that people installing solar and developers building big wind farms are lowering electricity prices for us all (see Section 2 for how this works).

Box 17: Renewable energy is good for humanity

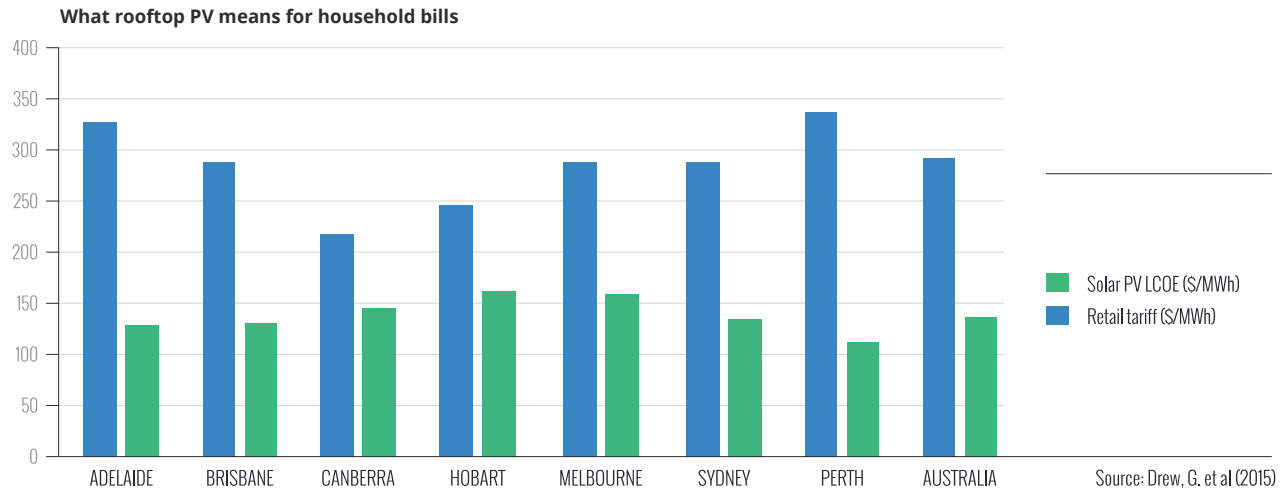
Energy poverty is a major issue across Africa and Asia. Over one billion people don't have access to electricity and 2.8 billion don't have access to clean cooking facilities (e.g. they rely on kerosene, coal or solid biomass instead of electricity or natural gas). Without electricity, it's impossible to run a side business or for children to study at night, while the lack of clean cooking is involved in 3.5 million preventable deaths every year.

Renewable energy is playing a vital role in bringing energy to communities who are often far from the grid or simply can't afford centralised energy. Companies such as mkopa in Kenya are using mobile-enabled bank accounts to sell small home solar systems that replace dangerous kerosene lamps and allow families to charge mobile phones using solar electricity. Other companies are using clean cookstoves to improve the health of communities and reduce the consumption of firewood, which is a major burden for women and an important driver of deforestation.

In India, the 'Saffron Revolution' for solar is well underway. In 2014, President Modi committed that by 2019 every household in India would be able to power at least a light with solar power.[331] From practically a standing start in 2014, solar uptake is steadily increasing across India at the micro, rooftop and large-scale level, to the point that India ranked #4 in the world for solar PV investment in 2016.[332] Energy from two-thirds of India's existing coal fleet is now more expensive than energy from new solar and wind plants.[333]

On Small Islands Developing States, communities are replacing expensive, dirty diesel generators with safe, clean and affordable renewable energy. This global energy revolution is only just taking off – but if we get it right we'll have a more equitable world with burgeoning growing economies that have avoided the trap of fossil fuel energy systems and are taking advantage of safe, abundant renewable energy.

Figure 14: Retail prices and rooftop solar costs compared[334]



People are leading!

More so than in any other country, everyday Australians are leading the transition to clean, renewable energy. Australia has the highest per capita installation of rooftop solar PV,[335] with just under 1.7 million solar roofs.[336] Or put another way, one in five Australian homes have solar on their roof. That means there are over 5 million Australians living in solar-powered buildings.

How did we get here? Through the hard work of passionate people. People campaigned for the state and federal policies that made solar economic when it was still quite expensive. And people in their communities went further and ran bulk-buy programs to make it even cheaper and easier to install solar – creating an early market for this fledgling industry. The results of this people-powered push for solar are significant. Australia's rooftop revolution has:

- created 11,150 jobs[337]
- established a solar industry and driven down the cost of installing solar for all of us
- lowered wholesale electricity prices, saving all consumers billions (for example, a report by Energy Synapse for Solar Citizens found that "in the year from 1 May 2016 to 30 April 2017, the wholesale electricity price in NSW would be a whopping 33–50% higher if households and businesses with rooftop solar PV systems, up to 100 kW, were not generating clean sun power. This has saved energy consumers between $2.2 and $3.3 billion!"[338])
- helped prevent blackouts,[339] when gas and coal generators couldn't stand the heat.[340]

Solar PV is just the beginning of clean energy at the household level – a whole host of new technologies, products and services from apps to storage to smart appliances and demand management options, mean that people are now starting to have more choice. It's no longer just a choice of which company will sell us the same electrons. Energy consumers are starting to demand new services introducing actual competition with differentiated products into the retail energy game for the first time. Woe-betide any consumer-facing energy company that doesn't put empowered people at the centre of their thinking.

However, even more excitingly, people powered clean energy isn't stopping with rooftop solar and consumer choices. There are now more than 90 community energy groups that have sprung up across the nation,[341] developing innovative local clean energy projects. There are thousands of Australians willing and able to get local renewable energy projects going in their communities, particularly in regional and rural areas.

Communities are also standing up for big renewables too. From the five-year campaign in Port Augusta – a former coal community – to win Australia's first concentrating solar thermal plant (see Box 27), to local support for wind farms, people across Australia are actively championing a renewable future that benefits their own community, the country and the world.

Given how many Australians have embraced solar, it should come as no surprise that renewable energy is extremely popular. Poll after poll shows overwhelming support for renewables. Indeed 96% of Australians want renewables to be our main source of energy.[342] Policy makers and politicians ignore this popularity at their peril and have in the past frequently found themselves in deep water after underestimating how popular a renewable policy might become (see Figure 12).

However, while the vast majority of Australians love renewables, to date not everyone has been able to join the solar feast.

Some people are locked out!

All Australians, no matter what they earn or where they live, deserve access to affordable clean energy.

Australian households are still paying off the electricity network companies' latest five-year spending spree, on top of more recent electricity price rises driven by the gas cartel and fossil-fueled gentailers gaming the system. Some have been able to take steps to manage this increase and reduce its impact on the household coffers (see Figure 14).

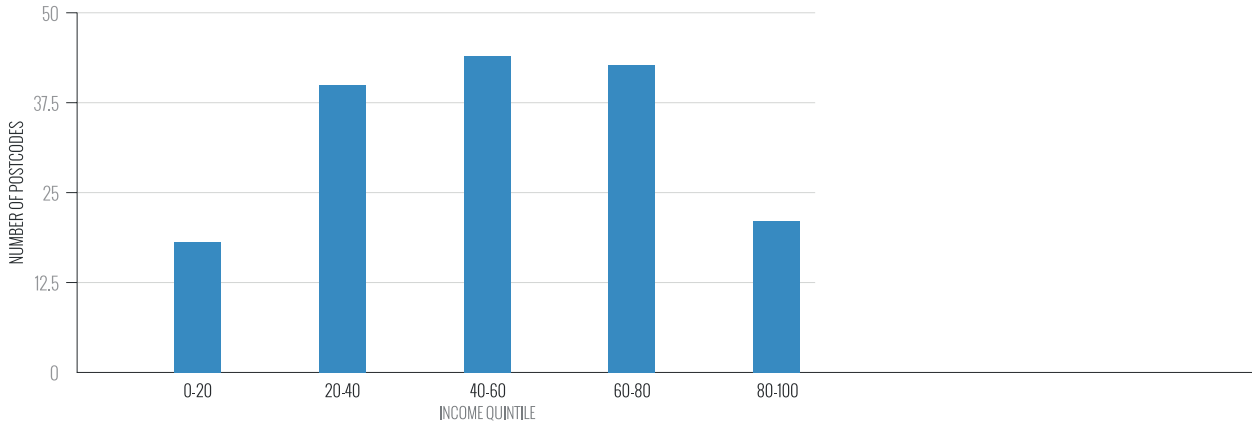
The chart below (Figure 15) shows that it is primarily lower and middle income suburbs that have embraced solar. Solar PV is clearly not just for the wealthy, despite what some political commentators would have us believe. However, the chart also shows that the lowest income suburbs have been the most excluded from solar access.

It is clear that some parts of our community still face barriers that block them from directly benefiting from the renewable energy revolution and these people are typically those who are most struggling to afford energy at all. Many of Australia's lowest income and most vulnerable households have been unable to access or afford energy efficiency upgrades or household solar, leaving them exposed to soaring and often unaffordable bills. As the Australian Council of Social Services puts it, for the estimated 13.3% of Australians living in poverty,[344] "energy affordability is a growing, and sometimes crushing, problem."[345]

Barriers to clean energy access exist not only for low-income households but also renters, apartment dwellers, homeowners without solar access or those who have inappropriate roofs. Also, while Australia has helped pioneer off-grid solar PV systems, many remote communities and particularly Aboriginal communities don't have access to clean energy providers.

In the US, it is estimated that 49% of households and 48% of businesses are unable to host their own solar PV systems.[346] In Australia, *at least* 30% of households are locked out of solar.[347]

Figure 15: Solar uptake by income quintile [343]



The padlocks holding us back

Locked out energy users face fundamental market barriers that make solar, energy efficiency, storage and other clean energy solutions inaccessible and/or unaffordable. These barriers broadly fall into four categories – access to information, cost barriers, structural barriers and regulatory barriers.

Low community awareness and complexity

Most Australians concerned about rising energy prices are unaware of how efficiency and other clean energy improvements can help keep bills affordable. Even where people have a basic idea of what might be needed, people don't know where to turn to get reliable and trusted advice that suits their individual needs. This isn't helped by the fact that Australia's energy retailers are trusted less than the big banks,[348] unfortunately with good reason (see Part 1, Section 2.5).

Moreover, as our energy market continues to evolve and the range of energy products and services continues to expand, this complexity will only increase. For many people, this complexity undermines their ability to make the 'rational' decisions necessary for a truly competitive market to function.[349]

This is even truer for disadvantaged households, even though they are most in need of the bill saving and health benefits of efficiency. Consistent findings from projects funded under the federal government's Low Income Energy Efficiency Program highlighted the need for information and retrofit services to be delivered in the context of existing trusted services and relationships (such as community peers, financial counselling or home care services).[350]

Another implication is that many households are prioritising investment in rooftop solar without making basic efficiency improvements at the same time. This means we are missing opportunities to maximise bill-saving and health benefits at the household scale, as well as capture demand management and emission reduction benefits across the wider energy system.

Unaffordable up-front costs

Unaffordable up-front costs are a significant barrier preventing many households from accessing efficiency and renewable energy upgrades to their homes. In fact, those households most in need of bill saving and health benefits are those most unlikely to be able to afford efficiency and solar. While past and current government programs such as Vic's Energy Upgrades Program have made a range of efficiency measures available at no cost, higher-value measures (such as efficient fixed appliances), which require a co-contribution payment, have generally remained inaccessible to low income households and those experiencing energy hardship. Furthermore, available finance products (like solar loans and leases) are typically not appropriate either as the interest rates are too high or some low-income households are not eligible due to credit-rating issues.

Lack of incentive

More than 6.5 million Australians who rent their homes are largely locked out of the clean energy transition because most landlords see little financial incentive to invest in property upgrades while the bill saving and health benefits are reaped by tenants. This is known as the 'split incentive' problem and it leaves renters bearing an unfair share of the financial and health costs of inefficient housing.

It's no secret that Australia is in the midst of a housing crisis with much of the younger generation locked out of home ownership (and thus currently locked out of solar ownership). This growing intergenerational inequality needs to be addressed urgently, within both the energy and housing sectors. Further, given that low-income households are more likely to be renters, they face the dual challenges of financial constraints and unmotivated landlords, further entrenching disadvantage.

Additionally, for many homeowners, their incentive to invest in improvements is undermined by the relatively high investment in time and effort needed to overcome the information and complexity barriers mentioned above.

Energy market rules and tariffs

Energy market rules and tariffs are preventing expansion of options for household scale solar beyond rooftop solar (e.g., for those without solar-ready roofs or tenants) and dis-incentivising existing solar homes to remain connected to the grid.

These barriers are systemic, entrenched and difficult to address, it will require both government support in the form of the policies outlined in this section and greater innovation by community enterprises, as well as the reforms to the rules proposed in Part .[351]

Some people are more affected by the transition than others

Without government intervention, the benefits of transforming an essential service like electricity will be unevenly distributed, and some will be left behind altogether. As well as locked-out energy users, the people most affected by the transition to clean energy are those who live and work in communities where coal companies have operated for many years.

These workers and the communities that support them have proudly supplied states and cities with electricity for decades, and they face significant hardship if the transition to clean energy is managed poorly. In many cases, these communities have already faced painful privatisation transitions, experience higher than average unemployment[352] and have shouldered the burden of toxic air pollution for many years.[353] Sudden and unplanned closure of major industries in these places will have impacts that ripple beyond the retrenched workers themselves; to spouses, children and people working in downstream local businesses.

Coal companies are fond of using workers as a human shield, arguing that they should be allowed to pollute for free in order to preserve jobs. While some people still argue that the impact on workers and communities in places like the Latrobe Valley means we shouldn't transition away from coal and other fossil fuels, this is tantamount to putting one's head in the sand or sticking fingers in your ears and going lalalala at the top of your voice. It denies that the world is changing – that the economics of energy have changed, and offers false hope in the place of real solutions. It ignores the people in these communities already crying out for attention and intervention and perhaps most importantly it fails to recognise that climate change – an unintended but nevertheless hugely significant side-effect of burning fossil fuels – is also affecting the lives and livelihoods of billions of people.

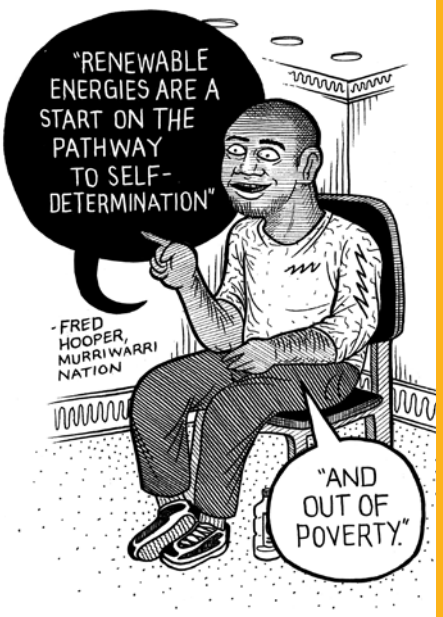
If we don't change the way our electricity system works and quickly, people living in low-lying areas around the world, including in Australia, will have to relocate. Tourism operators who enable people to experience the wonders of the Great Barrier Reef will be out of a job because it will be dead – and that's just the tip of the iceberg.

Instead, we need to ensure that anyone potentially negatively impacted by the transition to clean energy is supported properly. What we're really talking about here is energy justice – where nobody is left behind in a truly just transition to a more equitable, fair, affordable and clean energy system that works for all Australians everywhere.

Let's talk about energy justice

A just transition ensures environmental sustainability as well as decent work, social inclusion and poverty eradication[354] in the process of industrial or economic change. Specifically, taking an energy justice approach means we must ensure a number of things in the process of delivering a more sustainable electricity system:

1. The responsibilities and any costs of the transition are equitably shared across society. Key principles underpinning this concept include:
   a. Polluters pay – that is the organisations that have created the problem (in this case climate change) have a responsibility to pay their fair share for fixing the problem
   b. Those least responsible should not shoulder a disproportionate amount of any burden. For example, there is a very real fear that Australia's most vulnerable households and communities, who are least responsible for causing climate change, are going to be those left paying for the profits of big energy companies, because they are the least able to access clean energy solutions such as solar, storage and energy efficiency. We cannot let this happen!
2. A fair distribution of the benefits. This means that no-one should be locked out of the potential benefits of clean energy. It also means that those most affected such as climate impacted communities and those who through no fault of their own are most affected by the transition away from fossil-fuels should receive the most support.
3. Where possible, the transition is used to rectify broader injustice, poverty and inequality – not further entrench it. For too long, some Australian communities, particularly Aboriginal communities have been given two choices: support extractive and environmentally and socially destructive industries such as mining, or live in poverty. This does not have to be the case with renewables, they offer a real path to economic development. As Fred Hooper from



the Murriwarri Nation put it, "renewable energies are a start on the pathway to self-determination... and out of poverty".[355] This means that in a just energy transition it is not enough to equitably share the cost and benefits, we need to go beyond and proactively support solutions that are socially and environmentally regenerative.

For too long, the social or energy justice dimension of the transition to 100% renewable energy has been de-prioritised or ignored. While we are well progressed on the technological and economic dimensions of this transition (i.e. we have the technology and renewables are winning on price), support for the people who need it most is lagging far behind. The good news is that people are finally starting to notice.

Between the end of 2016 and 2018 the ACTU,[356] ACOSS, The Climate Institute, Brotherhood of St Laurence,[357] the Victorian[358] and QLD governments,[359] Solar Citizens,[360] Community Power Agency,[361] the One Million Homes Alliance[362] in Vic, the Sydney Alliance[363] and many other organisations across Australia, all developed policies and plans and elevated their call to support people to be put front and centre of the transition to clean power. Even the Finkel Review recognised the need to support low income households access solar and energy efficiency. Specifically Recommendation 6.6 reads:

"...identify opportunities to accelerate the roll out of programs that improve access by low income households to distributed energy resources and improvements in energy efficiency. Identify options for subsidised funding mechanisms for the supply of energy efficient appliances, rooftop solar photovoltaic and battery storage systems for low income consumers." [364]

Fairer & faster

If we are serious about putting people at the centre of the energy debate, we will not only make the transition to 100% renewable energy fairer, we will also make it faster. By unlocking solar for renters and apartment dwellers this could lead to an additional 2-8GWs of solar capacity. At the low end of the spectrum, 2GW represents a 32% increase in market size on the current domestic/small-commercial solar market.[365]

People are not just energy consumers, but innovators, champions and citizens. Supporting communities, households, farmers, and business owners leverages the organisational resources – time, money, land, rooftops – of thousands if not millions of new actors in deploying renewables and other clean energy solutions. Together we can turbocharge clean energy, sharing the benefits with communities and people across the country.

How do we do it?

So how do we deliver a truly just transition to 100% renewable energy that is as fast as climate change demands and fairer for all?

The following recommendations spell out how citizens and communities can be supported to lead the way in delivering 100% renewable energy for 100% of our population and to claim their fair share of the billions spent on electricity each year. Specifically, we have pulled together a suite of policies that target and support different segments of the Australian population to participate in and be supported through the energy transition. German politician Herman Scheer suggests this is critical, stating "the most important political task is to provide a policy and legal framework for renewable energy which enables people to participate." [366] Table 8 summarises the different segments or groups of people, the challenges they face and the policies proposed to support them. Each of these policies is outlined in more detail in the remainder of this section.

It is important to note that these segments are not mutually exclusive. For example, there are many Aboriginal people in remote or edge of grid communities, who rent and experience energy stress. As such, some people may be eligible for and benefit from a range of these policies working together.

As has already been highlighted, millions of Australians are getting on with the job of repowering their homes, their businesses and their communities with clean energy, however the going is tough and some people can't because the rules of the game are stacked against them. This is why it's time for governments at all levels to step up, fill the gaps, remove the barriers and level the playing field. Government programs and public ownership and agencies have a big role to play here (see Section 2.3 for a more detailed discussion of this), however, so too do households, communities, organisations and business. This is why the policy suite below is deliberately designed to leverage a range of actors and the different expertise they have to offer. As Naomi Klein says, "to change everything we need everyone." [367]

If we are to counter the rise of inequality, one of the things we need to do is turn the big challenge of climate change and energy transition into an even bigger opportunity by putting people and communities at the heart of repowering Australia with 100% renewable energy.

Table 8: Clean energy for all: challenges and solutions

Who	Challenges they face	Policy solutions
Remote and rural Indigenous communities	They are dependent on expensive, polluting diesel generators and overpriced grid connections. Community consultation for past clean energy programs has been inappropriate and has not led to the community empowerment outcomes desired by Indigenous communities.	A collaboratively designed, well-funded, national Indigenous Communities Clean Power Program.
Fossil fuel workers and communities (note this section can be found in Part 3 of the Repower Australia Plan)	A chaotic market-lead transition is leaving workers and communities in the lurch. High-income jobs are lost as power stations close in areas where unemployment is already high. In addition, the human health impacts of air pollution from coal power stations are higher than average.	Establish an Energy Transition Agency empowered as an independent statutory authority to oversee the energy and workforce transition. It would be responsible for: • instigating an industry-wide, pooled redeployment scheme • establishing job hubs to deliver tailored support to workers before power stations close • establishing local advisory councils of stakeholders supported to inform local authorities and plan strength-based economic renewal strategies, and • ensuring full mine rehabilitation.
Low-income and energy stressed households	Since electricity prices are increasing, Australia's lowest-income people struggle to pay their bills. Low-income households cannot afford or access the benefits of solar PV and energy efficiency. This ultimately leads to a growing number of disconnections. Current approaches to address these issues are completely inadequate.	Federal and state governments should set a goal of ending energy stress by 2030. Top programs to do this should include: • establishing Power Access, a public interest retailer that provides clean energy services for Australia's most energy stressed households • set up a decade long low-income clean energy grant and retrofit program that builds on the Low Income Energy Efficiency Grants program findings • support and extend programs that work, such as CEFC finance for social housing providers • unlock rates repayment programs for clean energy.

Who	Challenges they face	Policy solutions
Locked out energy users, particularly renters	Buying a house has become super expensive in many parts of Australia, young people particularly can't afford to buy in the property market. This is leading to a growing number of renters. However, rented houses tend to be the coldest in winter, hottest in summer and most energy-intensive to run. Meanwhile renters have no rights or recourse to install solar or undertake energy efficiency upgrades and landlords have no incentive and little motivation to do so.	The federal government should work with states to ensure robust, mandatory efficiency standards for rental properties are introduced. Successful state-based clean energy programs for public and social housing should be scaled-up nationally. Set up programs to ensure every renter can access solar with four possible models from unlocking solar gardens, to incentivising landlords to do the right thing.
Everyone	Everyone means everyone but in particular: • People who live in apartments who are also locked out • Farmers and food manufacturers who are currently doing it tough and have abundant land and renewable resources they could harvest • Small businesses, particularly those who rent • Edge of grid communities who suffer from some of the least reliable power • The passionate early adopters and community energy entrepreneurs who take a risk and test different technologies and models making it easier and cheaper for the rest of us.	Establish the Smart Energy Communities Program, including 50 Regional Energy Hubs, with capacity building funding available. These Hubs would not only support community energy, they would be a trusted source of information, provide coordination and energy advice from everyone from farmers to small-business to low-income households. They would also be a delivery agency for many of the other programs outlined in this table. Financial support for everyone to access storage: through a means-tested contribution from the federal government. An updated consumer protection regime for new energy products and services.

3.2 Expand Indigenous communities' access to clean power

Put clean energy within reach of every Indigenous community.

People on the frontlines of climate change and the fight against companies burning fuels like coal deserve to be first in line to benefit from a renewable future. A collaboratively-designed, well-funded national Indigenous Communities Clean Power Program could ensure that by 2025 all remote Aboriginal and Torres Strait Island communities have access to clean, affordable, local renewable electricity.

The program should take a systemic approach that provides infrastructure together with training, mentoring and job creation, and a focus on locally relevant and owned solutions as part of a long-term contribution to Aboriginal and Torres Strait Island community development and independence.

The story so far

In 2001 there were over 1,100 remote Indigenous communities across Australia. Remote communities are by nature off grid, and mostly use diesel to generate electricity. But with diesel fuel prices forecast to continue rising,[368] many off-grid projects are looking to renewables as an alternative power supply.[369]

Many Indigenous communities are calling for support to switch from expensive, polluting diesel generators or overpriced grid connections to renewable energy and storage. Past programs along these lines have had some success and were abandoned without any compelling reasons. Among other benefits, they delivered fuel cost savings for remote Indigenous communities, as well as savings to public budgets that can be reinvested in Indigenous communities.

The compelling case for renewable energy in rural and remote communities has been recognised by four main government programs to date:

- The Renewable Remote Power Generation Program (RRPGP). This was an example of how a little upfront financing assistance enables remote communities, both Indigenous and non-Indigenous, to make a rapid shift to renewables. However, in yet another case of a good solar initiative being dumped for overachievement, the program was shut down after seven years when the rising cost of diesel sparked an even more rapid rush to install solar and the program ran out of funds two years ahead of schedule. Many opportunities for Aboriginal and Torres Strait Island communities to replace diesel fuel with renewables were abandoned at that point.
- The Bushlight Program. This well-regarded program was run by the Centre for Appropriate Technology from 2002 to 2012, funded by the same program (RRPGP). Bushlight installed 148 remote renewable energy systems in 130 remote Indigenous communities, before being defunded in 2013.
- The $40 million Remote Indigenous Energy Program was part of the Clean Energy Future Package aimed at providing energy efficiency education and renewable energy systems to remote Indigenous communities that were off grid and dependent on diesel for power supply. It was intended to maintain the 148 renewable systems in 130 remote Indigenous communities that Bushlight had installed since 2002.
- More recently, the federal government, through ARENA, has provided financing to a number of remote and regional programs that support renewable energy solutions under the Regional Australia's Renewables (RAR) Program. ARENA has also awarded grant funding to a number of state and territory governments to facilitate increased uptake of renewables in remote communities including QLD and NT, through Ergon Energy and NT Power and Water Corporation (NTPWC) respectively. Through this Ergon Energy has undertaken a 1 MW expansion of Doomadgee Solar Farm that displaces an expected 528,000 litres of diesel per year.[370] Solar SetUp in the NT is a $55 million program partially funded by ARENA and NTPWC's non-profit subsidiary Indigenous Essential Services, building on previous feasibility studies into solar/diesel hybrids at Daly River. It aims to deliver 10 MW of solar across 35 communities.

In addition, Ergon and NTPWC, with WA Water, are partners on a three-year research program to develop a culturally appropriate and community-driven framework for energy and water services based on experiences in three remote Aboriginal and Torres Strait Island communities.

State and territory governments also provide a range of existing grants and incentives to support renewable installations in remote communities. In QLD for example, the Renewable Energy Diesel Replacement Scheme (REDRS) provides a rebate of up to 50% of the cost of installing renewable energy that reduces or augments diesel use for electricity generation in off-grid areas. Eligible renewable energy technologies include solar, hydro, wind, biomass, and any other technology using a renewable energy source. The REDRS applies to domestic and commercial installations. A nominal cap of $150,000 rebate applies to domestic installations. Similar programs exist in WA, NT and SA.

Most recently, Aboriginal leaders have come together to form the First Nations Renewable Energy Alliance, to ensure that the deployment of renewables is proactive and appropriate to Aboriginal communities' needs. Not just their energy needs, but economic development, cultural and self-determination needs and desires.

Where to now

As renewable costs fall and as diesel costs become more apparent, Aboriginal leaders are building momentum to reignite rural and remote Indigenous Australia's shift to renewable energy. **This time around, we should take on board the lessons learned from past projects from around Australia by establishing a long-term program with secure funding, set up on a more participatory and community driven basis, and with more of a focus on local training and employment.**

There are many reasons to rethink and expand support for Indigenous renewables, including the need to take advantage of new opportunities as well as the urgency of overcoming old challenges:

- There is a continued focus from funding bodies and utilities on technological – rather than social – fixes, which is still ingrained in much of the planning and rhetoric around remote Aboriginal and Torres

Strait Islander communities and misses a significant opportunity. There is plenty of evidence on how to engage and work with indigenous communities, but it is usually ignored.

- There is a history of colonisation that lives on today through much of the 'community consultation' being conducted with Indigenous communities, including:
  - historically, diesel power supply systems leading not only to high costs for communities and polluting power, but amplified by losing additional land to utility companies' leases
  - a move to force closures of remote Aboriginal and homeland outstations and eviction of people from their land and homes, with the economics of running them used as an excuse.[371]
- There is a rise in new social innovations in energy (and water) with many social enterprises and 'sharing economy' projects able to scale up thanks to new information and communication technologies
- Renewables, particularly wind and solar, are coming down the cost curve, and battery storage following fast
- Prices of diesel (a dirty and polluting fuel) are likely to rise over the medium term[372]
- There is increasing international attention on Australia's poor treatment of its first peoples
- There is strong growth of the community energy sector in Australia, with a strong network of communities sharing and learning together and with some successful examples in Aboriginal communities (see Box 18 for an example).

A much more systemic and empowering approach to the energy supply of remote Aboriginal and Torres Strait Islander communities is urgently needed. An approach along the lines of Empowered Communities[373] that puts the needs and the voices of communities at the heart of the process.

The time is therefore ripe for new models that are community driven, involving local groups developing low-

Box 18: Remote Aboriginal community solar in NSW [374]

In late 2014, three Aboriginal communities in remote northern NSW invited The Valley Centre to work with them on a community resilience building project. These communities have a vision for energy independence, local community development, sustainability and self-reliance.

With rising energy costs and an unpredictable power supply, greatly compounded by extreme temperatures in summer, it was immediately apparent that energy affordability was the most critical issue. Electricity bills commonly range from $2,000 to $5,000 for each household and in some cases can be much higher. As Uncle Ike explains: "The price of our food is double what you get in the cities... And we are paying more for power than we are for any other cost. So how are you supposed to eat, how are you supposed to live?"

Over the last 12 months thanks to a NSW government grant, these communities, in partnership with the Valley Centre and community energy group Pingala, have investigated the potential for local clean energy solutions.

The project is now moving towards implementation. AllGrid Energy is designing a grid-connected behind-the-meter solar power and battery backup system for each of the 60 houses across the three communities. New, more energy-efficient appliances and resources to empower the community to lower their individual consumption are also part of the plan. To deliver this, Pingala has developed a new business model based on local community ownership combined with funding from ethical and community investors.

By implementing this project, new jobs and training opportunities will be created in the maintenance of assets, finance management and governance, and up-skilling of local electricians to be off-grid certified. This model will allow these communities and others that follow in their footsteps to realise their vision and take control of their energy future. In the words of Uncle Ike again: "Anything you can own, gives you pride... and if you can, own your own power!"

carbon energy services so that solutions are appropriate to local situations, with the community having ownership over outcomes.[375]

A community scale approach can be far more transformative, enabling citizen participation, building on local knowledge and networks and developing locally appropriate solutions.[376] For Aboriginal and Torres Strait Islander communities, a more participatory model of switching over to renewable electricity can provide additional benefits to low-carbon energy, including training, local Indigenous jobs, improved energy literacy, reduced energy poverty, community wellbeing, a more diversified economy, building cultural connections between infrastructure and land, and self-determined positive collective visions of the future. This program is also likely to generate valuable knowledge and insights to be shared with other remote communities, from tourist resorts to other small end-of-grid or off-grid towns. This knowledge could be shared through the Smart Energy Communities Network – see Section 3.5.

How it could work

The Remote Indigenous Community Clean Energy Program should be designed in collaboration with leaders of Aboriginal communities who will be involved. For example, it could be mediated through the First Nations Renewable Energy Alliance. Input should also be sought from organisations like the Centre for Appropriate Technology who have been doing this for many years. However, one way the Remote Indigenous Community Clean Energy Program could work is as follows.

The program could be structured into two phases – scoping and piloting followed by scale-up.

Phase 1: Scoping and piloting

- **Task 1:** Scope best-practice examples and models: identifying case studies of Indigenous community led clean energy systems and models that work well, are supported by communities and are optimal in social and economic and technical outcomes.
- **Task 2:** A three-year pilot project: working with a small number of remote Aboriginal and Torres Strait Islander communities (say 10) to trial a full community scale installation of renewables (likely solar). Deliberative processes undertaken in partnership with the communities will be key to the success of this pilot. The process could include a series of facilitated community futures workshops on the needs and preferences of each of the communities in relation to energy use (and energy related water) and provision in a culturally sensitive way, that leads to long-term outcomes.
- **Task 3:** The establishment of an ongoing functioning of a steering group that oversees the initial pilot program scale-up, communicates successes and failures, tracks progress and provides strategic guidance to participants. It is essential that the Remote Indigenous Community Clean Energy Program is not driven by boardroom or ministerial agendas, but by collective problem-solving. A steering committee or board with representatives from a cross-section of Aboriginal community representatives (majority), together with state and territory governments, federal government, energy and water utilities, and environmental and social not-for-profits could fulfil this function.

Phase 2: Scale-up

The scale-up phase would support all remote Aboriginal and Torres Strait Islander communities to become clean energy independent as soon as possible. This should include:

- taking the successful models *and* processes from the pilot and adapting and applying them with all other remote Aboriginal and Torres Strait Islander communities
- funding for training and capacity building, transferable and relevant skills, education and outreach to build a network of energy leaders (or champions/rangers depending on the model) in remote Aboriginal and Torres Strait Islander communities. This is essential to ensure long-term uptake, maintenance, education, energy literacy and employment outcomes in the participating communities.

How to fund it

We estimate that the Remote Indigenous Community Clean Energy Program would cost in the order of $30 million for the scoping and pilot phase over three years and a further $150 million in the scale-up phase over five to seven years.[377]

The states and territories with the most remote Indigenous Communities – WA, NT and QLD – all have Community Service Obligations. This is where a government requires a business division or government owned corporation (like Ergon or NT Power and Water) to undertake non-commercial activities for social purpose. In the NT the cost of the energy Community Service Obligation for one year was $73.13 million.[378] In QLD the cost is closer to $500 million per year (noting that this is across all edge of grid and remote communities *not* just Indigenous communities).

Some of the Community Service Obligation topped up by ARENA funding and/or CEFC low-interest loans could be used to cover the cost of the Remote Indigenous Community Clean Energy Program. Implementation funding could also be supplemented by alternative sources such as private, social impact and community finance.

3.3 Supporting low-income households

Access to electricity, like access to healthcare, is a basic human right in a modern society such as in Australia. Affordable electricity should be seen as part of our common wealth, a benefit to which we all contribute and in which all can share.

Vulnerable households being left out in the cold

With the electricity system in disarray and electricity prices rising to astronomical levels (see Part 1, Section 1.2), Australia's lowest income and most vulnerable people are struggling to pay their electricity bills. As the Australian Council Of Social Services (ACOSS) puts it:

Currently there are about one million people, including over 731,000 children, living below the poverty line in Australia. The number of people who struggle with energy stress is likely to be much higher than the poverty figures.[380]

Disconnections because of a failure to pay bills are a growing problem. In NSW, disconnections for electricity increased over 50% in the five years from 2010-2011 to 2015-2016. Gas disconnections in 2015-2016 reached a seven-year high in SA and neared their highest level in over a decade in Vic.[381] Given that electricity is an essential service, this is perverse. As the recent Thwaites report put it "residential and small business consumers must purchase energy and are therefore participants in the retail energy market even if they are not interested in the product and regardless of continued price rises."[382]

Low-income households tend to use less energy in absolute terms than high-income households, but it accounts for a higher proportion of their household income (see Figure 16w) – typically 4 to 7%. Furthermore, a higher proportion of low-income households' energy consumption is impossible to avoid. This is particularly true of the unemployed, people with disabilities, families with young children, and people who need special medical equipment that runs on electricity.

Box 19: AllGrid Energy – the Indigenous-owned energy company lighting up remote communities

AllGrid Energy aim to use the growth of renewable energy to provide employment and empowerment to Indigenous Australians. The Portagrid is AllGrid's answer to Tesla's Powerwall – a low cost, portable solar battery that's perfect for providing power to remote communities where electricity is expensive and difficult to obtain.

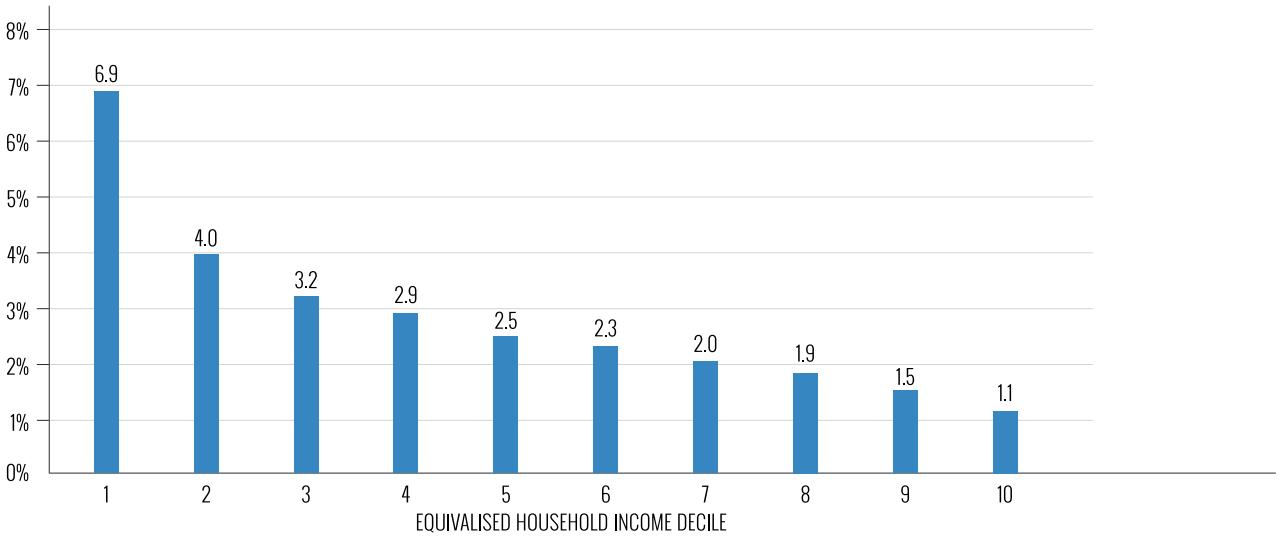
Ray Pratt is the CEO of AllGrid Energy's parent company DICE. He believes that renewable technologies have the potential to not just ensure a safer climate, but to be the catalyst for greater Indigenous self-sufficiency and advancement.

"DICE was built on the back of a long history in completing all types of work, especially electrical work, in far out remote Aboriginal communities," says Pratt. "Some of my best memories are of hard work in the middle of the bush … there was always a sense of pride being able to leave a house with power on. Pretty simple yet rewarding to restore power so people can use their fridge or in some cases just lights…basic things most of us take for granted."

While their Portagrid is lighting up homes in remote communities, AllGrid's WattGrid storage system is lighting up the residential market. Using the proven and reliable technology of tubular gel acid batteries, AllGrid have been able to deliver Australia's most cost-effective domestic storage system.

"Oz is one of the world leaders in solar uptake and it is predicted that in five years more than one million homes will also have storage," says Pratt. "AllGrid Energy intends to stay as a leader in this market and make a strong proud statement of success as an Indigenous business."[379]

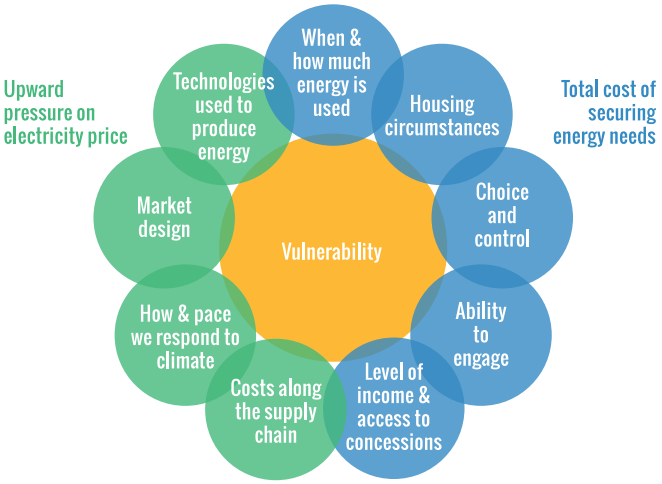
Figure 16: Proportion of annual expenditure on energy[383]



Unsurprisingly the highest burden is in Tas, the state with the lowest incomes and the coldest climate.[384]

According to ACOSS, groups most impacted and likely to seek crisis or emergency assistance for payment of bills include "those subsisting on unemployment or student allowances, pensioners, renters, single-parent families, people living in poverty while in paid work, and Aboriginal and Torres Strait Islander people."[385]

Figure 17: Factors influencing total costs of energy



The situation is complex, with many factors combining to increase energy stress (see Figure 17 [386]). The households most impacted by rising electricity costs include many groups who are more likely to be home during the day and would thus benefit most from rooftop solar electricity. However, because many low-income households rent, have credit rating issues, and/or live in apartments, they are too often locked out of the clean energy revolution (discussed in Section 3.1). It is unlikely that innovative social finance alone can overcome these barriers.

Whether we like it or not our energy system is changing. We need to ensure that low-income customers can access affordable electricity, no matter what the energy future. But we can also go one better, by ensuring they have a chance to participate (if they choose) in the renewable transition, and that they are in a better position after the transition than they are today.

Governments must intervene where markets fail

As we explain in Reboot the System, the fact that both wholesale and retail electricity markets are broken is now widely accepted.

The Thwaites review found three main factors associated with retail market failure: cost of competition; the structure of the market (or, the concentration of market power in a handful of gentailers); and bad practices such as energy retailers deliberately making discounts and offers unintelligible (see detail in Part 1, Section 2.5). Most of these issues are complex and won't be solved overnight, and they are in addition to structural market barriers such as split incentives, barriers to entry, and more that prevent many low-income households from accessing modern clean energy solutions such as solar PV and energy efficiency.

The current approach is inadequate

The current approach to addressing energy hardship and affordability is through energy concessions at a state and federal level, as well as energy hardship programs offered by retailers as required under the National Energy Customer Framework. Unfortunately, energy concessions are confused, fragmented and inconsistent across different jurisdictions.

There are at least 25 different energy concession programs across Australia. At a federal level this includes the 'Energy Supplement' and the 'Utilities Allowance'. At a state level, amounts paid to low-income households range from $494 per year for electricity in Tas,[387] to $218 per year for gas and electricity combined in SA.[388] Households with medical-related energy costs and illnesses that are exacerbated by heat or cold are also eligible for additional support in most jurisdictions. Different groups of people are eligible in different states, with some of the energy concession schemes not targeted to those who most need them or designed for what is needed. For example, consumer advocates have long argued that a lump-sum payment is an ineffective approach to concessions. The Victorian approach of paying a proportion of an eligible household's energy bill would go much further to addressing issues of energy hardship and stress.[389]

There are also practical issues with the current concessions approach. For example, concessions are only available after the fact, which means that low-income households cannot ever receive pay-on-time discounts. Further, if a household shops around for the best deal and changes their retailer, it can take upwards of six months to regain their concessions. As such, many current concession programs are effectively preventing customers from getting a good deal and thus really only paying the extra retailer costs. This does not help customers most in need and costs the state government upwards of $170 million per year[390] – a lose-lose situation that must change.

Tools in the toolbox

An in-depth analysis[391] of the 44 initiatives under the Commonwealth Low-Income Energy Efficiency Program (2013-2016)[392] revealed a need for a unified effort to support the variety of low-income households. Specifically, Australian governments should set a goal of ending energy stress by 2030 – that is, ensuring that no household spends more than the current national average on energy.

Just as we need an innovative approach to stimulating the transition to 100% renewables, we also need an innovative approach to achieving the goal of ending energy stress and supporting low-income energy consumers. There is no silver bullet approach, instead we need a toolkit approach with different policies targeted to different needs. Some of the ideas needed are no brainers and have been proposed for years, others are new.

These policies broadly fall into five areas:[393]

1. Electricity pricing reform – specifically measures such as the fair and equitable tariff setting process proposed in Reboot the System and the policies that start to internalise the cost of carbon pollution in Unleash Big Renewables
2. Ensuring consumers are informed and enabled – specifically the Regional Energy Hubs as part of the Smart Energy Communities program proposal and retail market reforms, including a simple standing offer, as outlined in the Reboot the System section
3. Enacting robust consumer protections (see the Empower Everyone section below)
4. Ensuring all households have the capacity to pay for electricity. This importantly involves overhauling Australia's inadequate energy concession scheme programs to address the issues outlined above. However, updating concessions only goes so far – these programs are designed to meet the immediate needs of energy stressed households, but they do little to increase the chance that households will have the capacity to pay for electricity in the medium-to-long term. That's why we're also proposing Power Access, a public interest retailer for low-income households whose role is to reduce household bills in the short and longer term
5. Unlocking access to clean energy. This is the focus of the policies in this section. To do this effectively requires four things:
    a. Carrots: funding – below we outline a proposed new funding program to make energy efficiency, solar and storage solutions affordable for those who need it most
    b. Sticks: minimum energy performance standards – see Section 3.4
    c. Making it easy: one-stop shops – see the Smart Energy Communities Program
    d. Promotion and effective targeting.

In addition, according to researchers reviewing the Low-Income Energy Efficiency Program, the situation for many low-income households is so dire and untenable that immediate short-term efforts are urgently needed. Urgently establishing Power Access would provide much-needed assistance to those who need it most.

Box 20: Obama's Clean Energy Savings for All Initiative

"Solar panels are no longer for wealthy folks who live where the sun shines every day, they have to become reality for Americans and communities all across the country." **President Obama**[394]

During his second term in office, President Obama drove an ambitious program to ensure that every American family could choose to go solar and cut their energy bills. The Clean Energy Savings for All Initiative was underpinned by the catalytic goal to bring one gigawatt (GW) of solar to low and moderate-income families by 2020. This goal is a 10-fold increase and an expansion of the initial target President Obama set in his Climate Action Plan to install 100 MW of renewable energy on federally assisted affordable housing by 2020.[395]

The Clean Energy Savings for All Initiative spanned a range of actions from innovative finance mechanism, to technical assistance for states and communities, training workforces and supporting job development in low and moderate-income sectors, and working with the private and philanthropic sectors. Two great examples are:

- The Community Solar Challenge. Run by the Department of Energy it awarded teams in dozens of communities up to $100,000 in cash prizes and technical assistance to develop innovative models to increase solar deployment and cut communities' energy bills, particularly in low-income communities.[396]
- The scaling-up of the Property Assessed Clean Energy (PACE) Financing program. The innovative PACE approach allows American homeowners, including low and moderate-income households and veterans, to finance solar and energy efficiency improvements at no upfront cost and to pay back the cost over time through their property tax bill (like Australia's council rates).

Solar, storage & energy efficiency incentives scheme

A good financial incentives scheme for low-income solar, storage and energy efficiency options includes a mix of grants, zero-interest loans and an easy repayment mechanism.

Grants

State and federal governments should set up and expand existing grant programs for low-income clean energy solutions. In the short term, this should include rebates and full-capital grants for some of the big ticket items, specifically solar PV, solar and heat-pump hot water services, fridges, and the items listed in the Cash for Gas Guzzlers scheme (see Part 3, Section 3.2). In the medium term, as a whole Power to the People package is established in a more unified and interconnected way, a more tailored approach should be taken. Energy stressed households would be offered an energy audit, then up to $3,000 per household should be provided in grants for the clean energy interventions that would do most to lower each individual households' bills – noting that the measures needed will differ from household to household. KPMG estimates that 42,000 people live in energy poverty,[397] that would mean that a low-income grants program would cost $126million. Easy interventions like draft proofing should be done at the same time as the audit. The rest should be done as a package, incorporate additional loan finance and be facilitated by a non-profit, one-stop shop (see the Smart Energy Communities program).

Zero interest loans

A range of clean energy interventions just make sense, however they are inaccessible to cash-strapped households. State, federal and local governments should provide zero-interest, at least five-year loans to low-income households to install solar, purchase energy efficient appliances and other energy efficiency measures. These should be means-tested. The programs could also be run through banks or existing government agencies, where governments then just pay the interest, or like HECS with repayments made via the tax system. Federally, this program could be run through a new micro-finance division of the Clean Energy Finance Corporation (CEFC). At a state level, revolving loan-funds should be established – these could partner with the CEFC.

In addition, existing programs that work should be extended. For example, the CEFC has made long-term financing available to St George's Community Housing (SGCH), a leading community housing provider in NSW. The financing is available to incorporate energy efficient initiatives into several new Sydney social and affordable housing projects during construction. In addition, CEFC finance will support a long-term plan to make ongoing sustainability improvements to SGCH's existing housing for the benefit of tenants.[398] This project should be extended and adopted by all social housing providers in states and territories across the country.

Rates-based repayment programs

One of the challenges about providing finance (as opposed to grants) for low-income households is how to make the repayment process easy and low-risk. One of the things about upgrading houses with solar, storage and energy efficiency measures, is most of these upgrades (with the exception of some appliances) stay with the house. The best form of repayment is one that stays with the house, even if the occupant moves. What is an existing payment that all homeowners pay? Council rates.

Local governments have a special role to support low-income households. As the closest tier of government to the community, they can facilitate and implement tailored programs to disadvantaged community members. This makes the model of rates-based finance a clear winner for making clean energy accessible and affordable. Around the world, this is starting to happen in a big way.

One great example is the New Zealand Voluntary Targeted Rates (VRT) program. This was developed to reach low-income households with New Zealand's national insulation program through rates-based finance. This program is tailored towards owner-occupiers, specifically households that are asset-rich and finance-poor (such as the elderly), in order to overcome the barrier of high upfront costs for insulation. The mechanism allows the ratepayer to choose to pay off the energy efficiency upgrade on their rates over a nine or ten-year period.

Here in Australia, the Darebin Solar Savers project (EUAs for residential buildings) is a partnership between Darebin Council and Energy Matters, Moreland Energy Foundation. This partnership implemented Australia's first residential rates-financing program for solar. The Darebin Solar Savers project installed solar on 300 low-income pensioners' roofs in Darebin (a suburb of northern Melbourne). The participating households were better off from day one. They paid zero upfront for the solar and pay back the cost through their council rates over 10 years, with the additional rate payments coming to less than the savings on their electricity bills. This program has now been expanded to 22 councils across Vic.

To unlock rates-repayment programs for clean energy requires three main things:

- Some states require legislative change, to allow a special or opt-in rate to apply to individual residential properties
- Programs and support mechanisms need to be put in place to make it less onerous for councils to implement rates-financing
- Changes to legislation to ensure the debt associated with the program doesn't sit on a council's balance sheet.[399]

Establish PowerAccess, a public-interest retailer for those who need it most

We propose the establishment of PowerAccess – a not-for-profit Energy Service Company (ESCo) and retailer specifically for low-income households. The remit of PowerAccess would be to supply electricity and other energy services such as energy efficiency upgrades, solar PV and more, to low-income households across Australia.

The overarching goal of PowerAccess would be to ensure that its customers spend less than the average state percentage of household disposable income on electricity, while supplying as much of that electricity with renewable energy as possible – a win-win approach. PowerAccess would be free to undertake a wide range of innovative measures to achieve these outcomes for its customers. A similar model to PowerAccess exists in Scotland, called 'Our Power' – see Box 20 for more details.

Why PowerAccess is needed

Establishing PowerAccess would deliver several benefits at once. First and most importantly, low-income customers would likely be better off as they would be serviced by an organisation with the objective of reducing their customers' electricity bills – quite a different remit to that of profit-oriented retailers. Moreover, as an organisation PowerAccess would have lower costs and overheads than commercial retailers, as it wouldn't have to worry about customer churn, and its minimal marketing costs are unlikely to be any greater than the costs already incurred by governments when they communicate with the recipients of existing energy assistance benefits. Also, a not-for-profit retailer would not have to syphon off profits, any surplus can instead be reinvested back to support more low-income households.

In addition, establishing PowerAccess should have positive flow-on benefits for other retail customers. Because hardship programs and disconnections are significant expenses for commercial retailers, PowerAccess could reduce these cost burdens and enable them to focus on lowering bills for everyone else.

Finally, PowerAccess is one of the best ways to ensure the transition to clean energy is done fairly and equitably. It helps low-income households cut pollution and lower their energy bills, and provides the certainty needed to face the coming energy transition with confidence.

Box 21: Our Power

In 2015, 35 social housing providers banded together to set up a not-for-profit energy company Our Power, which serves more than 200,000 residents. The initiative is backed by a £2.5 million loan from the Scottish government and £1 million from Social Investment Scotland.

"Our Power aims to reduce heat and fuel costs by passing benefits from the energy sector to our communities. We do this by not paying dividends to shareholders, by finding the most efficient ways to operate, by generating our own power and by reinvesting any profits to benefit our customers and their communities."[400]

Our Power expects to save its members up to 10% on their household utility bills compared to standard commercial tariffs. Over five years, this would equate to £11 million in savings for households in some of the most disadvantaged communities in Scotland.[401] The potential of this model has since received further validation from the Scottish government, which in 2017 committed to establishing a national publicly owned, not-for-profit energy company by 2021.[402]

How would PowerAccess work?

There are a number of questions that need to be answered in thinking through how PowerAccess would work in practice.

The first is **who does PowerAccess service and how do they get signed up?** The primary customers for PowerAccess would be Australians eligible for energy concessions. In conjunction with this initiative, a review should be conducted to ensure that those experiencing hardship and energy stress are adequately covered by the current concessions scheme eligibility criteria.

Customers would then join PowerAccess through a number of pathways. The most obvious would be for customers who are disconnected to be automatically referred to PowerAccess. PowerAccess could also be the standing provider for public housing tenants (though they would have the option to change). Finally, the government would notify concession customers that they have a choice: either retain their existing energy concessions or become a customer of PowerAccess.

The second key question is **who would run PowerAccess and how much would it cost?** Exactly how PowerAccess would be established and what it would cost would need to be scoped in more detail. For example, the federal or state-level government could establish a new publicly owned entity, or it could tender for a non-profit provider. PowerAccess could also potentially be combined with, or developed by, the energy services agency for federal government buildings proposed Section 2.4, to increase the purchasing power of both.

The main condition is that the organisation be not-for-profit and have the goal of lowering household power bills without affecting standard of living. That is, lowering power bills by rationing energy, such as avoiding use of heating or air conditioning, would not be considered a success for this provider. Once the desired structure of the organisation is developed, it would become a matter of recruiting staff and setting up the necessary operating procedures. A trial with a small cohort of customers should be considered.

As to costs, PowerAccess could in part be paid for by states pooling funding from their current energy hardship budgets, since customers would leave their existing concession program to become a customer of PowerAccess. Furthermore, the focus on energy efficiency, solar and other energy services should over time lower power bills and thus the cost of PowerAccess significantly. If the establishment of PowerAccess is also combined with the introduction of minimum energy performance standards for rental (and other) properties, as discussed in Section 3.4, the cost savings would be even larger.

The final key question is **what would the day-to-day operations of PowerAccess include?** At its core, PowerAccess would undertake the basics of any retailer, such as purchasing electricity, managing risk, issuing bills, and setting prices and tariffs (ideally including block tariffs). There would also be a hotline to dispense detailed advice. There would be an energy service arm, which would first identify the customers most in need of energy efficiency and other services. It would also work with the Regional Energy Hubs established under the Smart Energy Communities Program (see Section 3.5) and social welfare organisations to deliver practical energy efficiency, solar and a wide range of innovative measures to achieve its remit and better outcomes for its customers.

3.4 Empowering renters

Ensure all Australians can access clean energy no matter where they live.

More than 30% of Australian households rent,[403] and with some of the weakest tenants rights laws in the world, that means more than 6.5 million people[404] live in relative uncertainty about the very roof over their heads.

While fixing Australia's housing crisis is a little beyond the scope of the Repower Australia Plan, there is no doubt that fixing the appalling energy performance of our rental properties and increasing access to clean energy solutions such as energy efficient appliances, solar and storage for renters, would be a step in the right direction.

Public *and* private

There are two main categories of renters in Australia: those who live in public or social housing and those who rent from private landlords. While neither category of renters has been much of a focus of the energy transition to date, the programs that have existed have primarily been targeted at public and social housing. The reason being these landlords – be they state government agencies, not-for-profits or private companies – manage hundreds if not thousands of properties. Getting a few large landlords to up their game has been seen as easier than getting hundreds of thousands of private landlords to get serious about clean energy.

Examples of programs for public and social housing providers have included:

- **Affordable Retrofits program:** The Vic government provides assistance to low-income households and concession card holders to keep energy bills in check. The program is implemented through community organisations which offer subsidised energy efficiency and renewable energy upgrades to a limited number of households. It includes free in-home energy assessment, free guidance to choose the best energy plan to suit household needs, and generous government subsidy towards the cost of a home retrofit.[405]
- **Solar for rental properties:** This initiative is part of Queensland's $300 million Affordable Energy Plan, starting in early 2018. The government conducts a $4 million trial to assist landlords and tenants to share the value of installing solar systems. The trial is offered to 1,000 houses in order to incentivise landlords to install solar for their rental tenants who will be able to benefit from the power the solar system generates.[406]
- **CEFC finance for social housing providers:** As noted above, CEFC and the largest NSW social housing provider – St George Community Housing (SGCH) – have reached agreement about a 10-year loan of up to $60 million to develop high-performing, energy efficient homes.[407] This should be expanded to a national program including all social housing providers in the country.

These programs should be continued and expanded to all public and social housing tenants and properties across Australia. The low-income programs will also likely help many renters. The big gaps that now remain and that need to be addressed urgently are mandatory efficiency standards for rental properties and increasing access to clean energy solutions for private renters.

Mandatory efficiency standards for rental properties

You don't need to be an energy wonk to know that renters in Australia often get a bad deal from their landlords. But if you care at all about climate or social justice, you should be particularly outraged that renters often bear an additional burden of high energy bills from inefficient homes they have no ability to improve.

About half of low-income households live in rental properties, and low-income households are twice as likely to be renting as those in the highest income quintile.[408] For Aboriginal Australians, a study in Vic found that 86% of households are renting, and 67% of rent homes were built more than 20 years ago.[409] Unfortunately, effective efficiency standards are only in place in Australia for *new* buildings, leaving a huge gap in the rules for older rental properties.

As a consequence, rental homes often lack basic efficiency measures that are nearly universal for owner-occupied properties. For example, in Vic only 58% of private and 55% of public rental housing has any insulation, compared to 95% of owner-occupied homes.[410] The survey of Aboriginal households found that only 19% have wall insulation.[411] By allowing landlords to profit from renting houses built like a leaky tent, this policy absence effectively encourages them to dump rising energy costs on families that can least afford it.

Renters want increased efficiency, but often can't get their landlords to pay for it – or even get permission to pay for improvements themselves in many cases. According to a recent survey conducted by QCOSS, 70% of QLD renters asking their lessor for permission to make energy-related improvements to their homes were unsuccessful.[412] For instance, one tenant responded that "I attempted to have insulation installed under the government's free scheme. The owner told us to get quotes, then said he would have the job done by someone who was doing all his properties. It never happened." In Vic, 82% of renters making efficiency improvements had to do so without permission from their landlords.[413]

This would be bad enough if it were 'just' a financial burden for low-income households, but it also represents a serious and ongoing public health threat. While a leaky tent can be fine enough for a weekend of camping – if the weather's nice – living in one through the heat of summer and the cold of winter can kill, particularly for the old and the very young. For example, heat waves in February 2009 resulted in an estimated 46% increase in ambulance call-outs in Melbourne and 374 deaths.[414] On the opposite end of the temperature spectrum, it is an absurd national tragedy that more people die of exposure to the cold in Australia than in Sweden.[415]

New standards are required to ensure that families can rent homes knowing that they'll have minimum levels of energy performance, in the same way that properties must meet certain standards for health and safety. Government action is merited for several reasons:

- Efficiency improvements are extremely cost-effective; Environment Victoria (EV) estimates that rental efficiency standards would save the average renter $850/year and create up to 5,400 jobs to boot.[416] However, renters usually miss out because the benefits of efficiency accrue to renters, while the costs are borne by landlords, so nothing ends up getting done and those savings (and jobs) get left on the table.

- If landlords don't pay the cost of efficiency upgrades, we all end up paying the bill through increased healthcare costs and concession payments. In New Zealand, a home insulation program produced $1.2 billion in benefits, largely from reduced hospitalisation costs and mortality rates. EV estimates that improving efficiency for low-income households could deliver $2.5 billion in savings from energy concessions in Vic alone.[417]
- Improving housing efficiency will reduce peak demand on the power system during summer heatwaves, as well as gas consumption during the winter. That means less stress on the electricity system and lower prices for everybody.

Unsurprisingly, action on rental efficiency standards has practically universal support from renters; over 90% of Vic tenants were in favour of mandatory standards according to a recent University of Melbourne poll.[418]

Table 9: Estimated average costs of efficiency measures and household savings

Efficiency measure	Retrofit opportunity (%)	Estimated maximum cost per house ($)	Investment across rental housing stock ($m)	Estimated annual savings per household ($/yr)
Ceiling insulation[a]	75[b]	1125[c]	506.3	133.5
Draft-sealing	50	1037	311.1	157
Hot water[d]	30	818	147.2	100
Low-flow shower rose	60	86[e]	31.0	102
Efficient lighting	93[f]	574	320.3	100
Heating upgrade[g]	80[h]	1388	666.2	157
Dual-flush toilets	20	450	54.0	100[i]
Total		**$5478**	**$2036 million**	**$849.5/year**

[a] Average of cost of insulation deemed 'easy' or 'difficult' to install

[b] Estimate based on 36-50% of rental homes being uninsulated with a further 20-25% requiring a top-up

[c] Planned re-inclusion of ceiling insulation under the Victorian Energy Upgrade Program would lower costs for landlords

[d] End-of-life replacement Gas price increases since this research was done could mean lower-emission heatpump systems now a better option (see Alternative Technology Association 2014, *Are we still cooking with gas?*)

[e] Free to property owners under the Victorian Energy Upgrade Program

[f] It is likely that some of this upgrade potential has been taken up in owner-occupied homes since research was done. However, participation in VEUP has been lower for rental homes, so original upgrade opportunity has been retained.

[g] End-of-life replacement. Gas price increases since this research was done could mean lower-emission reverse cycle systems now a better option (see ATA 2014)

[h] End-of-life replacement. Sustainability Victoria 2016, *Energy Efficiency Upgrade Potential of Existing Victorian Houses*

[i] From Yarra Valley Water at www.yvw.com.au/help-advice/saving-water/home, 35,000 litres saved per year at $2.87/kl (average of two lowest block tariffs)

Source: "Bringing Rental Homes Up to Scratch," p. 13

It also enjoys across-the-board support from both the environment and social sectors. ACOSS[419] and EV[420] have both specifically recommended rental efficiency standards in recent reports. Similarly, the One Million Homes Alliance – which includes the Brotherhood of St. Laurence, VCOSS, the Tenants Union of Victoria, and more – supports an agenda for efficiency retrofits for one million Victorian concession card homes, including through standards.[421]

Encouragingly, even many landlords support policy changes to improve efficiency. The same University of Melbourne poll noted above also found that 70% of landlords in Vic supported minimum efficiency standards for rental properties.[422] While some less-conscientious landlords might protest taking on responsibility for increasing the efficiency of their properties, it is absolutely fair and just that they do so. As shown in Table 9, EV estimates a maximum cost of $5,500 per home to meet basic rental efficiency standards, which could be reduced with incentives or concessional financing and, in any case, would typically be spread over several years.

Consider that landlords in Vic make a median profit of $20,000 annually in rental income of each property, and over half of them are in the top quintile of wealth.[423] Is it most fair for costs to be borne by a) low-income renters, b) all Australian taxpayers and ratepayers, or c) the landlords that profit from renting leaky tents disguised as homes? It's not a trick question.

How rental efficiency standards should work

Efficiency standards for rental properties can be implemented at the state level, making them an appealing option for state governments that want to protect their constituents from rising energy costs and show leadership on climate and energy issues. However, while these standards are a very 'common sense' policy, they must be implemented carefully to ensure there are no unintended consequences. There are four core components of effective rental efficiency standards, drawn largely from EV's "Bringing Rental Standards Up To Scratch" report:[424]

- **Features-based standards:** To keep compliance straightforward, standards should be implemented as a list of required features that specifies exactly what steps (insulation, draught-sealing, etc) are required at each stage. This contrasts with potential alternative approaches based on total household energy use or average energy bills.
- **Increasing stringency:** Standards should be set at an initially low level, with a focus on forcing the worst-performing buildings to meet basic efficiency levels. More responsible landlords won't have to do as much – a fair reward for their efficiency consciousness in the past. Once this baseline has been achieved, standards should be gradually tightened over several years to ensure continued progress across the board.
- **Phase-In period:** In order to allow landlords to make improvements most cost-effectively, they should be allowed to achieve compliance over a period of five years. This could be implemented through a rolling compliance requirement for standards to be met at the start of a new lease, backed up with an absolute date for compliance in case of multi-year leases or other situations.
- **Protections for renters:** Finally, it is crucial that these standards aren't used by shady landlords as an excuse for unjustified rent increases or worse. That means additional protections for renters must be included as part of the efficiency standards package, including rights for tenants to challenge non-compliance, and requirements for landlords to set aside a bond for repairs and maintenance.

The governments of NSW and Vic are both considering minimum standards for residential properties;[425] these initiatives should be turned into action, and would be an opportunity to provide a strong example for other states.

Accessing solar

Ensure every renter can access solar

Hopefully by now we've done a good job at explaining why solar is good for households. Currently, private renters are the cohort least likely to be able to access the benefits of solar, particularly if these renters are low-income and live in an apartment. To date, in Australia no policies that we know of have been set to really try and address this issue. Thankfully, some smart minds have come up with some clever ways to solve this problem.

We reckon there are four approaches to helping private tenants access the benefits of solar (and in two cases energy efficiency):

1. Create solar gardens
2. Enable landlords and tenants to split the benefit
3. Incentivise landlords to do the right thing
4. Unlock rates based financing for renters.

Given that there are pros and cons to all approaches, we think policy makers should put in place programs that support at least two – as what suits one landlord or tenant will be different to others. This feeds into the idea that in energy there is no silver bullet – we need an ecosystem of solutions.

Option 1: Solar gardens

How does it work?

As outlined in Part 1, Section 3.4, solar gardens work by installing a central solar array, generally near a population centre. Consumers can purchase a share of the array, with the electricity generated credited on their bill. In this way private renters can sidestep their landlords and still access the benefits of solar without having to install it on their own roof. As the fastest growing segment in the US solar industry, Solar Gardens contributed 200 MW of new photovoltaic capacity in 2016, a four-fold increase over the previous year.

Policy support to drive solar gardens

While there are no known legal impediments to solar gardens they aren't currently operating in Australia – mainly because they are more complex than just installing solar on a rooftop. We urgently need a series of funded trials to ensure that solar gardens are legally feasible, economically viable and desirable to renters. Participants in solar gardens should be eligible to receive a fair price, using the Victorian Essential Services Commission's methodology for a fair FiT or better. Regulatory changes may be needed to require networks to offer lower network charges to solar gardens where the electricity is used and consumed (in real time) within the same local distribution area, or at least to ensure that network tariffs support local use of the network. Finally, federal or state governments could consider providing a means-tested rebate available to low-income renters to close the gap, so they can afford to participate in a solar garden.

Option 2: Landlords and tenants split the benefit

How does it work?

A property owner (landlord) installs a solar system and a special smart meter. A third-party organisation monitors the household energy use and solar output, then splits the financial benefit of the solar array between the tenant (lower electricity bills) and the landlord (for example a monthly payment). This requires both a property with a suitable roof to install solar and a landlord willing to enter into such an arrangement.

Policy support to drive this mechanism

There are currently a couple of enterprises offering this model, including Sun Tenants,[426] however neither have currently reached scale. To drive this model further, trials and programs and policies that support start-ups to scale are needed, including through tax incentives or low-interest finance. It is important to note that a more enterprise-based approach will work for more affluent renters, however, a close eye is needed to ensure that enterprises are not leaving tenants worse off than they were before.

Option 3: Incentivise landlords to install solar and improve energy efficiency

How does it work?

Provide a financial incentive to landlords to install solar and undertake energy efficiency upgrades. This would be available to tenants who have landlords interested in taking up the incentive and have a suitable roof to install solar, although energy efficiency upgrades can also be undertaken.

Policy support to drive this mechanism

There are several possible mechanisms to incentivise landlords to install solar:

- The federal government could make the upgrades/solar installation tax deductible or eligible for accelerated depreciation. This could be as simple as changing what is considered eligible repairs and reasonable upgrades to rental properties. This is a federal mechanism, so state government would have an advocacy role.
- State governments could reduce stamp duty for rental properties with solar
- Councils could offer reduced council rates for properties with solar, including rental properties
- Governments could develop a revolving loan fund for public and private clean energy upgrades, allowing landlords to access low or zero interest loans to be able to fund energy efficient upgrades and/or solar.

Note this suit of policies would nicely complement the mandatory energy performance standards policy – acting as the carrot to its stick, and ensuring that the new standards can be met at a reasonable cost to landlords. In addition, a local trusted delivery agency such as a Regional Energy Hub (see Section 3.5 below) would make policies such as these easier to implement and easier for landlords to take up.

Option 4: Unlock rates-based financing for private rental properties

How does it work?

Rates financing is where finance for rooftop solar or energy efficiency is facilitated through the local government. Solar or energy efficiency measures are installed at zero upfront cost to either the tenant or the landlord. The cost of the clean energy upgrade is then repaid through a special opt-in charge or rate levied on the property and paid by the occupant through normal rate repayments. In a tenant-landlord situation, the landlord could pass the special rate through to the tenant. It's essential that tenant protections be put in place (see suggestions below) and that engagement is done to ensure the savings from solar (and energy efficiency) are greater than the rate repayment, so tenants are better off from day one.

This program would work for any tenant who has a landlord willing to sign up to the program and has a suitable roof to install solar (although energy efficiency upgrades can also be undertaken regardless).

Policy support to drive this mechanism

Currently twenty two councils in Vic have adopted this program, after the initial pilot by Darebin Council, in partnership with Moreland Energy Foundation (see Box 21). However, the Victorian program only covers low-income homeowners (pensioners). So far the program has not been extended to renters.

There are a number of policies that would widen the solar rates-financing program to renters and extend it beyond Vic:

- State governments could amend state tenancy acts to allow landlords to pass through the opt-in rate to cover the solar and energy efficiency upgrade to tenants. Note: this must go hand in hand with additional protections for tenants. Tenants who are in the property when the upgrade occurs must be able to have veto power. Furthermore, any new tenants must be informed of the additional charge they incur as part of renting the property at the time of lease.
- In some states, such as NSW, the Local Government Act will also need to be amended to allow councils to levy a special rate on a specific property, as is possible in Vic
- State or federal governments should provide grant funding to get the program off the ground in other locations
- State governments could establish delivery agencies that have a duty of care to the tenants, to ensure they are better off from day one. This could be the Regional Energy Hubs part of the Smart Energy Communities program (see Section 3.5), in partnership with solar and energy efficiency companies.

3.5 Empowering everyone!

Australians are innovative, early-adopters of clean energy – time to make this easier.

Most savvy politicians now know that supporting people to drive clean energy is pretty popular policy. Given that we urgently need to move from polluting energy to clean, renewable energy, extending access to absolutely everyone is a no-brainer.

In the previous sections we've outlined the types of policies we need to support a range of segments of the Australian population to adopt clean energy solutions. We have particularly focused on those cohorts that need the most support from an energy justice perspective. However, they are far from the only sectors of society that we should help. There's also:

- people who live in apartments, who are also locked out
- farmers and food-manufacturers who are currently doing it tough and have abundant land and renewable resources they could harvest
- small businesses, particularly those who rent
- edge-of-grid communities who suffer from some of the least reliable power
- and then there are the passionate early adopters who take a risk and test different technologies and models, making it easier and cheaper for the rest of us.

The good news is that clean energy, if it can be accessed, can provide benefits to everyone. A mixture of policies outlined in this section and the rest of the Repower Australia Plan can be targeted to support all these groups of people and organisations. The even better news is that there are a few policies that will work to empower everyone – no matter where they live, no matter how much they earn.

We're not saying that these policies are good enough on their own – the targeted policies for low-income households and Aboriginal communities are still very much needed. Rather, these policies will ensure that the targeted ones are more effective, while also supporting everyone else.

What are these win-win policies?

Firstly, there's support for more people to access storage through household storage systems or shared community schemes. Given that storage is where solar was at 10 years ago, we need to support this industry to mature and bring down the costs for everyone.

Secondly, we need to support people and communities to lead on energy, providing the advice, expertise and dedicated funding that enables and unlocks many of the social access models of clean energy, as well as the more ambitious plans many communities have to go to 100% renewables themselves.

Thirdly, we need to ensure our consumer protection processes keep pace with the changes in how we consume energy – ensuring that new technologies, products and services are deployed in ways that benefit rather than bamboozle or rort us as energy consumers.

Then there are the policies that are in other sections of the Repower Australia Plan. For example, the policies that are part of the Energy Productivity Roadmap should help all Australians better access energy efficiency. While the Cash for Gas Guzzlers program outlined in the Get Off Gas section should help us all go gas free. Then there's the fair-price for solar and other energy market reform processes in the Rewrite the Rules section that are about making the energy system fairer and set up for a clean energy future – those are reforms we will all directly benefit from.

Households storage incentive

Battery storage is the new wave of household clean energy. While not a silver bullet by itself, household battery storage will play an important role in driving a secure and affordable transition to 100% renewable electricity. Batteries are set to follow a similar cost-curve to solar PV and are already coming down in price significantly. A short-term policy package that stimulates a skilled and stable battery storage industry is in both consumer and the public interest.

In the short term this should include financial incentives for households to deploy battery storage. At a state-level this could be through the provision of interest-free loans or even grants as proposed by the SA opposition.[427] At a federal level this could be through a 50% tax rebate, as proposed by the Australian Greens.[428] Another option proposed by Solar Citizens would be state government putting in place voluntary buy-out programs for existing solar households in Vic, the ACT, QLD and SA still receiving a premium feed-in tariffs. Under such a scheme, these households could voluntarily cash-in the remainder of their FiT to provide a rebate for a battery system. The remainder of the savings which Solar Citizens say could be as much as $4000 million could then be used to fund programs that provide low-income access to solar, storage and energy efficiency as outlined in the previous sections.[429] In addition, batteries should be included in the low-income clean energy program, ensuring that grants for battery storage can count towards the $3,000 cap.

It is important that this industry development program be designed to phase-out in no more than five years from the beginning, and not be cut short as solar bonus schemes were. For example, the tax rebate available could decline each year, starting at 50% in year one and reducing by 10% each year, so in year four, the rebate would only be 10% of the cost of a battery system. However, given how fast battery costs are declining, this should still help. At a state level, the amount of interest on a loan could rise by 0.5% each year from 0% in year one, to 2.5% in year five.

In addition to financial incentives, it is essential that other industry development mechanisms are put in place. This should include, but not be limited to the development of:

- safety and installation standards that are responsible and not overly onerous
- standards that encourage batteries to provide grid support services
- end-of-life stewardship and recycling programs.

Smart Energy Communities Program

Bringing together families, communities, small business and landholders to deliver practical smart energy projects.

Australians love local renewables

Australia is a genuine world leader in rooftop renewables. At a local level the uptake of household PV is one of the highest in the world. However, energy efficiency, mid-scale and community led renewables are areas where Australia is lagging behind many other places. For example, in Scotland there are over 500 community energy projects delivering affordable electricity, energy independence, and start-up funding for new regional enterprises. In the US, community solar is one of the fastest-growing markets for solar PV. This presents untapped potential.

Energy efficiency, renewable energy and the smart grid are the new frontier, not only for energy provision but for communities and organisations concerned with local economic development, climate change action and community empowerment.

Sounds great, but what actually is community energy?

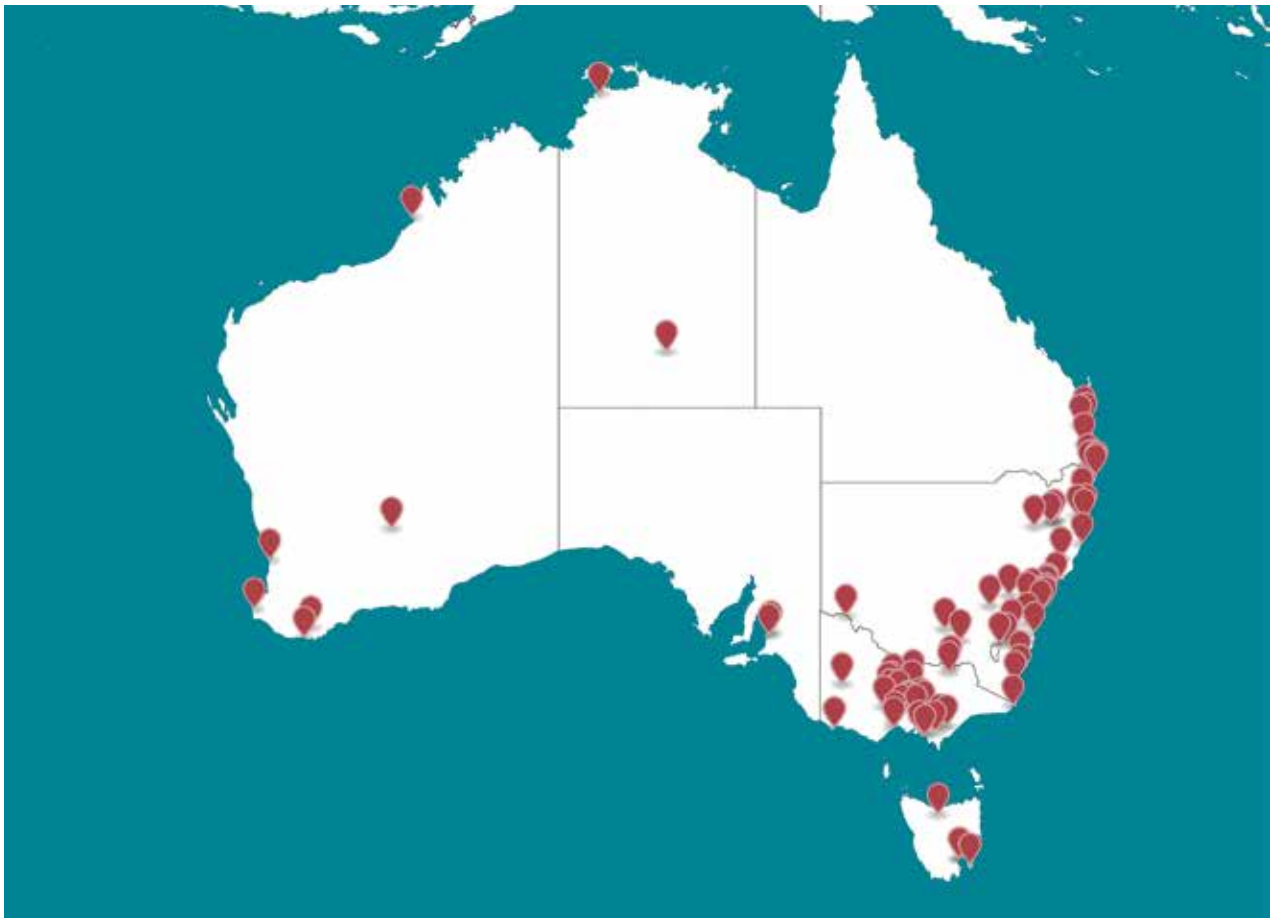
The Coalition for Community Energy defines community energy as:

"The wide range of ways that communities can develop, deliver and benefit from sustainable energy."[430]

In practice, community energy projects include:

- communities fundraising to put solar on a community building, for example Adelaide-based CORENA
- people investing their hard-earned cash in a solar array on the local brewery or dairy, as was the case with Pingala in inner-Sydney and Repower Shoalhaven on the south coast of NSW
- a community-owned solar or wind farm at the edge of town, such as Hepburn Wind in Vic and soon Solar Share in the ACT

Figure 18: Community energy groups in Australia[431]



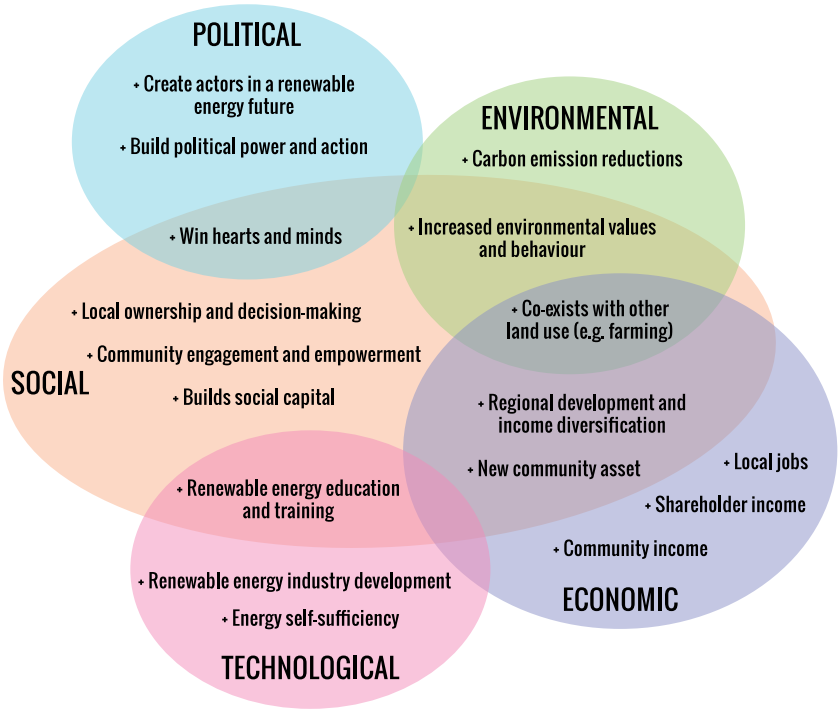
- communities developing 100% renewable or Zero-Net Energy Town plans, such as Uralla in NSW, which is starting with energy efficiency for local businesses and households (see Box 24)
- the first commercial micro-grid, a partnership between community energy group Totally Renewable Yackandandah and the local utility Ausnet Service
- community solar and battery bulk-buys, as is currently happening in New England by Farming the Sun and by Victor Harbor Council, which led to 40% of residences having solar
- community pumped-hydro projects, as is being planned by communities in Mullumbimby in NSW and in the Strathbogie Ranges in Vic
- the original community energy enterprise – Moreland Energy Foundation (see Box 21).

With over 90 community energy groups (see Figure 18) and more than 70 operating projects, the list could go on. There are so many ingenious energy ideas that communities are pursuing, and they bring with them a range of environmental, social, monetary, technical and political benefits (see Figure 19).

Why do we need community energy policy?

While community energy groups have enthusiasm, time, commitment and great ideas, they can lack the legal, technical, and financial support needed to deliver these projects. This means communities are missing out on local jobs and opportunities to reduce power bills while

Figure 19: Benefits of community energy [432]



Box 22: Best practice community energy – Moreland Energy Foundation

There are many community energy enterprises implementing innovative community energy projects and programs, but Moreland Energy Foundation Limited (MEFL) is the longest running and a model many communities are trying to emulate.

MEFL was founded as an independent NFP in 2000 by Moreland Council with revenue from the forced privatisation of the council-owned Brunswick Electricity Supply Department. The Brunswick Electricity Supply Department pioneered a range of world-leading energy efficiency and clean energy programs in the 1980s and MEFL continues that legacy to this day. MEFL is Australia's leading organisation in the implementation of clean energy programs that deliver real value to councils, communities, businesses and households, particularly low-income households.

For example, in partnership with Darebin Council and Energy Matters, MEFL implemented Australia's first residential rates-financing program for solar. The Darebin Solar $avers project installed solar on 300 low-income pensioners' roofs in Darebin (a suburb of north Melbourne). The participating households are better-off from day one. They paid zero upfront for the solar and pay back the cost through their council rates over 10 years, with the additional rate payments coming to less than the savings on their electricity bills.

cutting greenhouse gas emissions. As we've already stated, some people are missing out on clean energy all together.

Perhaps the biggest barrier community renewables projects face is finding the financing to transform an idea for a project into a tangible plan, which involves going through the pre-feasibility, feasibility and planning approval stages. These stages are the riskiest for any renewable energy venture, however unlike private enterprise or even government bodies, community actors do not typically have large reserves of capital to draw on. A relatively small amount of money in the form of a government grant to address this financing gap has been shown to make a significant difference to the development of a community renewable energy project.

Smart policy interventions like this can enable the community energy movement to unlock vital organisational resources including time, money, and land/roof space of thousands (if not millions) of new actors to deploy renewables.

Community energy also has the ability to assist lower income people who are struggling to pay their ever-rising bills. By actively being a part of the market, community energy organisations also help to bring down energy costs by challenging the high mark-ups charged by incumbent businesses. Community energy can also increase the social licences for larger scale renewables projects; increasingly communities are looking to partner with renewable developers, water utilities, councils and more to deploy renewables at scale, for the benefit of their local communities.

All sides of politics are embracing support for community energy. In NSW, the Coalition Government has funded 27 community energy feasibility studies through its Growing Community Energy Program, and we expect an announcement of a new community energy program as part of the next five years of the NSW Climate Fund. In Vic, the government has funded over 30 community energy feasibility studies and has just launched three pilot Community Energy Hubs, based on the Smart Energy Communities concept.

Introducing the Smart Energy Communities Program

The Smart Energy Communities Program would draw from the best examples of local clean energy organisations springing up across the world. It would include 50 Regional Energy Hubs, supporting hundreds if not thousands of volunteer groups, supported by a People's Power Fund and Network.

Box 23: Landcare in a nutshell

"Landcare is a grassroots movement that harnesses individuals and groups to protect, restore and sustainably manage Australia's natural environment and its productivity." [433]

Landcare is the brainchild of Rick Farley of the National Farmers Federation and Phillip Toyne of the Australian Conservation Foundation. It was formally established in 1989 when the Australian government with bipartisan support committed $320 million to fund the National Landcare Program for a decade. Landcare continues to this day with over 6000 Landcare and Coastcare groups across Australia.

The current iteration of the National Landcare Program provides three funding streams:

- Regional funding stream: this is investing "over $450 million throughout Australia's 56 natural resource management organisations over four years. This funding recognises the crucial role the 56 regional Natural Resource Management organisations play in delivering NRM at a local and regional level."[434]
- National funding: this funding is delivered directly by the Australian government to support local implementation of priority programs such as Clean Up Australia, whale and dolphin protection and 20 million trees.
- Network and capacity building funding: funding is provided for strategic support that increases the capacity of Landcare Networks, including through information sharing programs and initiatives such as the Landcare Conference and the National Landcare Facilitator.

Table 10: How the Smart Energy Communities Program would work

Organisations	Establish 50 Regional Energy Hubs – not-for-profit organisations in 50 regions (urban, regional and remote locations) across Australia.[435] Start-up funding for two years and ongoing matched operational funding. These Regional Energy Hubs would support many local volunteer community energy groups in their regions. They would also assist with advice on how lower and modest income households can reduce their energy costs.
Programs and funding	A Smart Energy Communities Fund would provide funding for community clean energy organisations (both those with and without start-up funding) to: • develop local renewable energy plans • develop, pilot and scale-up new models of community clean energy that enable community members, renters, low-income Australians, Aboriginal communities, farmers, small businesses and more to participate in and benefit from clean energy.
Capacity building network	A Smart Energy Communities Network would ensure that models, business plans and implementation strategies developed are shared across the six hubs established, as well as more broadly to regions and communities that were not successful in receiving start-up funding. The network would also be tasked with developing case studies, running training, and holding a bi-annual conference.

Structured similarly to the National Landcare Program (see Box 22), the Smart Energy Communities Program would be a 10-year program that works as shown in Table 10.

The Smart Energy Communities Program would leverage the efforts of existing volunteers, willing contributions from the private sector and community enthusiasm for renewables to support access for all Australians to innovative and emerging energy technologies such as solar and battery storage.

Just imagine if there were clean energy organisations across Australia at the scale of Landcare with the energy skills of MEFL.

Unlocking more than community energy

The Smart Energy Communities Program would, through the Regional Energy Hubs, provide legal and technical expertise and start-up funding to help kick-start DIY clean energy projects in towns and suburbs across Australia. Projects eligible for funding in communities across Australia could include:

- 'solar gardens' for renters
- farmer bioenergy hubs
- low-income energy efficiency (including retrofits of existing social housing stock)
- solar programs using innovative finance like council rates programs
- community wind farms
- local clean energy fair days and open days and more
- community wide plans to transition to clean energy like Kangaroo Island would like to develop (see Box 23).

As Naomi Klein puts it, when it comes to local energy "there are no hard-and-fast formulas, since the guiding principle is that every geography is different and our job... is to 'consult the genius of the place'."[436] That is why we have suggested Regional Energy Hubs located in 50 places across the country. That way, the programs delivered can be tailored to the needs and opportunities specific to that region. It is also at a scale that is manageable; not too costly – as would be the case with hubs located in every community – but with enough hubs to maintain connection to the people and organisations on the ground. The National Network, would then act as a way to ensure information is shared across the country and reduce reinvention of the wheel.

Box 24: Community Power – increasing reliability on Kangaroo Island

Kangaroo Island has always struggled with adequate power supply. The island stretches 150km long, with a single connection to the mainland at one end and kilometres of network to support the tourist destinations toward the other end. As a result, reliability is worse on the island compared to the mainland. The population of less than 5,000 people needs to work hard to ensure the infrastructure on the island can welcome over 200,000 visitors each year. New developments often have limited access to electric capacity, meaning they have to fork out for expensive network upgrades or invest in their own onsite generation. Major businesses like the abalone farm rely at least in part on expensive and polluting diesel generators. All of this makes development on the iconic island expensive and unnecessarily complex.

As renewable energy has fallen in price, the Kangaroo Island community has actively sought to unlock its benefits and advocated for local projects. Since 2011, residents have been exploring community owned power options, struggling with the constraints of the electricity market rules. As the undersea cable is now scheduled for replacement in late 2017, the island has investigated how to realise a vision of 100% renewable electricity and the possibility of becoming an exporter to the mainland.

A regional energy hub on Kangaroo Island would provide the expertise and coordination required to make this vision a reality. It would help optimise energy resources and network assets throughout the island by working with the community to deliver energy efficiency, storage, and supply/demand balancing. This in turn would free up of network capacity, enabling more activity on the network, strengthening and expanding the local economy, and creating the potential to export renewables to the mainland: a win, win, win!

However, while the Smart Energy Communities Program has a focus on unlocking community energy projects, a well-designed policy can also address a range of barriers holding back a fair transition to clean energy.

Trusted information

Regional Energy Hubs could provide a 'Home Health Check-Up' service, particularly for low-income households. They would become a 'one-stop shop' for information and delivery service. For example, when you're sick you go to the doctor and get a range of referrals, e.g. a prescription you can get filled at the pharmacy or a referral to a specialist. You also can get bulk-billed – they handle the financial transactions for you. Regional Energy Hubs could do the same but for energy.

- They would provide a portal to independent advice and information services for homeowners, landlords, tenants, small businesses and more. The advice available could cover tariffs, power plans, tailored efficiency options, fuel-switching and accessing renewable energy options (rooftop solar and community power/solar gardens) and more. This advice process should build on the learnings from the Low-income Energy Efficiency Program around engagement of diverse groups and need for delivery through trusted channels. It would also overcome the complexity and confusion barrier outlined in Section 8.1.
- They would provide household energy retrofit services including audits, affordable finance, accredited local trades and service providers.

Overcoming market barriers

In the Repower Australia Plan, we have tried to hammer home that there are fundamental market barriers such as split-incentives in the energy system that have stumped policy makers for years. The good news is that there are models outlined in the Repower Australia Plan that can overcome these barriers, from social access solar gardens to rates-based financing.[437] The bad news is that these models come with their own set of challenges, namely higher complexity and thus high transaction costs.

These socially beneficial models of clean energy involve multiple partner organisations, which add transaction costs, which in turn means these models are more expensive for end users. In addition, these models require a duty of care to vulnerable households and require significant face-to-face time to build trust. These models are unlikely to be delivered by the market alone.

The Smart Energy Communities Program is designed with this in mind. There is funding proposed for developing and deploying programs, hubs with the expertise and social purpose to coordinate the public and private partners involved, and a network to share information about what works and what doesn't. Furthermore, the hubs and/or regionally based welfare organisations could be the local delivery agencies for a range of other policies and programs including partnering with PowerAccess, helping to deploy energy efficiency and renewables solutions that will lower low-income households' power bills, while also stimulating local employment in the delivery of regional energy programs.

Evaluating the impact

To ensure that public funding is being spent well, it will be essential for the impacts of the Smart Energy Communities and other people-focused energy programs to be evaluated. The Smart Energy Communities Network should be charged with developing and implementing an evaluation framework that has all Regional Energy Hubs and local energy projects reporting their impacts – benefits and costs. An online portal and map could help visualise these impacts, showing how the local transition to clean energy is flourishing across the country.

How much would it cost?

The Smart Energy Communities Program would ideally be implemented as a partnership between federal and state governments. However, in the absence of federal leadership, states could pilot their own programs, as Vic is. Over time, the Smart Energy Communities Program would leverage community, local government and private investment through a range of innovative approaches. Indeed, modelling undertaken by Marsden Jacobs and Associates found that, given time, community energy projects could leverage up to $17 of community funding and in-kind contributions for every $1 of government funding.[438]

Overall, the Smart Energy Communities Program would require a minimum investment of $149 million in federal and state funding over the forward estimates period and a total of $460 million dollars over 10 years.[439] It is critical that, as with Landcare, there is a decade-long commitment, to ensure that long-term support programs, particularly for vulnerable households, can be implemented. In this space, it has been a case of too many pilots and not enough airplanes. A long-term, well-funded Smart Energy Communities Program would make the local transition to clean energy fly, while ensuring that all Australians, no matter how much they earn or where

Box 25: Uralla, from the forefront of Landcare to the forefront of community clean energy

Inspired by the small town of Wildpoldsried in Germany that generates more than 300% of its energy needs from renewables, Uralla in the New England Region of NSW is the first town to create a blueprint to transition to 100% renewables. Uralla is the first pilot town for the Zero-Net Energy Town model. It is stepping up, creating a shared vision and now getting on with implementing a transition to 100% renewable energy. Uralla is leading the way and showing other communities how it can be done.

Uralla is no stranger to environmental leadership. In 1992, the early days of Landcare, Uralla hosted the inaugural National Treefest – now a biannual event. This was a field day attended by 6000 people and organised by Landcare groups.[440]

Uralla is just one of many communities that are leading the way and creating 100% renewable community plans. 'Totally Renewable Yackandandah' in North-East Vic was established in 2014 and is working towards 'energy sovereignty' for Yackandandah by 2022. In 2015, Byron Bay Shire made a commitment to becoming Australia's first zero-emissions community,[441] which will involve transitioning to 100% renewable electricity.

they live, are able to take control of their power bills and access affordable, clean and renewable electricity.

Consumer protections

As we move towards Electricity System 2.0 a wider range of new products, technologies and services are entering the market and changing the way we engage with the system – both as consumers and producers of energy services.

That's increasing the complexity of the decisions consumers are required to make if they are to reap the full benefits of competition and new technology. And it disadvantages consumers who lack the necessary trust in service providers or are unable to engage with complex markets (because of literacy, education, language or other barriers). At the same time, because our consumer protection regime is set up for Electricity System 1.0 (see Part 1, Section 1.1), new and emerging products and services such as solar leasing arrangements, residential battery storage, electric vehicles and community energy projects currently sit outside existing energy specific consumer protection arrangements.[442]

Our consumer protections framework needs to continue to ensure all Australians' access to this essential service, adapting to the more dynamic relationship between suppliers and consumers of energy under Electricity System 2.0. There are two broad categories of reforms we need to actively progress now:

1. addressing barriers to informed decision-making by consumers in an increasingly complex market
2. making sure consumers are protected when things go wrong.

A number of initiatives could be adopted in the short to medium term, including:

- Testing the need for, and form of, customer-friendly decision-making interventions
- Requiring energy service providers to identify the consumer's purpose in acquiring a service, to ensure it is appropriate
- Ensuring adequate access to justice by expanding the jurisdiction of energy Ombudsman schemes – the main port-of-call for settling consumer disputes – to cover the providers of new energy products and services.[443]

Voluntary initiatives are also emerging, such as the Clean Energy Council 'Solar Retailer Code of Conduct' which allows solar energy companies to 'show their commitment to responsible sales and marketing activities.'[444] Amongst other things, signatories to the Code commit to providing the total cost of a solar financing agreement (e.g. solar lease or PPA) to help consumers make more informed decisions about complex financial products.

Already, the NSW government has started the ball rolling, putting out a Discussion Paper on a new energy consumer protection framework that works for a changing world. An expanded role for ombudsmen is also currently being explored in Vic and SA.[445] If any states have not put in place adequate new energy consumer protection programs by 2020, there could be a role for the federal government to step in.

4. Make Australia a renewable energy superpower

4.1 Using our superpowers for good

Use our wind and sun to create great jobs and power industries in Australia and around the world.

The economy has not been kind to people in Port Augusta or Elizabeth in SA, or in the Latrobe Valley or Geelong in Vic. And one of the things making life harder in places with high unemployment and declining heavy industry is that Australia has no industrial policy or regional development policy that is worth the name. For decades now, governments have used a supposed aversion to 'picking winners' as an excuse for inaction while they continue to back the losing policies of the past.

But there is another way. A combination of consumer demand, environmental necessity and public policy is unleashing trillions of dollars in sustainable investment worldwide. Around the globe, countries are implementing green industrial policy to ensure that they benefit from the wave of investment:

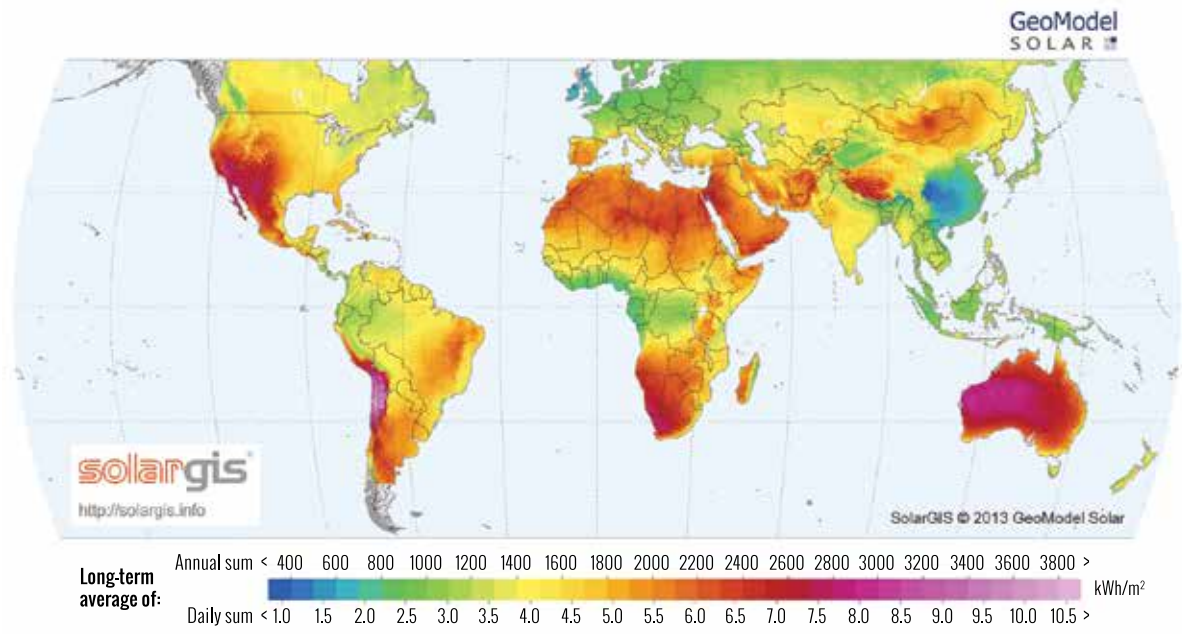
"The rest of the world is not sitting idly by. Australia must do much more to develop new industries and support companies making the transition to more sustainable business models if it is to compete for a share of these fast-growing markets."[446]

In 2016, US$242 billion was invested in renewable energy, roughly double the amount invested in fossil fuels.[447] Analysis by Beyond Zero Emissions (BZE) projects that over $28 trillion will be spent on renewable energy and efficiency equipment globally by 2035.[448] Earlier in 2017, the world's largest investment group, Blackrock, said "coal is dead...the thing that has changed fundamentally the whole picture is that renewables have gotten so cheap."[449] Blackrock is now looking to invest in renewable energy in Australia.

Australia is better positioned than almost any other country around the world to take advantage of this flood of investment. With more solar radiation per square metre than any other continent, we have the potential to generate solar energy at a lower cost than in many other developed countries.[450] Just 0.1% of this radiation, converted into electricity, would be enough to power the nation (see Figure 20).[451] We also have 120 million hectares of very affordable land suitable for large-scale installations,[452] a strong research base in solar technology and design, and we're close to major export markets.[453]

People's Climate March Melbourne, 2015. Photo: James Thomas

Figure 20: Where's the best sunshine in the world?[454]



If we play our cards right, we will be a superpower in an age of renewable energy.

Becoming a renewable energy superpower gives Australia many opportunities for the development of new industries and jobs. The process is about much more than energy – it's about making sure that we have an industry policy that's up to the task of the challenge.

Listen to the leaders, not the laggards

On this last point, there is a key lesson policy makers should learn from years of capitulation to industry lobbying. If there is strong evidence that governments in other countries are likely to take a particular action (from banning incandescent light bulbs to pricing carbon pollution), then it makes economic sense to be a leader rather than a follower.

Businesses in leading countries get a valuable head start on providing products and services to growing markets, compared to their competitors in follower countries. And businesses in lagging countries often get left behind, as with car manufacturers in Australia and the United States, which successfully lobbied against more stringent vehicle efficiency standards and ended up producing vehicles that didn't meet the standards imposed in growing markets such as China.[455]

It is all too easy for the noisy voices of outmoded industries to drown out those who would challenge their privileged position and see the economy open up to new opportunities. In the words of economist Ross Garnaut:

"Success requires independent citizens to reject government subordination of public to private interests, as powerful players from the old economy seek to block the emergence of the new." [456]

Good industrial policy can position Australia at the leading edge of the transition to clean, renewable energy and doing so will bring a range of benefits. However, transitioning whole industries, such as the electricity industry, not only involves supporting the industries of the future (renewables), but shutting down the industries of the past (coal and gas) and ensuring that the people involved are supported to find new, good jobs and opportunities.

Jobs, jobs, jobs

We've already seen the power of renewable energy to create jobs around the world. Germany's transition policy has led to over 382,000 new jobs in the renewable energy sector. Back at home, 11,150 Australians were employed full-time in the renewable energy sector in 2016,[457] larger by far than the coal-fired power station workforce.[458] This should not come as a surprise. Solar PV generates five times as many jobs in operation and maintenance per megawatt as coal or gas. Solar thermal

has four times the number of jobs per megawatt, and wind twice the number.[459] While the renewable industry has the potential to create thousands of new jobs, they won't necessarily be the same jobs or in the same places as previously provided by the fossil fuel industry. This makes a just transition plan essential (see Part 3, Section 2.2).

While there is no doubt there are more jobs in renewables than fossil fuels, ensuring that these jobs employ Australians requires a proactive approach. Policy is needed to encourage the local manufacture of components needed for renewable projects, the use of local tradespeople to build them (for example the regional concreter building the foundations for wind farms), and the development of skills through apprenticeships and training programs.

Powering the world

With some of the best wind and solar resources in the world and significant land areas, Australia is well placed to become a global leader in renewable exports – particularly the emerging renewable hydrogen and ammonia export industry, which is basically liquid sunlight. There are significant job opportunities in research and development, technology commercialisation and deployment, and potential spin-off industries such as a homegrown fertiliser industry.

If Australia manages the transition to renewable energy in a proactive, smart way then it has massive potential to attract new industries that are hungry for cheap and clean power. Bloomberg New Energy Finance recently predicted that Australia will once again become a 'magnet' for energy intensive industries in the decades ahead thanks to low-cost wind and solar power.[460] It is entirely imaginable that in the future there will be some times of the day that new industries will be able to access free or very low-cost power supplied by abundant wind and solar.

What to do?

To become a renewable superpower, we need to embed low-cost, clean, renewable electricity into every corner of our economy and then export our success to the world. Along this path we need to make sure that Australians from all walks of life are benefitting, and we use our renewable advantage to create meaningful, secure jobs in new industries with a big future.

We can do this by actively helping businesses move their production methods to electricity and aggressively pursuing electrification pathways in the transport sector. These changes don't happen without support and we need to make sure that businesses are able to learn from each other.

We also need to identify opportunities to turn our renewable potential into forms of energy that can be exported – this will take planning, demonstration and support. This all starts with a plan that brings together business, communities and government to work together to achieve enormous outcomes. We need to make sure that all the new projects we're building have good Australian jobs at their core. We can do this by making sure that we have requirements for local content in our projects and that we're actively supporting the next generation of leaders with the skills they need to drive the energy transition.

Finally, we can make sure that our neighbours in the Asia-Pacific get the benefits of our growing renewable expertise rather than desperately pushing coal.

4.2 Power transport and industry with renewable electricity

Electrification of transport and industry is efficient and climate friendly – let's get on with it.

To drive down our emissions across our economy, Australia is going to have to find new ways to power transport and industry entirely on renewable energy. This will require a comprehensive Electrification Roadmap for the transport and industrial sectors across Australia. This roadmap should give us a clear picture of the opportunities and challenges in electrifying the transport and industrial sectors. It will help us understand how many businesses and households would be affected, what additional renewable generation capacity would be required, the jobs that would be created, and the policies we'd need to speed up electrification and fuel-switching.

However, just having a plan isn't enough. We need to put in place policies that make sure that business has access to the information, skills and support to take advantage of Australia's ample renewable energy resources. This can be done through:

1. the establishment of the Clean Energy Solution Centre – a one-stop shop for energy advice for our industries
2. making electric vehicles accessible and attractive
3. over time as Australia gets the pollution out of our electricity, bringing more emissions-intensive industries to our shores.
4. ensuring we have enough renewables in the system to take their load (literally!).

Clean Energy Solution Centres

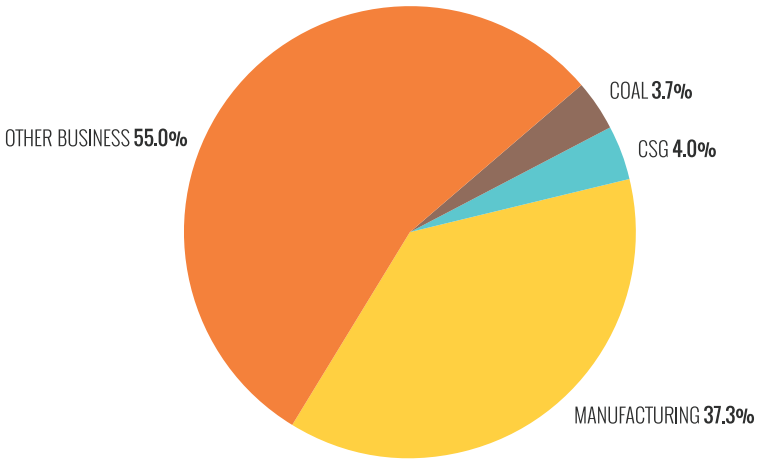
In 2017 business was projected to consume 69% of Australia's electricity generation.[461] Of this, manufacturing businesses account for 37% of electricity consumption (see Figure 21.)[462] At a company level the top 10 largest energy users and biggest electricity emissions culprits are listed in Table 11. Some of these companies are obvious – aluminium smelters in particular, given that aluminium is really solid electricity. However, some are more surprising; Australia's big two supermarkets, Coles (their parent company Wesfarmers) and Woolworths, come in #4 and #5 respectively.[463]

If we are serious about energy efficiency and a transition to 100% renewables, we have to work with the largest energy users. The good news is that some businesses are finally starting to see clean, renewable electricity as an opportunity and change is happening fast. In 2017 alone, the following companies have made significant steps towards a renewable business future:

- Telstra, which comes in at #9 on the big electricity users list, has signed a deal for a 70 MW solar farm and that is just the beginning of their plans.[464]
- Sunmetals is building a 116 MW solar farm to underpin its QLD based zinc refinery.[465]

Photo: John Englart, Flickr CC

Figure 21: Total business sector annual energy consumption: breakdown by business type



- Whyalla Steel's new owner Sanjeev Gupta has purchased a controlling stake in clean energy company ZEN, with plans to build 1 GW of large-scale solar, battery storage, pumped hydro and demand management for the steelworks and other big energy users in SA, with plans to expand to other states.[466]
- Nectar Farms is building a 196 MW windfarm and a 20 MW battery system to power their new 40 hectares of glasshouses.[467]
- The owners of Fosters, VB and Carlton United Breweries have committed their companies to be powered by 100% renewable electricity by 2025 at the latest.[468]

In addition, City of Melbourne was joined by 13 other organisations including NAB, data storage group NEXTDC, and Australia Post to do Australia's first large-scale corporate Power Purchase Agreement (PPA) for a new renewables project – a 80 MW wind farm in Vic.[469]

This change in attitude is not that surprising given that businesses around the country are struggling with rising energy prices. While many companies are getting on with it, for others cutting these bills can be difficult, particularly when companies use a large amount of energy and have complex needs. Nonetheless, from more efficient heating and cooling systems to purchasing renewables directly, we know there are many innovative options available for businesses to reduce their bills and capture more clean energy. There's also a range of government and private sources of funding to make these options viable. In fact, there are so many options it can be bamboozling, making it difficult for businesses to know where to begin. Governments can make it much more straightforward for businesses to adopt cleaner, cheaper energy alternatives.

Clean Energy Solution Centres would fill a major gap in Australia. They would be one-stop shops that give coordinated, integrated clean energy and efficiency advice for large energy users. They would be staffed by experts in renewable energy, energy efficiency and financial decision-making. The Clean Energy Solution Centre could be one federal organisation, given many of our large energy users operate across states.

Table 11: Top 10 electricity users in Australia (by scope 2 greenhouse gas emissions)

Name	Scope 2 emissions (t CO_2-e)	% of top 100 emissions
Rio Tinto Ltd	9,358,888	13%
Pechiney Consolidated Australia Pty Ltd	7,070,284	10%
Alcoa Australian Holdings Pty Ltd	6,057,867	8%
Wesfarmers Ltd	2,548,761	4%
Woolworths Ltd	2,464,023	3%
Glencore Holdings Pty Ltd	2,097,349	3%
BHP Billiton Limited	1,519,133	2%
Ausnet Services (Transmission) Ltd	1,498,281	2%
Telstra Corporation Limited	1,312,774	2%
Queensland Electricity Transmission Corporation Ltd	1,265,149	2%

Alternatively, each state across Australia could be home to one solution centre. Their purpose would be helping the biggest energy users transition to renewable energy and efficient production.

The establishment of Clean Energy Solution Centres should be coupled with the re-introduction of an expanded Energy Efficiency Opportunities Act (EEO). The EEO was introduced in 2006 and required any energy users consuming more than 0.5PJ of energy (total, not just electricity) to undertake audits to identify opportunities to reduce their energy use. In yet another example of perverse and ideological reasoning, this program was scrapped by the Abbott Government in 2014 as a way to reduce costs for business, despite the fact that the program had actually identified $1.2 billion in savings for business, of which $808 million were taken up.[470]

As such, the EEO should immediately be reintroduced and expanded beyond energy efficiency to include other clean energy options. In practice, this would mean the EEO would require Australia's largest energy users to take action and the Solution Centres would then support businesses to provide a pathway to lower bills, lower emissions and uptake of renewable electricity and demand management. The process would work like this:

Step 1: Each business would have to undertake an energy audit. The Solution Centre would help with in-house energy advice and connection to accredited auditors and provide a framework for assessing opportunities, specific to their business needs. Businesses that have undertaken an energy audit in the past two years could move on to Step 2.

Step 2: Based on the audits, the Solution Centres would help businesses plan for their business and access funding. These plans should identify a baseline and the level of cost-effective (<10-year payback) emissions and energy reduction opportunities available.

Step 3: The Solution Centres support companies to get coordinated access to grants through ARENA and other relevant programs, and finance through the CEFC and other relevant private-sector financing programs.

Step 4: The Solution Centres would help businesses participate in large-scale coordinated programs such as bulk-buys and trials to reduce costs and administration. For example, they could help coordinate direct renewable power-purchase arrangements, bulk-buys for solar, and common energy efficiency upgrades such as lighting across an entire sector or location.

Step 5: After a soft-start to the program, for two to three years businesses would be required to report how they are tracking towards their emissions and energy reduction plans. If they exceed their level of projected emissions and fall short on energy reduction they would have to pay a penalty for pollution above the projected plan that could cost-effectively be reduced. Since energy efficiency is typically cheaper than purchasing electricity or gas, and renewables are cheaper for many than buying grid electricity, these cost-effective options should be significant and thus the emissions reduction options also should be significant.

Clean Energy Solution Centres could be part of the new Energy Transition Agency (see Part 2, Section 2.3) and would be complemented by the network of Regional Energy Hubs (see Section 3.5), which would support households, communities and small and medium sized businesses to improve their energy performance.

These state-wide or national centres would also be empowered to drive the National Energy Productivity Plan. The plan had a wide range of excellent ideas, but is currently sitting on shelves, gathering dust. We need to take the good work done for this plan and put its implementation into an agency that has the teeth and resourcing to get the job done.

Getting renewable energy powered transport onto our roads

Electric vehicles (EVs) are incredibly exciting with potential for zero emission performance when charged with energy from the sun or wind. They also play a really important role in the grid, soaking up excess renewable generation when the wind and sun are plentiful and sending electricity back to the grid when they are scarce. However, Australia is missing out. Around the world there are already two million EVs on the road but in Australia we bought just 1369 electric vehicles in 2016, representing just 0.1% of the market. By comparison, the combined share of EVs and plug-in hybrids in the US is over 1%[471] and in Norway, the global leader, plug-in cars are an astonishing 37% of the market.[472]

We know that policy matters a lot in shaping the decision to buy an electric car. This is because the major barriers to purchasing an electric car are cost and concerns about charging (ominously called 'range anxiety'). There are a number of tried and true policies we could use to overcome these challenges.

Getting charging infrastructure in place

QLD and WA are leading the way with the development of their own state-wide charging networks. In WA, a network of 12 fast charging stations is being developed by the Royal Automotive Club (RAC) in collaboration with local governments,[473] and a recently announced initiative by the Australian Electric Vehicle Association (AEVA) and electricity retailer Synergy will install up to 70 more.[474] The QLD state government is funding an Electric Super Highway of 18 fast charging stations in cities and towns state wide, which it claims will be the world's longest EV charging network in a single state once completed.[475]

To help spread charging stations over the entire nation, we need two key policies. Firstly, we need to develop a planned charging network that links major destinations. This will give drivers the confidence they need to buy an electric car and will ensure that states are working in harmony with a national, comprehensive plan.

Secondly, we need an incentive to fund public charging stations. New Hampshire overcame this challenging by offering rebates for the development of public charging stations. To be eligible, the changing stations need to be publicly accessible and be located where they are most needed. This meant New Hampshire could identify where it needed new charging stations, allowing a broad coverage of charging stations across the state, avoiding clusters in affluent areas.

Making EVs more accessible

The upfront costs of an EV are a major barrier for many people. A recent survey by Deloitte found that 69% of Australians surveyed are unwilling to pay any premium for an EV whatsoever, but three-quarters would buy an electric car if it was priced below $30,000.[476] We can also make EVs more affordable by providing tax incentives and discounts. For example, an EV purchaser in California could earn both a federal tax credit of US$7,500 and a US$2,500 bonus payment from the state, changing the entire economic proposition of an electric car.

One option is to adopt a version of France's bonus-malus (or feebates), a system that adjusts the purchase

price of a new vehicle by establishing a benchmark performance standard and comparing the vehicle's performance against it. If a vehicle is cleaner than the benchmark, its purchase price is reduced (and vice versa). This scheme can be designed to be revenue neutral, as the penalty for vehicles with underperforming emissions standards is used to fund the rewards for vehicles that over-perform. This scheme could also be implemented through car registrations. Importantly, it can be set up to be dynamic, to make sure that performance improves over time and subsidies don't blow out.[477]

Making EVs more attractive

As suggested by former federal minister Craig Emerson, a low-cost way to encourage electric car rollout is to allow owners to use high occupancy lanes, which would give EVs a significant advantage over conventional cars.[478] This policy is already in place in countries such as New Zealand and Norway. To support the implementation of this policy, Australia will need to develop an EV-only licence plate.

A range of other opportunities are available to state, local and federal governments to support the uptake of EVs, and help Australians access their enormous benefits. Some of these include:

- setting a light vehicle carbon emissions standard that aligns over time with the EU standard
- setting government fleet targets for EVs
- coordinating bulk purchases of EVs across fleets to reduce costs and encourage manufacturers to make more models available in the Australian market
- providing financial incentives such as tax rebates, exempting EVs from the Luxury Car Tax, annual registration and stamp duty reductions, parking fee deductions, taxes on vehicle emissions, and differential road tolls
- providing non-financial incentives such as priority lanes (mentioned above) and reserved parking spaces
- increasing education and awareness by providing information to consumers (e.g. on total cost of ownership and fuel saving benefits) on websites and consumer labels.[479]

Bringing energy intensive industry to Australia

When Australia was tussling over whether to implement a carbon price there was a lot of emphasis on 'energy intensive industries' such as iron, steel, paper, minerals and chemicals. The concern was understandable (although entirely exaggerated) – the more dirty energy you use, the more you're affected by a carbon price. And these industries use a lot of energy.

As it turned out, the scare campaign about the carbon price was entirely overblown: the high dollar driven by the mining boom had a much greater impact on exporters than the carbon price. and these industries didn't set sail once a carbon price came into Australia. However, in the last year a peculiar change has started to creep into energy intensive industries – they are realising that renewable energy might be their saving grace after all.

While some industrial processes can be powered by electricity, there are other industrial processes that simply need access to mid-to high-temperature heat. However, this doesn't mean we're out of options. There are a range of heat-generating renewable technologies such as concentrating solar thermal and sustainable biomass combustion that can be used to provide heat and help build new industries around renewable resources.

Getting manufacturing in the right place

As we discussed in Part 3, Section 3.1, there are many options for reducing our reliance on gas for manufacturing by making sure that the right businesses are in the right areas, with access to ample renewable energy. The same approach is needed to make sure that manufacturing can thrive with cheap renewable energy. This means we need to lead with the right infrastructure, which can be done through Renewable Industry Precincts.

These areas would bring together renewable electricity and heat generation projects (wind, solar PV, batteries, concentrating solar thermal, sustainable bioenergy) with industries and businesses that have a high demand for heat and electricity. These areas should be identified across the country, with federal governments working hand in hand with state governments to understand where there is strong community support, demonstrated need and room for growth.

Once these areas have been identified, we need to provide the incentives for business to move in. This can be done in a range of ways such as favourable zoning, access to concessional loans and co-funding infrastructure between state and federal governments. See Get Off Gas, Part 3, Section 3, for more on Renewable Industry Precincts policy.

4.3 Develop a renewable exports industry

We can export liquid sunshine and sun powered products to the world.

Powering the world with Australian-made renewable hydrogen

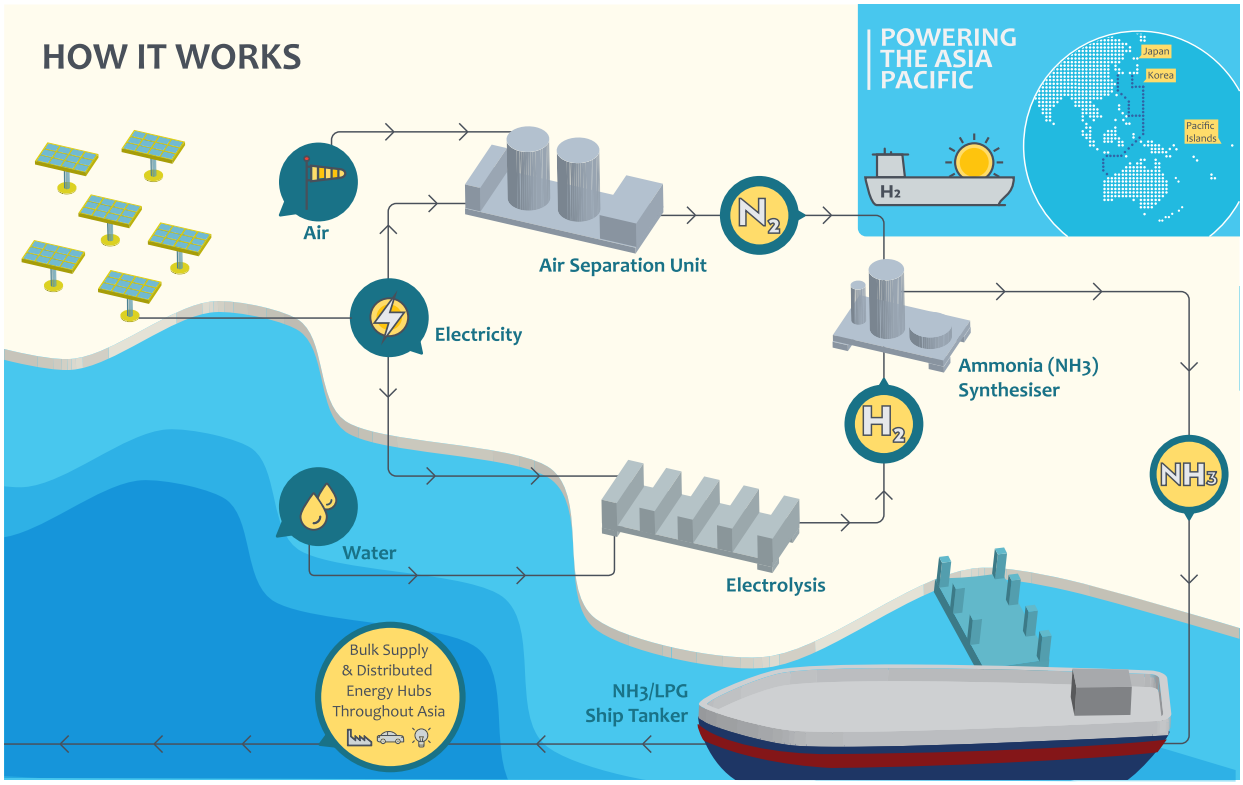
Stopping climate change means that every country around the world will need to totally decarbonise their economy. However, this doesn't mean that every country will be able to generate all the energy they need from within their borders. Indeed, for many countries they simply don't have the space to build enough solar, wind or other technologies to get close to meeting their demand. Luckily, the sunburnt country might be able to help.

Australia effectively has an unlimited renewable capacity to produce energy from the sun and the wind. What's less commonly discussed is that there are many technologies that can convert this renewable energy into liquid form, effectively creating liquid electricity that can be shipped around the world.

The most promising approach for this is to create renewable hydrogen. Hydrogen has a wide range of uses, including transport fuels, industrial heat and other processes that currently require oil. The process to create hydrogen uses electricity to 'crack' water into hydrogen and oxygen using a process called 'electrolysis'. To export this safely, the hydrogen is then turned into ammonia, which can be shipped around the world (see Figure 22). When renewable energy is used as the electricity source then the hydrogen that's created is clean and sustainable – harnessing the windiest or sunniest days to store energy for later.

The hydrogen export pathway proposed also produces renewable ammonia, which is an enormous global market that is anticipated to reach $76.64b by 2025.

Figure 22: Renewable hydrogen exports: how it works



With these processes we can repower this highly polluting, energy intensive process with clean energy.[480]

The CSIRO is at the forefront of delivering new technologies that unlock hydrogen business models by allowing hydrogen to be moved over great distances. These breakthroughs allow hydrogen to be separated from ammonia at point of use, which makes it much easier to ship. This is the missing link that allows hydrogen to be transported and used as an energy source.

The cost of producing renewable hydrogen has fallen rapidly over the past few years simply because the price of solar and wind has fallen through the floor. The costs of the core technology used to produce renewable hydrogen are falling rapidly, while there is a flood of investment to produce ammonia for fertilizer and other applications.

However, if we're to see major reductions in the cost of renewable hydrogen we're going to need to see a lot more of it, because technology gets cheaper as it scales up. Industry experts predict that renewable hydrogen will be cost-competitive with other comparable fuels such as diesel in the next five to 10 years, while the International Energy Agency suggest that by 2025 renewable energy will be able to produce ammonia affordably.

Supercharging storage

As hydrogen is effectively liquid electricity, it can play a vital role in providing seasonal storage in areas that simply can't produce enough of their own energy. For example, in places like South Korea and Japan, it can be used to get through those long, dark winters – shipped in when it's needed from warmer, windier areas around the world like Australia. It doesn't replace other forms of storage – we will still need batteries, pumped hydro and other technologies – but renewable hydrogen will play an important role. This capacity to overcome large seasonal dips in renewable energy production will be vital to create grids that are able to be fully unshackled from fossil fuels.

Soaking up the excess

Renewable hydrogen also has an important role in helping build a 100% clean, reliable grid. This is because renewable hydrogen would only be made when there's excess renewable energy being produced. This means that companies are able to invest more in renewables, safe in the knowledge that even if their production is sometimes in excess to demand it will still have a profitable home.

Selling renewable solutions across our region

Across the Asia-Pacific are several countries that have shown a strong interest in hydrogen. Small, energy-intensive countries like Japan and South Korea simply do not have the room to install enough renewable energy to power their economies. Nevertheless, both have shown a deep commitment to cutting pollution. Australian-made renewable hydrogen can fill the gap, providing these countries with the fuel they need to power their economies while harnessing the incredible capacity in Australia.

How do we make this happen?

New industries don't pop up overnight. They need support, guidance and coordination. This requires government to actively clear roadblocks while taking a long-term view.

ARENA has already begun to examine the potential for Australia to harness the opportunity of renewable hydrogen, identifying the area as a priority for future funding.[481] For example, ARENA recently funded a trial by AquaHydrex, a collaboration founded on IP from the University of Wollongong and Monash University that significantly reduces the cost of hydrogen production.

SA has also begun to chart a path for renewable hydrogen through its Hydrogen Roadmap. As part of this roadmap, SA has undertaken a comprehensive techno-economic study and called for proposals for hydrogen infrastructure projects under the state's Renewable Technology Fund. SA has also issued a call for tenders to supply at least six hydrogen fuel cell buses for use by Adelaide Metro, as well as the supporting hydrogen production and refuelling infrastructure.[482]

A renewable export roadmap for the nation

The federal government has an opportunity to harness these initial examples to launch a large scale, country wide, ambitious roadmap for renewable exports. Developing this roadmap will require a much better understanding of the renewable export pathways available to Australia. Renewable hydrogen will play a big role, and the roadmap will help us understand the market for hydrogen both in Australia and abroad, while identifying the synergies between hydrogen production and our domestic supply. However, there are other potential export pathways from exporting energy intensive products and commodities to directly exporting electricity, as a consortium of organisations is looking at for the Pilbara in north-west Australia. Understanding the opportunity and what is needed to drive renewable exports is a monumental task that will need a lot more goodwill, problem solving and optimism than we've seen in the past few years in Australia.

Showing it works

A renewable hydrogen industry that captures the imagination of the world will first need to show that it can work at home at scale. Australia has an excellent track record of renewable energy R&D (think UNSW holding the world record for most efficient solar PV cell on and off since the 1980s). However, we have a terrible track record in commercialising technology (just look at our lack of renewables manufacturing). With renewable hydrogen, Australia not only has an enormous economic opportunity, we have an opportunity to rectify past wrongs and commercialise homegrown technology within our shores – meaning that we will not only be able to export renewable hydrogen itself, but the skills and technology to make it. To do this, we will need to invest in getting initial demonstration plants up and running to show the cost effectiveness and quality of Australian renewable hydrogen. This will show the rest of our region what's possible. This has already started in SA, but will need to be scaled across different locations and environments across the country.

4.4 Make the transition job rich

Time to get serious about good, secure, clean energy jobs.

The renewable energy transition has only just started. Over the next decade we're going to see new solar farms, turbines and batteries around Australia. But, without the right policies, we'll miss out on some of the jobs that come with this transition.

State and federal policies play an important role in driving renewable energy deployment. This means we have the capacity to encourage project developers to use local content from local industries. We can make sure that, wherever possible, new projects use local contractors, ingenuity and research. To do this, we first need to understand where the jobs are. This means working with industries both large and small to map the opportunities for local businesses to serve a growing renewable sector. Once we know more about our capacity we can set about making strategic investments to enhance it.

Hunt out the jobs

Delivering new renewable energy projects is complicated. In many cases, we simply don't know what can be built with existing resources in Australia and where strategic investments could be made to maximise local job creation. This is because the supply chains involved in renewable energy production are complicated and spread over a number of industries.

To overcome this, we need to take a leaf out of the Vic government's book, when it went about developing a local tram manufacturing industry (see Box 25).

State or federal governments should undertake a parliamentary inquiry to understand where the jobs are in renewable energy and how we can make investments that will maximise local jobs.

Build Aussie jobs into our projects

As we set out in Section 2.3, reverse auctions are an excellent policy mechanism to drive deployment of clean energy projects like solar, wind, batteries and more. They have the added benefit of providing a straightforward

Box 26: The rolling stock strategy

Melbourne loves its trams. While other cities pulled up their networks in the 1970s, Melbourne stuck with the tram network. Today there are over 200 million trips taken each year. Over the last decade Melbourne's gradually upgraded it trams. Initially, these were sourced from overseas, but in 2015 the newly elected Labor government released a rolling stock strategy that delivered a strong pipeline of orders and a minimum 50% local content requirement. This gave Vic companies the certainty to invest in local manufacturing and to build trams in Melbourne again. This strategy was built on a detailed, comprehensive inquiry that had been undertaken by the Parliament of Victoria, which mapped businesses that could provide components for rolling-stock. This detailed mapping and pages of detailed spreadsheets with businesses that could deliver different component parts for trams gave Vic the confidence needed to make a commitment to set an ambitious local content requirement for its new trams.

and transparent mechanism to incentivise the use of Australian manufactured components, local installation services (for concrete, roads and landscaping) and Australian software and technical services. In both the ACT and Vic, projects have had to show how they will assist the local region and create jobs. In the ACT, this meant that new companies located their headquarters in Canberra, creating local jobs and driving investment in the ACT, while still attracting record-low bids. The Vic reverse auctions will have similar expectations baked into their designs.

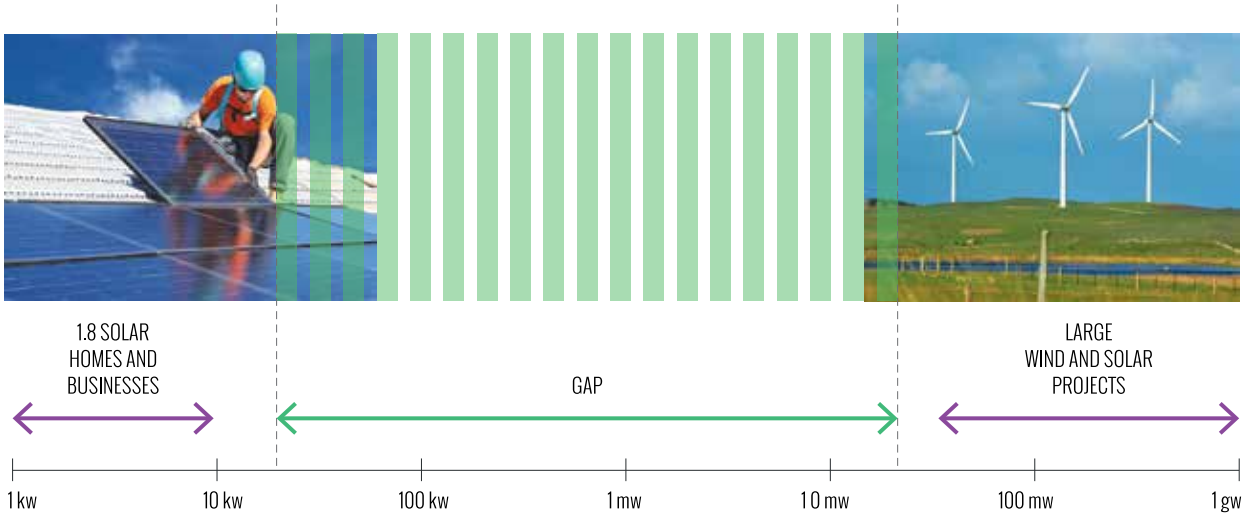
We note that the design of how these programs work to incentivise local content needs to be done carefully. International trade agreements don't tend to like the idea of governments supporting their own industries. As a result, when the Canadian province of Ontario specified that for wind and solar projects to be eligible for their Feed-in Tariff program they had to source up to 60% of the content locally, they got taken to the WTO by Japan. In 2012, the WTO ruled that this local content requirement breached WTO rules. However, Australian governments should not be deterred, the current approach by ACT and Vic is well within our sovereign rights and, in the ACT case, has led to more local jobs and benefits for their region. We need more of this, not less.

Jobs in the regions

Aussies love big things – the Big Banana, the Big Prawn, the Big Pineapple and our big renewables projects, be that the Snowy Hydro scheme, or really big wind and solar farms. We also quite like small things, particularly useful things that help us take control over our own lives – mobile phones, laptop computers and increasingly rooftop solar. However, we don't seem to be too keen on medium sized things.

Renewables are a great example of this – the majority of installed renewable energy projects are small <100 kWs (mostly <5 kWs) or really big (50 MWs plus). We are currently missing out on four to five orders of magnitude in scale. Especially renewables projects that are in the 100 kW-50 MWs range (see Figure 23). This mid-scale is what most sustainable bioenergy projects, community energy projects and more job-intensive renewable energy projects are operating at around the world.

Figure 23: The gap in Australia's renewable market [483]



Photos: (left) Federico Rostagno, (right) Martin Wurt/ACF

This is actually not surprising, because we've never had policy to support the growth of this part of the sector. We've had policies like the RET and Reverse Auctions that support whatever is cheapest – typically really large wind farms and now large solar farms. And we've had policies like rooftop solar feed-in tariffs and Small Technology Certificates under the RET that support small renewables, but we've left the mid-scale stuff to sit like a wallflower not being asked to Australia's renewable energy dance.

We know what you're thinking – if big renewables are so cheap, why should we bother with the mid-scale stuff? The short answer is that mid-scale projects deliver even more local benefits, especially in the form of local employment and profit-sharing.

Large multi-national renewables companies and investors are drawn to Australia's great renewable resources and occasional good policies. There are currently over 15,000 jobs building large-scale renewables across the country. The majority of renewable energy projects are, and will continue to be, built in regional Australia – parts of Australia that are also most in need of jobs. The biggest renewable projects are typically planned and deployed from our capital cities, and most of the local jobs are generated during the construction phase. A 5-10 MW solar or wind farm or grid-connected battery, on the other hand, is probably not going to be of interest to Goldwind or other big renewable developers headquartered in Sydney or Melbourne. However, 20 times 5-10 MW of them in a specific region would keep a regional Australian renewable energy company in business and employing regional Australians for a good number of years. Mid-scale renewables, particularly solar projects, are also easy for farmers to incorporate into their properties, helping to drought-proof their businesses.

Research is urgently needed to determine what policy or suite of policies would work best to cost-effectively drive the development of a job-rich, mid-scale renewables industry in Australia. This set of policies, combined with local content policies and better benefit-sharing schemes (see Section 2.2), would ensure that in the future we make sure renewables are bringing even more jobs to the regions.

Create jobs with a future

Unfortunately, with the rise of automation, crony capitalism and the decimation of the public service over the past few decades, jobs across the board are looking more precarious. The boom-bust cycle of renewables policy (outlined in Figure 12) has unfortunately meant that the renewables industry is no exception. We can start to reverse this trend by investing in publicly owned renewable energy. This would help increase the in-house capacity of the public service (something we urgently need to better regulate the future energy system), reduce boom-bust cycles and provide more secure jobs.

In the lead-up to the 2017 QLD state election, Labor Environment Action Network (LEAN) ran a campaign to get the government to commit to building 3 GWs of publicly-owned renewable energy in northern QLD over a decade.[484] They argue that if the state government had a 10-year renewables building program, workers could be assured of a job for at least a decade if not longer. If the program included apprenticeships, even low-skilled workers could be offered a pathway to secure employment.

The result of this campaign is that the QLD ALP will create Clean-Co, a publicly owned organisation to build renewables.[485] This will sit alongside the publicly owned organisations that own most of QLD's fossil-fuel electricity fleet. A small step in the right direction, but there is still a way to go and huge opportunity and scope for state and federal governments to get back into the game of providing an essential service – electricity – in ways that help and don't harm our planet, while delivering meaningful jobs and opportunities for workers, businesses and communities.

4.5 Make Australia the world's leading knowledge bank for renewable energy

Stop the clean energy brain drain and create a clean energy brain gain.

Australia is renowned for its education facilities. In 2017, over half a million people decided to come to Australia for their education, generating more the $21b of economic activity.[486] Luckily, students are also really satisfied with what they're learning here, with 89% of students saying they are satisfied or very satisfied with their Australian education. We can build on this legacy. Already energy industry insiders are looking to SA as a test-case for how to move to high penetrations of wind and solar. There is a real opportunity to make Australia the premier global destination for learning about how to transition to 100% renewable energy.

Helping build the next generation of transition leaders

Australia already has a world-class network of universities spread out across the country. However, these universities do not offer a single comprehensive, multidisciplinary program that provides the skills needed to lead the energy transition.

To develop a world-leading renewable energy education approach, we should form a cross-university collaboration to develop specialised courses that draw together the diverse skills and expertise that are required to train the next generations of energy transition leaders. These courses should break out of the silos of any particular discipline, allowing innovative collaborations across areas like engineering, political science, behavioural economics and communications. These courses should be marketed internationally, bringing industries, governments, students and professionals to learn about the transition to 100% renewable energy.

Australia can also use its expertise to offer tailored, executive level training by harnessing our business schools and schools of government to create courses aimed at policy makers. These courses would position Australia as a thought-leader in the energy transition.

Building Australia's renewable workforce

The sheer scale of the renewable energy projects that will be built in Australia over the coming decade have the potential to provide a generation of workers with sustainable jobs and skills they can take around the world.

The booms and busts in the renewable sector have made it difficult to give young people the certainty to invest in a career in renewable energy. Renewable power generators are usually unable to offer the full suite of skills that an apprentice needs to become a licensed electrician. This limits the potential take-up of apprenticeships in renewable power generation. This is further compounded by the fact that most training packages include qualifications with competencies related to renewables as electives and not as core competencies.[487]

To make sure we're ready to take advantage of the transition to 100% renewable energy, we must ensure that we're providing training that's up to the task.

First, and most simply, every qualification in every training package for power generation, utilities, electrotechnology and building and construction should include skills as core competencies – not electives.[488]

Second, apprenticeships should be focused on the areas of the economy that are most important during the transition to renewables. Apprenticeships and associated qualifications should be designed to give people the skills and adaptability to work across a range of renewable power generation technology jobs.

Third, Apprenticeship Centres should focus their efforts on matching the next generation of workers to the next generation of jobs and cease support for employment in old technologies.[489]

4.6 Support our region to benefit from the clean energy revolution

Stop peddling 19th century coal to the world and start supporting 21st century renewables.

Every few months a desperate coal advocate says that coal provides a noble service to the developing world. They argue that since our economy was built on coal, every other country must pass through a dirty energy phase before they can get access to renewable energy.

They are right about one thing – getting access to energy remains a huge challenge around the world. In Australia, we take reliability for granted and worry about infrequent power outages. But for many people in our region, accessing reliable, affordable electricity is a distant dream.

Right now, 700 million people in the Asia Pacific lack access to electricity, while over two billion people burn wood, dung and crop waste to cook and heat their homes. In some cases, there's a shortfall in generation capacity – they simply don't have enough power plants – but, as often, the transmissions lines that deliver energy are deeply insufficient.

Many poor people simply can't afford to access electricity even when it is available. These people may live in the shadow of a transmission tower, but high costs of connection mean that they can't take advantage of the power running past their window.

However, the desperate coal advocates are also very wrong. While these challenges are daunting, our neighbours are embracing renewable energy, not coal, as a way to turn this situation around. Across the Asia Pacific, countries are embracing renewable energy to reduce fuel costs and deliver affordable energy. These countries are also acutely aware of the need to reduce emissions – while they may have done nothing to drive climate change they are the ones most profoundly affected by rising sea levels, increases in extreme weather and depleted fish stocks, not to mention the terrible health impacts of fossil fuel driven air pollution.

For many countries in the Pacific, renewables represent an opportunity to get away from expensive, carbon intensive diesel generators. The diesel used to power generators is dirty and imported at great cost, which is unsustainable in countries with small national budgets and limited export opportunities. Renewable energy opens up a range of options for switching to cheaper energy systems. Already, countries like the Cook Islands have pledged to move to 100% renewables, and many other islands are preparing similar transitions.

In South-East Asia there is a similar enthusiasm growing for renewable energy as smog and air pollution begin to have major health impacts. But while India, South America and Africa are all embracing wind and solar at a jaw dropping rate, a handful of coal barons still see South-East Asia as the last bastion of coal development. As such, more needs to be done to support our closest neighbours to access clean, affordable power. Australia can play a positive role in this clean energy future by exporting its technology and training the next generation of clean energy leaders from our region.

Gear our aid program towards universal access

Australia should play a leading role in ensuring universal access to clean electricity within our region. This means making access to energy a priority of our aid program. A new program in Australia's aid portfolio should be established to help identify and deliver opportunities for technology transfer and renewable energy development across our region.

Help build our region's scientific capacity

Scientific exchange can have incredible benefits for both Australia and our neighbours. Australia should develop a new scientific exchange program that is focused on energy transitions. This should include opportunities for scientists and engineers from SEA and the Pacific to study and learn at Australia's world-class scientific institutions and to establish new collaboration projects. These projects could include climate motoring, land-use improvements and the development of new renewable technologies.

Share the best of Australia's technology

Eighty-five percent of those who lack access to electricity are living in rural, remote places. Expanding centralised energy generation is unlikely to help these people, as the transmission lines required to provide electricity simply can't be economically developed in these rural areas. However, small-scale, off-grid solutions provide a range of opportunities to help improve access by providing low cost energy that is fit for purpose. Australia has the capacity to develop significant expertise in this area, given that we have a number of communities that are far from the grid. To drive this process, we should refine, deploy and scale off-grid solutions, working collaboratively with people from across our region to develop new approaches and deploying them at scale across the region.

Stop pushing coal

Coal companies have made a lot of money selling Australia's resources to the world, but those days are numbered. There is no doubt that global demand for coal is drying up as countries move to clean, cheap renewable energy, but to squeeze a little more out of the dying industry, the Turnbull Government is using our foreign muscle to try to bankroll coal projects through international development banks.

For example, Australia has pushed the new Chinese-backed Asian Infrastructure Investment Bank (an Asian-focused alternative to the World Bank) to fund coal projects in the region, despite the bank's own research noting that fossil fuel production has "severe negative impacts", particularly in Asia's densely populated cities.[490] We have also set up programs to encourage 'mining for development' despite the costs that such projects can have on local people.

We need to turn this around. Australia should be a consistent voice for renewables in all our engagements with other countries. From ministerial engagement through to development cooperation, Australia should be consistently helping countries to get off coal, rather than continue to push a costly and dangerous addiction for a narrow, short-term self-interest.

To bring transparency and accountability to our international engagements, an inquiry should be undertaken into the public service's capacity to drive renewables through our international engagement. As part of this, an audit should be undertaken into how much time is spent supporting coal projects compared with renewables as part of our bilateral engagements, along with an audit of the policy and technical knowledge within key agencies such as the Department of Foreign Affairs and Trade (DFAT) and the Australian Treasury.

PART 3

REPLACE
THE POLLUTERS

1. Introduction

It might seem obvious to some, but given the disproportionate influence of big fossil fuel companies over Australian politics, we need to spell it out: we cannot keep digging up and burning fossil fuels if we want a liveable planet. Fossil fuels have no place in a 100% renewable future. To fully unleash renewables, we need to get fossil fuels out of the market and into the history books. And we need to ensure that the right measures are in place to look after affected workers and communities during the transition.

To begin with, all levels of government should show their commitment to a renewable future by ruling out new coal or gas-fired power plants.[491] Because governments and corporations have encumbered today's energy system with the legacy of yesterday's terrible decisions, we also need them to remove the roadblocks holding back renewables, by:

- stepping in to help manage the orderly phase-out of coal-fired power by 2030
- supporting the transition to a flourishing future for post-coal communities
- passing air pollution laws strong enough to protect our health
- supporting our power, industry and transport sectors to get off gas
- cutting the fossil fuel subsidies that push energy spending in the wrong direction, and
- ensuring that new renewable players aren't held back by being made to pay through the nose for grid connections that most of their fossil-fuel predecessors acquired for free.

1.1 The key ingredients of good industrial policy

Take a hands-on approach to decision-making.

A hands-off approach to our economy is not an option. Every decision a government makes – or fails to make – shapes our economy in some way. High minimum wages incentivise employers to spend more on productivity boosting technologies. Mandatory building efficiency standards foster particular types of services and skills in the construction sector. Urban planning fosters some kinds of transport investments over others. Some economic options are open to towns with high-speed broadband and closed to those that lack this infrastructure.

It follows that if governments are already shaping the economy, they should make decisions in a conscious and informed way, rather than trusting dumb luck or the legacy of past decisions. Good industrial policy:

- reflects ambitious and achievable social goals (like reducing inequality or building a climate-safe economy)
- is based on a realistic understanding of a nation's potential economic strengths and weaknesses
- is supported by long-term investment in education and infrastructure
- develops the capacity of exporters to compete on value rather than price
- designs any industry specific measures to phase out in a smooth and predictable way once they have achieved their purpose
- works in tandem with bottom-up, locally tailored approaches to economic renewal
- is shaped by a highly skilled, independent, frank and fearless public service, with strong industry expertise and enough autonomy to resist short-term pressures from self-interested lobbyists, and
- is integrated into broader economic policy, which is in turn informed by sound advice on local and global megatrends (such as long-term trends in climate, population, consumption, growing and declining markets, investment shifts, regulation, etc.).

HOW TO REPLACE **THE POLLUTERS**

The path to a post-coal future

In this section we talk about how we can close old, dirty, toxic coal plants while supporting workers and communities to build a post-coal future.

- Secure a just transition for fossil fuel workers and communities by establishing a Transition Agency and supporting people to get the assistance they need to create a safe, jobs rich future
- Kick-start the coal power clean-up by implementing an orderly coal closure policy
- Stop the health hazards of burning coal by introducing pollution standards with teeth

Get off gas

In this section we outline how Australia can kick its expensive and polluting gas habit for good. Specifically, state and federal governments should:

- Promote renewable heating options for industry, including creating renewable industry precincts for gas and high temperature industries
- Introduce a Cash for Gas Guzzlers program to support households and small-business go gas free, by replacing gas guzzling appliances with efficient electric alternatives
- Make sure new households and developments don't get hooked on gas in the first place, by mandating they should be gas free.

Stop propping up polluters with public money

Australian taxpayers subsidise polluting fossil-fuel companies to the tune of billions of dollars each year. To repower Australia we must:

- End tax concessions such as the diesel fuel rebate for mining and accelerated depreciation for fossil fuel companies
- End cash subsidies by ruling out funding fossil fuel projects through the Northern Australian Infrastructure Facility and
- End institutional support for polluters across the board.

2. The path to a post-coal future

2.1 We need to talk about coal

Commit to an orderly phase-out of coal-fired power by 2030, with a just transition for affected workers and communities.

Australia's fleet of coal-fired power stations is among the oldest and least efficient in the world. Everyone knows that they will have to be shut down sooner or later – the only question is when. A carefully managed phase-out of coal-fired power will speed up the uptake of renewables, deliver major health and environmental benefits, and ensure that workers and their communities are looked after through the transition instead of being abandoned by the big power companies.

Whilst most experts agree that the closure of power stations like Liddell in NSW, Gladstone in QLD and Yallourn in Vic is inevitable, many politicians are not willing to confront the issue directly, even when energy companies are actively calling for intervention. By 2020, 45% of Australia's power stations will be over 40 years old.[492] AGL's Head of Economics and Sustainability, Tim Nelson, has described the design life of a coal-fired power plant as 25-30 years, and written that **"75% of the existing thermal plant has passed its useful life."** [493] A few years ago, nearly half of the coal-fired power plants over 35 years old had already been mothballed,[494] and those that remain up and running are operating past their use-by date.

No one should have to live next to these clunkers. **The plants that are most responsible for cooking the planet are also the worst for our health, emitting more toxic NOx, SOx (nitrogen and sulfur oxides), mercury and particle pollution** (particulate matter or 'PM') than other forms of power generation.[495] If regulations were passed requiring their owners to bring these toxic pollutants down to the level of the most efficient plants, they would be more likely to respond by closing them than by wasting money upgrading an asset that has no long-term future.[496]

The most polluting plants also tend to be the ones that waste the most water.[497] The insatiable thirst of sub-critical coal-fired power plants [498] has already caused electricity price spikes during droughts and it makes such plants highly vulnerable, given that more droughts are on the way as the world warms. As with the resistance to the impact of fracking on water tables in prime farmland, we can expect growing pressure to divert the water currently allocated to coal power to agricultural uses.

If we manage the transition, workers and local communities will be better off. If we leave it to the companies to sort out, then Australians will be left to eventually foot the bill through our taxes and we'll get old, dirty, dangerous plants and mine sites causing harm to people and the environment. How do we know this? Because it's already happening:

- The disastrous Hazelwood coal mine fire of 2014 started in a disused part of the mine which had not been adequately rehabilitated. The fire, which burned for 45 days, had massive health and economic impacts on local residents.[499]
- We have already seen the sudden closure of ten coal plants including the Anglesea, Hazelwood, Northern and Playford power stations in Vic and SA with no plan for a just transition (see Box 26 for lessons from the Hazelwood closure). Other plants are also teetering on the brink. **The closures at Port Augusta were announced just after a fire broke out inside one of the plants. It shouldn't take a potentially deadly accident to prompt us into action.**[500]

It was the responsibility of the owners of existing plants to have seen this coming. In the words of Grant King, CEO of Origin Energy: "Anyone who invested in coal-fired power in the last 10 years knew what the future looks like." [501] Their workers deserve support, however, and so do the communities in which they operate. **A plan to phase out coal which is predictable, affordable, and looks after workers and their communities is a much better option than leaving it to the whims of a volatile energy market and the owners of polluting companies who put profits before people.**

SA is now coal-free after the closure of the Port Augusta plants. Internationally, 20 countries led by Canada and UK have agreed to work together to phase out coal power by 2030.[502] **The federal and state governments should take the lead on modernising Australia's electricity system, giving workers and industry certainty with a plan for phasing out all coal-fired power by 2030, starting with the orderly closure of the oldest and dirtiest coal-fired power plants.**

Boom & bust

Unfortunately, in the past five years we have had the exact opposite of an orderly planned phase out of coal. Instead, hard-right ideologues like Tony Abbott have spent at least the last decade waging war on climate action. From rolling Turnbull as opposition leader, to the "axe the tax" campaign, to trying to kill the Renewable Energy Target, ARENA and the CEFC, the hard-line conservatives in our federal and some state governments have thrown everything they can at slowing renewable energy. While we know their efforts cannot hold back the tide forever, they have made the transition more chaotic.

As outlined in Part 2, Section 1.1, we have had a series of boom-bust cycles of renewables policy and deployment. This has had flow-on impacts for the closure of coal, workers and communities. After a renewables growth spurt in 2012-2014, Australia had an excess in electricity generation. We had some renewables and still a lot of coal-fired power stations. At this point, we sorely needed policy to get the most polluting power stations out of the system, to let the new renewable shoots grow. Instead, as we outline in Section 2.2 below, we had a series of disorderly exits, with 10 coal-fired power stations shutting down between 2011-2017, with an average of only four months' notice to workers, communities and energy system operators.

This spate of shutdowns happened to occur when Abbott's renewable energy target review by climate sceptic Dick Warburton caused our renewables industry to unwillingly slam on the breaks in 2014. As a result, we now have a tightening of supply and demand in 2016-17. What's more, in summer a number of the remaining coal and gas power stations increasingly aren't able to handle the heat. A report by the Australia Institute found that "during the February 2017 heatwave across south-eastern Australia, 3600 MW [of coal and gas generators] failed during critical peak demand periods in SA, NSW and QLD as a result of faults, largely related to the heat". This is equivalent to 14% of the total capacity of the coal and gas power plants in those states."[503] In all cases, renewables saved the day.

If that renewables investment in 2014-2015 had occurred as planned, we would be fine, but instead we need to rapidly scale our renewables, storage and demand management deployment to ensure we can power our homes over summer, with decrepit coal clunkers no longer really up to the job. The good news is that we have a huge pipeline of renewable energy projects, with 2017 being the biggest year for renewables construction in Australia's history. The bad news is we still don't have a plan to retire coal-power plants past their 35-year design life.[504]

All of this has implications for policy. If we continue this boom-bust cycle, it will mean sometimes we need policies to support power station retirement and then other times we need policies to support renewables deployment. However, this boom-bust cycle is a terrible approach to industry policy. Instead, we need a fearless policy approach that recognises the age of coal is coming to an end and an orderly and just transition is needed now.

Generators want governments to intervene

AGL, which earned itself the title of Australia's biggest greenhouse gas emitter when it went on a coal-fired power shopping spree between 2012 and 2014, now wants governments to play a hands-on role in the closure of their own and their competitors' oldest and most polluting power plants:

"We believe policy makers should begin to consider how to facilitate an 'orderly' rather than 'disorderly' exit and replacement of the ageing capital stock"
– AGL Head of Economics, Tim Nelson, 2015[505]

"It is important that government policy incentivise investment in lower-emitting technology while at the same time ensuring that older, less efficient and reliable power stations are removed from Australia's energy mix"
– AGL CEO Andrew Vesey, 2015[506]

Meanwhile, **a consensus has quietly emerged that no new coal-fired power stations will be built in Australia.** Big power companies like Engie (GDF Suez),[507] Origin Energy[508] and AGL have announced that they will not be replacing their old coal-fired generators with new ones.[509] **This isn't surprising given that wind and solar PV are both already cheaper than new-build coal or gas.**[510]

Indeed, only the conservative climate deniers willing to ignore facts seem to think a new coal power station is a good idea. Knowing full well that private investors are not going to fund a new coal power station, Abbott and his mates have abandoned their 'free-market principles' and are now calling for government to fund a new one in QLD. A fool's idea.

However, the LNP's love of coal still extends beyond just the hard right. In the most recent example of the prime minister putting a love of coal before the people he represents, Malcolm Turnbull has attempted to stop AGL from shutting Liddell in 2022. It's almost unheard of for a prime minister to publicly tell a company what to do and what he was proposing – extending the life of Liddell – would cost $3.6 billion, while alternatives such as clean energy solutions would cost $2.2 billion. An ISF study found that a Clean Energy Package including energy efficiency, wind energy, demand response and flexible

pricing would save more than $1.3 billion compared to the Extend Liddell scenario.[511] While AGL does not have a stellar track-record, it's announcement in 2015 that it planned to close Liddell – one of the oldest coal power stations still standing in Australia – is the type of corporate leadership that we should celebrate. Seven years of advanced notice gives the community and workers time to plan. Now we need to ensure that the measures to ensure a just transition are put in place (see Section 2.2 below).

Why haven't the most polluting plants been decommissioned already?

With the closure of Hazelwood in 2017, Australia's dirtiest power plant has finally shut down. However, there are still 19 more coal-fired power stations chugging away, spewing pollution into the atmosphere. What's stopping them closing? There are three main hold-ups to the transition to cleaner power sources.

Firstly, nobody wants brown coal, except for the handful of ageing power stations that have already been built to burn it. Brown coal is, in essence, worthless toxic sludge. It has almost no export value, and this makes it cheap[512] – so cheap that the power stations burning it can undercut their cleaner competitors. (While new-build wind is cheaper than new-build coal, a written-off coal-fired power plant puffing away in the final years of its existence can undercut other generators, including newer coal-fired power plants.) A carbon price would help to shorten the profitable lifespan of the most polluting power stations but brown coal in particular is so cheap that the price would have to be quite high to drive it out of the market altogether.

Unfortunately, the current market dynamics mean that it's more likely that a black coal power station will shut down next, rather than brown coal – which is sub-optimal to say the least from a pollution perspective. As brown coal is so cheap, it means its brown coal generators are cheaper to run than black coal generators (see Table 12 below). According to Environment Victoria, this means:

"Victoria's brown coal generators tend to run at high capacity factor, compared to the more expensive black coal power stations in New South Wales and Queensland, many of which are only operating at 50-60%. If higher cost generators are producing less, they are likely to be less profitable, and therefore more likely to close. Black coal generators in New South Wales and Queensland are roughly 30-40% less polluting than Victoria's brown coal generators. The closure of a black coal generator could lead to an increase in output at Victorian generators, potentially increasing carbon emissions despite the closure of a power station."[513]

Experts agree, government intervention is needed to stop this happening.[514]

Secondly, when it comes to quitting coal, when there is an *excess of generation* like in 2015 and again in a few years when the current pipeline of renewables gets built, **lots of players want out, but no one wants to be the first to leave.** This is because those who stick around a little longer will benefit from a slight boost in wholesale electricity prices if their dirtier, cheaper competitors shut down first. In other words, **the owners of outmoded coal plants play a game of chicken, hoping the other guys will swerve first.**[515] **If all of them refuse to blink, the rest of us have to deal with the consequences: power plants operating dangerously past their use-by-date and undermining the business case for renewable energy and harming people and the planet.**

Finally, **safely decommissioning and cleaning up coal power plants and their associated mines costs money** – quite a lot of money.[516] Unfortunately, past governments have been lax landlords. They have failed

Table 12: Victorian Brown Coal Mine Rehabilitation Bond Increases[517]

Figures in $millions

	Original bond (set at privatisation)	Bond increase announced April 2016	Bond increase announced October 2017
Loy Yang	15	112	154
Yallourn	11.4	68.5	148
Hazelwood	15	73.4	289

to require power plant and mine owners to pay upfront bonds sufficient to cover the full costs of clean-ups if they go broke. Though we should note that after some good campaigning the Vic government has required the remaining brown coal mine operators in the Latrobe Valley to increase their rehabilitation bonds, in line with what is actually needed to ensure these huge and toxic pits are remediated effectively.

However, in other states, taxpayers and local communities continue to be left unprotected. Owners of existing mines know that costs delayed are costs saved, so they have yet another incentive to 'sweat' their assets beyond their natural life, or abandon them to grow cobwebs instead of paying to dismantle them. As the Hazelwood mine fire shows, the consequences of putting off proper rehabilitation and not maintaining their assets can be very serious. As Frank Jotzo points out, we should at least regularly audit whether power station owners are in a financial position to cover their decommissioning costs.[518]

Outmoded coal: a major obstacle to renewable energy

The state of our energy market is pretty odd by international standards. It is unusual to have policies to support increased investment in renewable energy without a price on pollution or emissions standards to speed the exit of old, dirty, coal-fired power stations. The effectiveness of policies like the RET have been held back by unfair competition from coal companies, who receive direct subsidies in the form of cheap water and other government handouts, and indirect subsidies in the form of unpriced pollution and health impacts.

Right now, though additional renewable investment faces many hurdles, they are very cheap to run once they're built. That's why Sven Teske and the team at the Institute for Sustainable Futures have found that a 100% renewable energy system will cost less overall than a system based on fossil fuels.[519]

But the upfront costs of building more renewables must be paid for, and recovering those costs can be hard when competing with written-off fossil fuel plants that were built decades ago on the taxpayer's dime. **Defunct coal-fired power plants are hanging around like the ghosts at the feast, deterring investment in new renewables by raising the possibility that they could be reanimated if prices rise again.** Over the next decade we need to get excess dirty energy out of the market once and for all to give renewables projects the certainty they need.

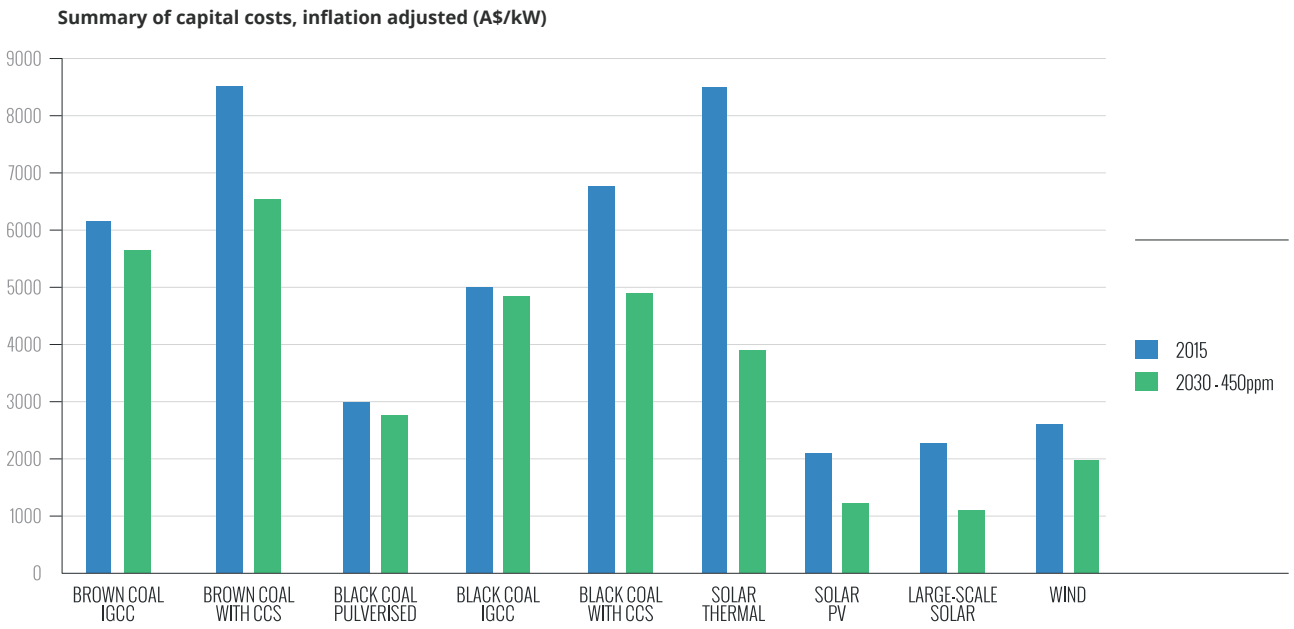
Coal and Australia's climate pollution

Coal-fired power closure is necessary to get Australia in line with the global effort to slow down and reverse dangerous climate change. To limit global emissions to a level consistent with a 2°C warmer future,[520] the world needs to shut down at least a quarter, or 290 GW, of 'subcritical' coal-fired power by 2020 (the equivalent of around 300 very large plants).[521]

Fast facts: coal and the climate

- Three-quarters of Australia's electricity comes from coal and the vast majority of that comes from obsolete, inefficient 'subcritical' coal plants.[522] We can think of this style of plant as the equivalent of sticking a lidless pot on an open fire rather than a pressure-cooker on an induction stove.
- Because of this coal and inefficiency, Australia does more damage to the climate per unit of electricity than almost any other developed country – even more than China and Saudi Arabia.[523] It also means every Australian is responsible for more pollution than any other population in the developed world.
- By announcing a carbon pollution reduction target of 26-28% on 2005 levels by 2030, the Turnbull Government created a new floor on climate action. If Australia is to pull its weight in preventing dangerous climate change, this target is not sufficient. What the government's target *does* do, however, is put brown coal power stations on notice, because the target would be impossible to attain if their owners managed to keep them ticking over until 2030.
- Ultimately, all coal-fired power is incompatible with a liveable planet. The big coal-fired power companies spent far too long using the idea of capturing and burying their emissions as a delaying tactic rather than a serious investment. With the world taking substantial climate action in the wake of the Paris climate conference, they have left it far too late to get on board.[524] While these companies were lobbying against climate action and waving around pamphlets on Carbon Capture and Storage (CCS), the rest of the world was working to bring down the cost of genuinely clean energy. The result is that, internationally, wind and solar PV costs much less now than coal plants with CCS, which shows that coal, with or without CCS, is out of the picture on capital costs alone, without taking fuel costs into account).[525]

Figure 24: Generation technologies: capital costs 2015 and 2030 [526]



2.2 Secure a just transition for fossil fuel communities

A just transition means that Australian communities don't just survive the energy transition, but drive it – generating stronger, more secure work, and futures particularly for fossil fuel affected regions.

To achieve energy justice, we must make sure that people working in the old energy industries and the communities that surround and support them are not left behind in the coal dust. We need a just transition.

So what is a just transition?

The term 'Just Transition' comes from the labour movement and was first used by a Canadian union activist called Brian Kohler in the 1990s as part of a movement-wide effort to reconcile union imperatives of protecting decent jobs and conditions with the need to protect the environment. Kohler said: "The real choice is not jobs or the environment. It is both or neither." [527]

This concept was enshrined in the Paris Climate Agreement which implores states to take into account the imperatives of a just transition and create decent work and quality jobs.[528]

Communities across the world have developed guiding principles in which to shape a just transition:

1. improve the quality of life for people and communities affected by economic disruption, environmental damage, and inequality
2. foster inclusion, participation and collaboration
3. generate good, stable and meaningful jobs and broad, fair access to them
4. promote innovation, self-reliance and broadly held local wealth
5. protect and restore public health and environment
6. respect the past while strengthening communities and culture
7. consider the effects of decisions on future generations.[529]

To date it's been an unjust transition

In Australia this means creating policy and plans to ensure workers and communities in traditionally coal-producing regions are supported to lead local transitions into new decent jobs and sustainable local industry. This marks a significant departure from the chaotic market-driven approach to power station closure favoured by Australian governments to date.

Australia has a history of doing structural adjustment badly.[530] We often wait until a company or an entire sector goes under before offering training or financial assistance to retrenched workers.

In some cases, governments have deliberately washed their hands of responsibility for the consequences of their lack of foresight on the fate of coal-fired power. In NSW for example, the sale of government-owned Vales Point at the knock-down price of $1 million has allowed the government to dodge liabilities for decommissioning and worker redundancy.[531] In other cases it's simply a matter of too little, too late. The sudden closure of Alinta's operations in Port Augusta (see Box 28) illustrates the inadequacy of an unplanned transition away from coal-fired power.

Since 2012, 11 coal power stations across Australia have closed, with most giving four months' notice or less to workers and community.

Regions affected by the transition away from coal on average experience higher than normal unemployment.[537] This is thanks to policies of neglect executed by multiple governments and companies over many decades. Those who support a fairer and more sustainable future for all Australians hold ourselves to a higher standard. **We want communities grappling with the legacy of others' bad decisions to flourish, not just survive.**

Whether you think Australia's fleet of coal-fired power stations will or should be shut down over the next five, 15, or 30 years, one thing is clear. **The foundations of a post-coal future must be put in place today if affected workers and communities are to thrive through the transition and reap the benefits of energy justice.**

Table 13: Coal power station closures 2012–2017 [532]

Power station name	State	Size (MW)	Date closure announced	Date closure occurred	Notice period for workers and communities
Swanbank B [533]	QLD	500	March 2010 [534]	May 2012	26 months
Collinsville	QLD	190	June 2012	December 2012	6 months
Munmorah	NSW	1400	July 2012	July 2012	none
Wallerawang C	NSW	1000	January 2014	April 2014	4 months
Redbank	NSW	151	October 2014	October 2014	none
Energy Brix	VIC	170	July 2014	August 2014	1 month
Anglesea	VIC	150	May 2015	August 2015	3.5 months
Playford B	SA	240	June 2015	October 2015	4 months
Northern	SA	520	June 2015	May 2016	11 months
Hazelwood	VIC	1600	November 2016	March 2017	5 months
Muja AB	WA	240	May 2017 [535]	September 2017 [536]	4 months

A nation-wide just transition

In an energy transition so far characterised by decisions of corporate elites and the chaos they leave behind, the first step is to establish a nationwide coordinating body, responsible not just for moving Australia to clean energy, but for ensuring a just transition for working people and communities.

The Australian Council of Trade Unions (ACTU) has called for such an authority to be tasked with coordinating the orderly phase out of Australia's coal-fired power stations and managing the workforce transition to minimise the impact on workers, their families and communities.[538]

This authority could be the Energy Transition Agency (as outlined in Part 1, Section 2.1). In addition to overseeing the energy transition, this national agency would coordinate local transition authorities (empowered at the state level) to support workers and communities on the ground. Local authorities would be accountable to key stakeholders including unions, industry, local community and environment groups through local advisory councils. It would also work closely with other local transition agents such as Regional Energy Hubs (see Part 2, Section 3.5).

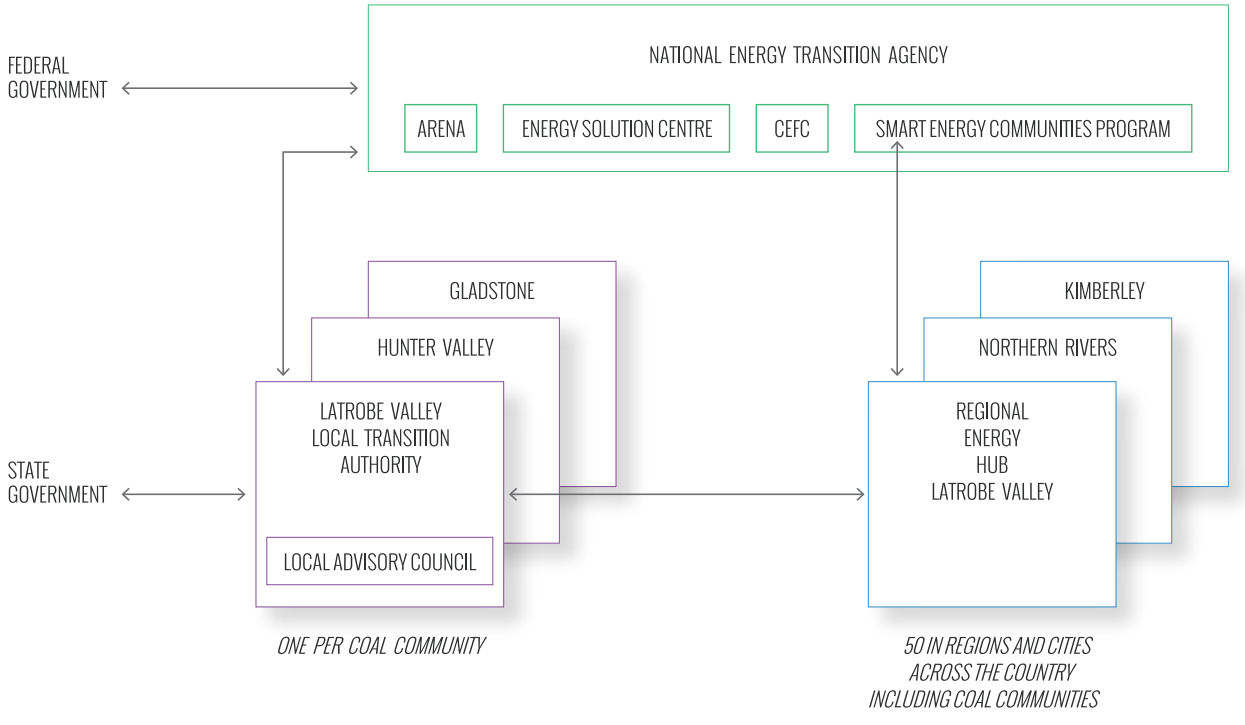
The Energy Transition Agency (ETA) should be jointly funded by industry and government and empowered by legislation. Making it an 'independent statutory authority' ensures it has a mandate that outlasts changes in government and allows it to rise above politics to deliver a steady transition plan, providing certainty for communities and workers.

Communities and workers deciding their future

When supporting a town to respond to the closure of coal-fired power stations, the shape of the transition should be driven by the community and workers and assisted by government, rather than using a 'one-size fits all' approach.

In addition to locally led strategies, any government that cares about the welfare of post-coal communities, regional jobs and Australia's long-term prosperity should also make strong industrial policy an immediate priority, starting with the basics, like infrastructure and access to training and education (see Part 2, Section 4.5 above). A lack of long-term public investment in essential infrastructure is a major barrier to good community economic development. Likewise, the regional TAFE

Figure 25: How they fit together: the Transition Agency, Regional Energy Hubs and more



Box 27: The Latrobe Valley Authority

Following the closure of Hazelwood power station, the Vic government set up the Latrobe Valley Authority (LVA)[539] to manage transition and provide support to workers.

So far, the authority has overseen:

- the creation of a worker transfer scheme placing 150 Hazelwood workers into jobs at other power stations
- delivery of a worker transition service, providing tailored support for workers and their families
- a Back to Work Scheme, enabling local businesses to hire and train unemployed people who live in the Latrobe Valley
- a program to retrofit 1000 homes with energy efficiency upgrades and solar
- plans to upgrade the Gippsland rail line, creating 400 jobs.

The LVA faces a number of ongoing challenges in its operations. Chiefly, it was not created until after the announced closure of Hazelwood, meaning it has had to play catch up from day one.

Additionally, it has only been provided with four years of funding, it does not have independent decision-making power and is not a statutory authority so is vulnerable to changes in government. Activities of local authorities like the LVA could be greatly strengthened and supported by a more coordinated national approach, such as empowering the ETA to oversee an industry wide transition, mobilise funding support, build relationships between local communities and encourage best practice in transition.

network is one of our best tools for delivering timely, tailored high-quality retraining packages. Governments should restore its funding and role at the heart of vocational education and training.

Ensuring each worker gets the assistance they need

Just like communities, individual workers will benefit from tailored assistance rather than a cookie-cutter approach. Given that there are already many barriers preventing coal sector workers from finding employment in other industries, a proactive approach is key.[540] One such approach is to create Job Hubs, empowered to provide personalised support and employment pathways in all coal-affected communities well in advance of power station closure.

Job Hubs can be located within existing or newly established local transition authorities and will:

- undertake comprehensive skills audits to assess opportunities within the current workforce
- provide individually tailored retraining options that provide relevant, useful, transferable skills at low to no cost
- deliver centralised, high-quality support including job placement services, financial counselling, short-term income support, advice and coordinated training pathways that can be undertaken whilst still employed.

Individualised retraining programs should be designed in advance, to allow workers to equip themselves for a smooth transition to new occupations. Examples could include:

- bridging qualifications and skills-gap training for those who need it, an area in which TAFEs have significant experience
- a post-trade qualification at diploma or graduate diploma level in high-level technical skills to broaden workers' existing employment experience in infrastructure and machinery repair and maintenance
- training in mine site rehabilitation, as one possible good way to ensure that the existing workforce can benefit from the jobs that come with decommissioning power stations and their associated mines (the skills needed for the initial stages of mine site rehabilitation will already be possessed by many miners, but the later stages are likely to require more specialist environmental management skills)

- training in business skills and access to loans for those with relevant trade skills to set up a small business.

In each coal-fired power station, there will be different cohorts of workers who will want different things when the plant closes. Some will be willing to take a decent redundancy or retirement package, others will want to move to another coal generator and some may take advantage of retraining opportunities and seek work in alternative industries.

The ETA can ensure a smooth transition for workers by overseeing an industry wide, multi-employer pooled redeployment scheme that allows workers to stay employed in the sector for as long as possible. A pooled redeployment scheme would:

- offer staff from closing generators redeployment opportunities from remaining power stations or opportunities to transfer to renewable projects
- provide first priority to older workers, who find it more difficult to transition
- provide voluntary redundancy packages (including superannuation contributions) for those who do not wish to participate in redeployment schemes.[541]

Too often working people are told blatant lies about how long power stations will remain operating. A year before Hazelwood closed the community were told the station would run until 2032. A pooled redeployment scheme will be most effective and provide real certainty to workers if it is paired with realistic timelines for the phase out of coal power. People deserve to know how many years of work in the sector they have ahead of them and we should take over-optimistic lifespans provided by coal companies with a large grain of salt. For example, AGL saying that it plans to keep Loy Yang open until 2048 is just deceptive – we need to talk about real timeframes. The ETA should be empowered to transparently manage a smooth phase out of coal power stations that is consistent with Australia's constrained carbon budget and commitment to keep global warming well below 2°C.

Photo: Erika Degoute

Box 28: Repowering Port Augusta

In August 2017 a 150 MW solar thermal plant with storage was announced for construction in the SA town of Port Augusta.[542]

In the months before the announcement, the fight for a just transition in Port Augusta had reached a critical point. For over five years the community had been campaigning for the town's polluting coal-fired power stations to be replaced with a concentrated solar thermal plant. Only a year before, Port Augusta's two coal power plants, Northern and Playford B, had shut their doors without a transition plan in place.

"It was a fairly rude shock to most people – because they'd been saying it would be 2030 only months earlier," says Gary Rowbottom, a technical officer who worked at Alinta's power station.

The community knew that a just transition in Port Augusta would benefit everyone, not just the people who were losing their jobs. The entire community has suffered the impacts of burning coal on the outskirts of their town, which has historically had some of the highest rates of lung cancer in SA, and above average rates of respiratory diseases like asthma. Replacing coal with solar energy would mean more than 650 construction jobs and 50 ongoing jobs as well as a healthy environment for everyone.

Gary Rowbottom is also chairperson for the Repower Port Augusta community group which led the solar campaign charge alongside the city council, unions, local business groups, health groups, climate groups and renewable energy groups across Australia – as part of the Repower Port Augusta Alliance.

In 2012 the Repower Port Augusta group invited the community to vote on whether the existing coal-fired power stations should be replaced with a solar thermal plant or gas. The poll received over 4000 votes, with a resounding 98% of voters supporting a transition to solar. As Gary says, "we recognised a good idea when we saw it".

On August 14 2017, a year after the coal stations had closed, the SA government committed to a long-term power purchase agreement for the world's biggest solar thermal plant with storage to be built in Port Augusta by SolarReserve, following an open tender process.

On the day of the announcement, resident and Repower Port Augusta spokesperson Lisa Lumsden said, "Premier Weatherill and the South Australian government backing solar thermal in Port Augusta is a testament to the hard work and generous spirit of our community and everyone who has stood with us to make this happen. This will help us build a bright new future in Port Augusta and will ensure SA has clean, renewable electricity 24/7".[543]

Dan Spencer, Repower Port Augusta campaigner with Solar Citizens, summed up what the victory represents for transition policy in Australia: "This decision shows what can be achieved when our representatives stop using renewables as a political football and get on with making an orderly transition to clean, renewable energy happen for all Australians."[544]

As Gary says, "The construction and operation of these plants bring real jobs to real families, making real electricity, clean electricity, for decades. That is the vision we want to share in for our country, and for our region".

Renewable economic renewal

The example of Repower Port Augusta (Box 27) shows that, in many cases, renewable energy projects are waiting to step in and fill the gap when old coal-fired power stations shut down. Industries like grid-scale battery construction can be leveraged to make use of existing grid infrastructure. In some places newer coal and gas plants may be suitable for conversion into turbine-only 'synchronous condensers' to help stabilise the grid.[545] For transitions in the energy sector, there are significant opportunities in different clean energy options discussed throughout the Repower Australia Plan.

The opportunities, if done well, could create thousands of new jobs. And it's not just energy jobs that will be created by the shift to clean energy. Many local industries will benefit, from turbine manufacturers and concrete producers to sandwich shops and local service industries.

However, it's not enough just to rely on high job creation in the new energy industries. We also want the jobs of the future to be safe, secure and satisfying, and

there needs to be broad, fair access to them. Achieving this will take long-term planning and support. Industries need certainty to grow and employers need an idea of future workloads to create permanent well paid jobs. This kind of long-term thinking and leadership is a pivotal role that can be played by the Energy Transition Agency (see Part 1, Section 2.3).

Finally, to ensure local communities like those affected by the phase-out of coal-fired power also stand to benefit from the scale-up of renewable power, policies could also be designed so that coal-affected communities are among the first to benefit from energy efficiency programs and the growth of renewables. For example, coal-dominated communities with good wind and solar resources should be among the first in line for public renewable energy funding (for example via the Community Powerhouses program) and should be among the first in line for funding for energy efficiency projects.

In addition, traditional coal communities, can – with support – also benefit from the emerging economic opportunities in reducing pollution across all sectors, including manufacturing, agriculture/land use, waste management, transport systems and buildings and construction.

Local communities playing to local strengths

While mining and electricity sector jobs are high paying across coal-affected regions, they account for a relatively small percentage of total employment.[546] So when providing structural assistance to communities, it's necessary to deeply understand the lay of the land and play to local strengths. This means bolstering other local industries in the area and working to diversify economic and employment opportunities before shutdown, rather than taking the past approach of paying large sums of money to lure big businesses into a community that they are unlikely to have a commitment to support.

No one understands local strengths better than community members themselves. Communities can be supported to design strategies to shape their own economies by establishing local advisory councils to bring all stakeholders together. These local advisory councils would be funded by the national ETA and supported by local transition authorities. Including local, state and federal governments, local businesses, unions, power station and mine owners, and community groups (including social justice, Indigenous and environment groups) could develop economic diversification and renewal plans that take that community's specific strengths and challenges into account. To help with this process, proposals from these local advisory councils could be tagged for priority funding from local authorities and existing regional development programs.

A just transition is about much more than just finding work for people who've lost their jobs in the coal and gas sectors. And when planning for changes that will affect the whole community, it's important to make sure everyone is meaningfully involved. Poorly managed transitions risk entrenching existing inequalities, so interventions to promote empowerment of women, young people, Indigenous people and people from culturally and linguistically diverse communities to actively participate in and benefit from the transition is crucial.

Support for existing small businesses in transitioning regions is also important, particularly if these small businesses have been dependent on supply chain opportunities from coal-fired power stations, such as small-scale manufacturers and catering companies. This support could come in the form of additional financial support (grants and loans), training, financial counselling and support to identify new business opportunities.

The effects of industry transitions amplify outwards, so it's important that support services provided to power station workers also be accessible for their families; including counselling, other mental health services, employment assistance and training.

Key interventions for a just transition

Two critical ingredients in delivering a just transition are certainty for the workforce and local leadership from communities. This means that good transition policy will require not just long-term planning, support and policy signals from government, but also a degree of decentralised decision-making and leadership that allows for genuine local ownership of economic renewal plans.

This means there are important roles to be played and key pieces to be delivered at all levels of government.

Key policy recommendations for federal government:

- Create the ETA as an independent statutory authority to oversee the energy and workforce transition
- Support the ETA to deliver an industry wide pooled redeployment scheme
- Seriously invest in essential infrastructure to support long-term regional development
- Set clear climate and energy policy signals to provide certainty to industry, communities and workers experiencing transition.

Key policy recommendations for state governments:

- Establish local transition authorities (or confirm funding of existing ones) to facilitate a just transition in local communities
- Support local advisory councils of local stakeholders to inform local authority decisions
- Support local transition authority to deliver Job Hubs, providing worker support and employment pathways well in advance of power station closure
- Make sure companies are liable for full rehabilitation of mines and decommissioning of power stations. Ensure that power sector workers from local areas have first priority to these employment opportunities.

Key policy recommendations for local governments:

- Actively lead on sustainable, strengths-based local economic development strategies
- Facilitate programs that support the entire community through transition, establishing community driven economic renewal plans and extending support to other local industries, families of affected workers and traditionally marginalised groups.

2.3 Kick-start the coal power clean-up

Support the orderly exit of the oldest and dirtiest coal-fired power stations.

We need governments to step in to help manage the orderly, planned phase-out of coal-fired power plants. There are a few ways this can be done:

1. **A centrally managed and planned transition.** This would be where a Transition Agency (proposed in Part 1, Section 2.3) takes responsibility for managing Australia's (or an individual state's) transition to 100% renewable electricity by 2030 and the full shut-down of coal. They would ensure sufficient renewable capacity is installed and then require through legislation coal power stations to close, on a predetermined timeline. This would allow for local planning, electricity system planning and would ensure that that we stay within Australia's carbon budget in the process.
2. **Lifetime limits.** This is where governments legislate that a power station must close after it reaches a certain age. The Finkel Review proposes that age should be 50 years, however this is clearly too old, for climate reasons as well as reliability and security of supply reasons. An analysis could be done of the carbon budget for the Australian electricity sector and then an age limit set to ensure that coal-fired power stations close in time to meet this budget.
3. **Emissions intensity standards.** This is where plants are required to close if they are above the maximum emissions standard, with the standard slowly tightening to zero by 2030. However, given that the most emissions intensive power stations are all in Vic, a national standard would likely create energy security issues. As such, state-based standards would need to be established. Emissions standards were the "centrepiece of President Obama's Clean Power Plan in the US: requiring different states to meet overall emissions intensity standards, which have been set in recognition of state-by-state peculiarities. It is expected this could lead to the closure of 30-49 GW of US coal capacity by 2020." [547]
4. **Coal clean-up auctions.** Where coal power stations bid for funds to help them cover their closure costs. This option is written up in detail in Version 1 of the Repower Australia Plan and combines elements from models proposed by Dr Frank Jotzo and Salim Mazouz at ANU,[548] Dr Richard Denniss and Rod Campbell from The Australia Institute,[549] insights from researchers at the Institute of Sustainable Futures at UTS, and insights from researchers at the Stranded Assets Program at Oxford University's Smith School of Enterprise and the Environment.[550]

A good coal closure policy must be designed to deliver on the best possible combination of the following outcomes:

1. Shut the highest-emitting plants first and create an incentive for the remaining generators to reduce their emissions
2. Ensure that energy security and reliability are not unduly affected
3. Distribute windfall gains to remaining generators (from higher prices and market share) fairly to incentivise low-cost exit
4. Ensure companies are not let off the hook for their responsibilities to workers and the community, including redundancy packages, retraining, rehabilitation bonds and more.

Each option has different strengths and weaknesses, however whichever policy (or combination of policies) is chosen, one thing is clear. We need to support existing coal communities and workers to plan for alternatives right now.

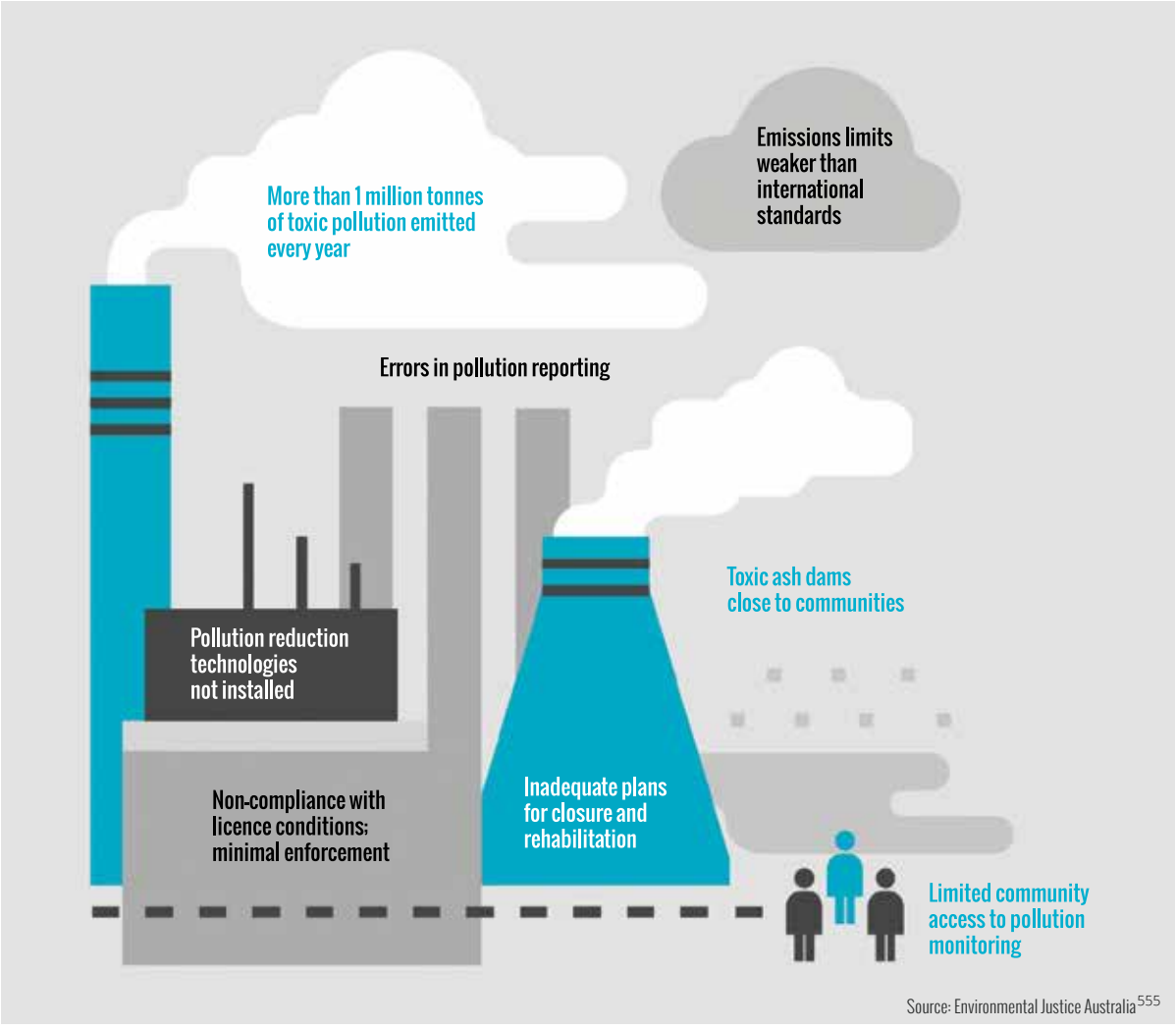
2.4 Cut toxic pollution from existing power stations

Require coal power stations to clean up their pollution – and pay for the health costs they inflict on our communities.

The coal clean-up auctions are a smart way to get the ball rolling and to help ensure adequate funding for rehabilitation and a just transition for affected workers and communities. But without stronger emission regulations, coal and other fossil fuel generators will continue free-riding by forcing the rest of us to pay for the health costs of their pollution. To protect Australians from these impacts, we need to implement stronger national air pollution laws and more effective monitoring and enforcement by the states, in line with proposals from Environmental Justice Australia (EJA).[551]

Politicians propped up by the coal lobby like to hide behind the fact that Australia has relatively good air quality by international standards, but that's no comfort to Australians that suffer from this pollution every day. Despite improvements over the past two decades, a 2013 Senate Committee inquiry found that air quality is still a major problem in many parts of Australia.[552] More than 3,000 people die from urban air pollution

Figure 26: Australia's coal-fired power stations: toxic and underregulated



Source: Environmental Justice Australia[555]

in Australia every year according to one estimate,[553] and the total financial cost to communities of coal pollution – including the costs of treating respiratory and cardiovascular diseases, lung cancer, and many other illnesses – is estimated at $2.6 billion per year.[554]

If 3,000 Australians a year were dying from gunshot wounds, we'd see the strictest gun control laws the world has ever seen. But air pollution, the silent killer with powerful friends in government, is allowed to get away with murder.

The burden of bad air is not shared evenly throughout the community. Not only are children, pregnant women and elderly people particularly vulnerable to the health effects of air pollution, researchers have found that communities exposed to the most toxic emissions tend to be those where Australia's most disadvantaged people live. Australia's most polluted areas have disproportionately low incomes and education levels, high unemployment, and high numbers of Indigenous residents.[556]

Fast facts: Coal is Australia's biggest air pollution problem

Coal-fired power plants are the worst source of air pollution in Australia:

- Coal power stations produce over a million tonnes of toxic pollutants every year, emitting more than 30 chemicals that cause or contribute to serious health problems including increased risk of heart attacks, strokes, asthma, lung cancer, and other respiratory and cardiovascular diseases [557]
- Burning fossil fuels for electricity generation is the single largest source of sulfur dioxide (SO_2), smog-forming oxides of nitrogen (NOx), and fine particle pollution ($PM_{2.5}$), all of which are particularly hazardous to human health [558]
- People who live near industrial pollution sources (such as coal mines and coal-fired power stations) are most at risk from the health impacts of air pollution, as well as groups that are inherently susceptible to poor air quality, including children and the elderly, those with pre-existing heart and lung disease, and socio-economically disadvantaged groups [559]
- Coal pollution travels – the majority of sulfur dioxide and oxides of nitrogen in Sydney comes from coal power stations in the Hunter Valley and Central Coast.[560]
- Some of Australia's major pollution hotspots include:
  - Morwell, Vic, where coal-fired power stations and mines have created one of the highest PM pollution levels in Australia. It's also where the 2014 Hazelwood coal mine fire created 15 times the acceptable limit of pollution and where a leading expert found a "high probability" that eleven deaths were caused by the fire.[561]
  - Port Augusta, SA, where Alinta's coal-fired power stations have now closed down, has twice the average lung cancer rates in the state and the highest childhood asthma rates in the state [562]
  - The Hunter Valley, where burning coal has been estimated to result in $600 million worth of health costs a year and national air pollution standards are routinely exceeded.[563]

Yallourn Power Station, Latrobe Valley. Photo: Martin Wurt

Box 29: Liddell's losing battle

If there was one power station that could serve as the poster child for the politics of coal in Australia, it would be the ancient Liddell Power Station in NSW. Built in the early 1970s, since the closure of Hazelwood it's now Australia's oldest and likely most decrepit power plant. Ongoing problems with turbine, boiler and conveyor belts have required over $140 million in repairs since 2015[564] and resulted in significant outages during the summer of 2017.[565] As station owner AGL Macquarie's general manager put it, "The failures become more regular, the weak points larger and more numerous. We are fighting a losing battle."[566]

Given the mounting financial and environmental costs of keeping Liddell running – estimated at $3.6 billion *and* 40.4 MT of additional CO_2 emissions to extend its life by just five years[567] – it's no surprise that AGL recently announced plans to close the station in 2022.[568] In a September 2017 analysis, AEMO said that this closure would not impact the reliability of the Australian electricity system – provided that new resources step forward, such as "additional renewable generation... to deliver a national renewable generation outcome."[569] Of course, that's not what the coal-fired wing of the Coalition wanted to hear, which led to the bizarre spectacle of the Prime Minister futilely begging AGL to reconsider its decision.[570]

Amidst all this discussion about reliability and economics, it's unfortunate that the human health costs of Liddell have not been a larger part of the conversation. According to EJA, it emits comparable PM, NOx, and SOx to power stations that run much more often, and it has the highest SOx emissions intensity of all Australia's power stations. It has also had a growing list of environmental non-compliance reports in recent years, including a series of issues relating to coal ash dumping that have endangered local bodies of water. Most luridly, water discharged from the station into Lake Liddell has caused the once-popular recreational spot to be closed due to an infestation of deadly, brain-eating amoeba.[571]

The fact that politicians would seek to extend the life of this facility, which is not only losing millions of dollars but inflicting ongoing environmental and health damage to the surrounding community, is shameful proof of where their loyalties lie – to coal companies, not their constituents.

Profits before public health

It's very clear that Australia's air quality laws are not strong enough. A 2011 review concluded that Australia's existing pollution regulations "are not meeting the requirement for adequate protection of human health,"[572] and the Australian Medical Association says that: "Current air quality standards in Australia lag behind international standards and have failed to keep pace with scientific evidence." Disturbingly, in contrast to areas like renewable power where states are showing leadership while the Commonwealth government dawdles, the blame for Australia's failure to control pollution lies equally with both levels of government.

The federal government only requires the states to monitor and report emissions for six common pollutants, including SOx, NOx, and PM, against national standards, but requires no specific enforcement actions. Former Environment Minister Greg Hunt previously flagged his support for stronger federal action on air pollution, saying, "This is a critical national issue and I would like it to be a signature objective of my watch."[573] But when the 'National Clean Air Agreement' was struck in December 2015, it turned into a race to the bottom that failed to tackle most of Australia's major sources of air pollution, including coal-fired power stations and mines, and instead proposed "cooperative action" with industry without guaranteeing meaningful enforcement or even a unified national framework for regulation.[574]

So, as it stands, the states are where the rubber hits the road in terms of enforcing our pollution standards – but by all accounts, most states are asleep at the wheel. Pollution standards nominally exist for both the 'receiving environment' (ambient air quality) as well as 'point sources' (the power plants themselves), but in practice the way these standards are set and enforced vary widely from state to state and even power plant to power plant.

This opaque patchwork of rules makes it difficult to understand just how poor Australian pollution controls are in relation to the rest of the world, but EJA analysed them collectively as part of its new report "Toxic and Terminal" – and the results aren't pretty.[575]

In almost all cases, Australian power stations are allowed to pollute much more than the power stations in the United States, European Union, and China – and in many cases, it isn't even close. For example:[576]

- The Loy Yang A station can emit *eight times* the allowable particle pollution of a power station in China
- Stanwell and Gladstone's particle pollution limits are double the US limit set in 1978
- Nitrogen oxide limits for all three Vic power stations are up to three times the pollution limits set by the EU and China
- **Some NSW power stations are permitted to emit 666 times the mercury pollution as US power stations.**

If these weak standards weren't bad enough, the states barely enforce them. Regulators rely on the power stations themselves to monitor and report their own emissions, usually only a couple of times a year, with no independent verification. On rare occasions where these polluters report themselves in violation of the standards, penalties are often non-existent or else low enough so that it's cheaper for the coal stations to pay fines than clean up their operations. To make matters even worse, communities near coal-fired power stations have no access to real-time data on the pollution that might pose serious risks to their health on any given day.[577]

In short, the states' policies for emission standards, monitoring, and enforcement all seem expressly designed to prioritise polluter profits instead of public health. Beyond the usual influence coal money exerts over politicians, it probably doesn't help that state governments are the owners of several of Australia's coal-fired power stations. Even more scandalously, there are well-established technologies available to reduce their pollution – technologies which many other countries *require*.

How to make pollution standards with teeth

Bringing Australia's pollution standards up to international levels will take time, but states and the federal government can both take actions today that will help protect the health of our communities instead of coal profits. It's doable, and it's the right thing to do.

Box 30: Controlling pollution from coal plants

Proven technologies are commonly used to reduce the main hazardous pollutants emitted by coal power stations overseas – but they are hardly used at all in Australia.

SOx: Sulfur oxides can be virtually eliminated with wet scrubbers or flue gas desulfurisation.

NOx: Selective catalytic reduction techniques – similar to catalytic converters on cars – can reduce smog-forming nitrogen oxides.

PM: Bag/fabric filters can capture ash and fine particulate pollution much more effectively than the electrostatic precipitators used by some Australian power stations.

Source: EJA, Toxic and Terminal[578]

The federal government should develop a new generation of environmental laws that include the following:

- The laws should give power for the Commonwealth government to set binding national emissions standards based on protecting human health, which should be in line with international standards. This national framework is essential to ensuring that the states don't continue a race to the bottom that has led to the current patchwork of lax standards and enforcement practices in Australia. Standards should be set by an independent national commission at a level that adequately protects human health and the environment. States would be free to set stronger, but not weaker, standards and could implement the standards in a way that suited them, provided the standards were being complied with.
- Government should create a national load-based licensing scheme, with fees that reflect the health costs and other externalities of every tonne of pollution emitted. Load-based licensing schemes make polluters pay for the impacts of their pollution by setting limits on total pollution per plant and charging license fees in proportion to these pollutant loads (i.e. the amount of pollution emitted) and their impacts. To be effective as well as fair, fees under this scheme must genuinely reflect the full health and environmental costs that pollution forces on the community.

- Government should establish a new national Environment Protection Authority (EPA) that would have responsibility for ensuring states and territories are complying with the standards. The EPA would have intervening and escalating powers to ensure compliance. If a state or territory was not implementing the standards, the EPA could recommend the withholding of Commonwealth payments or, in pressing circumstances, have power to make overriding laws to bring the State into compliance.[579] Additionally, the new laws should include a right to citizen enforcement so that communities affected by pollution laws can take polluters to court to enforce the law if regulators refuse to.

State governments' role:

- State governments should subject all power stations to limits on particle pollution, SOx, NOx, and mercury, with standards set according to best available techniques. This means requiring the use of the most effective technologies and operational practices that are practical and commonly available for minimizing pollution – for instance, the technologies outlined in Box 29 – Controlling emissions from coal plants.
- They should require all power stations to implement continuous stack monitoring of regulated pollutants, with data reported publicly in real time. Additionally, states should fund increased ambient pollution monitoring that similarly makes data immediately available to the public. Australians deserve full transparency on the pollution that is putting their health at risk.

Pollution standards with teeth could work in tandem with coal-clean up auctions to deliver a predictable, affordable and fair phase-out of coal-fired power.

Photo: Kenn W. Kiser

3. Get off gas

3.1 Gas: polluting, expensive and unpopular

Help the power sector, industry and households reduce or eliminate their gas consumption while minimising financial impacts of rising gas prices.

Australia's gas crisis was created by gas companies themselves – along with their allies in the government who thought that supporting a liquified natural gas (LNG) export boom would be good for the economy. Given the opportunity to benefit from this short-sighted strategy, gas companies signed long-term contracts with customers overseas and de-prioritised their customers in Australia, starving the local market of an affordable gas supply. The result is absurd: despite the added costs of liquefying gas and shipping it halfway across the world, Australian gas became cheaper to buy in Japan than in Australia.[580]

In Australia, the wholesale price of gas has more than doubled, from $3 to $4 per gigajoule a few years ago to $7 to $10 today.[581] Prices for end users are often even higher, with commercial and industrial users offered contracts ranging from $10 to $16/GJ in the past year according to ACCC.[582] This is not a temporary condition; average prices are never expected to fall to their previous lows.[583] Meanwhile, remarkably, there is a glut of gas on the global market that is expected to last well into the next decade.[584]

There's bad news and good news about this situation. The bad news for gas consumers is, the days of cheap gas in Australia are never coming back. As we discuss below, international markets have raised the floor for prices, and options to expand domestic gas supplies are all too expensive to bring them down. The good news is, more affordable renewable alternatives are available today for not only power generation but many domestic and industrial applications as well. With supportive policies in place, the gas crisis might be just what's needed to jumpstart the transition to cleaner energy for these residential and industrial consumers that have been even slower to change than the electricity sector.

Gas is polluting

This section is primarily focused on the economic case against natural gas, since that's understandably front-of-mind with so many households and businesses threatened by gas price increases. But we shouldn't lose sight of the fact that gas isn't just uneconomic, it also pollutes our air, water and farmland and wreaks havoc on our climate. Given its impacts it shouldn't come as a surprise that gas is also deeply unpopular. From its extraction to its use, natural gas comes with environmental burdens that we shouldn't have to bear when renewable alternatives are available for similar or even lower costs.

Drilling threatens water supplies

Gas companies in Australia are pushing to exploit resources that would be recovered via a process called hydraulic fracturing – or 'fracking'. Fracking has become a dirty word (and let's face it, it already sounds like one) because it requires the injection of massive amounts of liquid chemicals into subsurface rocks in order to break them apart and free the gas stored inside. Sound risky? You're right.

During fracking, groundwater can easily be contaminated by these toxic chemicals. The chemicals can migrate through different rock layers, or through the fractures created by fracking or when equipment fails.[585] In the United States, where fracking has seen the most widespread use, there have been numerous instances of fracking fluids contaminating local groundwater supplies, particularly around the Barnett Shale area in northern Texas[586] and the Marcellus Shale in Pennsylvania,[587, 588] as well as Pavillion, Wyoming.[589]

The threat to water supplies doesn't end once the gas is produced – there are also significant risks associated with the storage and disposal of fracking fluids after they're recovered from the well. Contamination of surface water may occur from release of untreated wastewater onto the land or directly into waterways, because of leakage from storage facilities, or from accidental spills or leakage of fracking fluids at the surface.[590]

Communities in NSW have already suffered from toxic spills from coal seam gas (CSG) operations in recent years. The initial operator of the Narrabri CSG project, Eastern Star Gas, documented 16 leaks or spills of fracking water from 2009 to 2011.[591] When Santos took over in 2011, 10,000 litres of untreated toxic coal seam gas wastewater containing heavy metals such as arsenic and lead spilt into the Pilliga Forest, killing vegetation and wildlife. Santos was found guilty in the NSW Land and Environment Court and fined a measly $52,000.[592]

Methane is a massive climate problem

Natural gas is often touted as 'the cleanest fossil fuel' – a bit like being the least fatal form of cancer, but true enough when it comes to pollutants with local impacts like smog and particulate matter. When it comes to greenhouse pollution that drives global climate change, however, it's a different story altogether.

Most people know that carbon dioxide is climate's public enemy #1 – but too few recognise that natural gas is its top henchman in disguise. The main constituent of natural gas is methane, a greenhouse gas with 86 times the global warming effect of carbon dioxide over a 20 year period.[593] Because of its massive near-term impacts, it has been estimated by the California Air Resources Board to account for as much as 20% of current global warming.[594] It's no wonder methane is frequently referred to as a 'superpollutant' [595] – you wouldn't be wrong to just call it a supervillain.

At the power station, this methane is converted to harmful-enough carbon dioxide in the combustion process. But there's a more insidious danger: leaks of unburned methane known as 'fugitive methane' can and do occur throughout the natural gas production process as well as the pipeline transmission and distribution system. These methane leaks are a pernicious problem as they are invisible – and none of the detection technologies (e.g. aircraft-mounted monitors) used in jurisdictions like the US have been comprehensively deployed in Australia. Thus, according to a University of Melbourne study, there is "significant uncertainty" concerning estimates of methane emissions from Australia's gas system due to the reliance on industry provided figures and outdated estimates.[596]

These fugitives are armed and dangerous – and they can turn supposedly clean natural gas into a climate threat worse than coal. The University of Melbourne research estimates that if fugitive methane leaks are equal to 3% or more of total gas use, the climate impacts of this superpollutant outweigh coal's greater carbon dioxide emissions. Current estimates for leakage in the US range from 2% to 17% – and, worryingly, we don't have any estimates for system-wide leaks in Australia.[597]

We're already seeing the impacts of global warming today, and methane has played a disproportionate role in these near-term impacts. We know that increased use of natural gas means more climate-cooking leaks – but we don't have any real data on how much is leaking or where. Why would we consider natural gas a climate solution when we don't even know if it's better or worse than coal?

Gas is unpopular

Given all these environmental risks from gas use, it's no wonder it's become so unpopular with Australians. Polling consistently finds 80% of the community oppose unconventional gas exploration, and twice as many Australians support state fracking bans as oppose them.[599] In early 2017, Vic became the first Australian state to permanently ban fracking, along with a moratorium on conventional onshore gas exploration – both the result of a strong grassroots campaign spearheaded by farmers and environmentalists.[600] In the NT, the Labor government was elected on a platform to ban fracking, and online polls have found opposition to fracking at close to 90%.[601]

Gas is polluting, and it's unpopular – and, if that's not enough to establish that gas can't be part of a smart energy policy, the next sections will explain how it's a bad deal on top of that.

Gas prices – what's gone up, won't go down

The massive expansion of the LNG export industry is widely recognised as the main culprit in the gas crisis, and this connection to global gas markets will ensure that Australian gas prices will likely never return to their previous lows. Australian customers may be paying more than international customers right now, but even if prices moderate, global market prices are much higher than what local business used pay (see Table 14). This shouldn't come as a surprise: Australian governments were warned that the gas export industry would push up prices, and ignored these warnings.[602]

Table 14: Historical gas prices

Location	2008–2013 average gas prices per GJ [603]
Victoria, Australia	A$3.3
US	A$5.2
Europe	A$9.7
Japan	A$18.6

As well as being sheltered from the international market, Australia's historically low gas prices were supported by an abundant supply of conventional gas. But production from conventional gas fields is declining, and unconventional gas costs a lot more to produce.

Fracked gas is expensive gas

The idea that opening up new unconventional gas fields will cut gas prices seems to make sense – but the reality is that these resources are 'unconventional' because they require the use of expensive extraction techniques that are only economically viable at higher prices.

The gas industry is notoriously lacking in transparency, so it can be hard to get a true picture of gas production costs. But an AGL research report revealed that the costs at the wellhead for AGL's cancelled coal-seam gas project in Gloucester and Santos' beleaguered Pillaga Project are the most expensive on the East Coast, at $8/GJ,[604] or more than double what we paid just a year or two ago. Similarly, the proposed Narrabri coal-seam gas project in Gunnedah, NSW has an estimated production cost of $7.25/GJ according to AEMO.[605] Note that this is simply the cost of extracting the gas, not including the cost of transporting it or the price including profit once sold.

A recent McKinsey report indicates that the price problem with unconventional gas in Australia is likely to be widespread, requiring high prices just to break even:

"Conventional gas supply capacity is in steep decline and higher cost unconventional supply sources represent an increasing share of future supply capacity. Any new resources that are not yet scheduled for development are likely be more costly, requiring market prices of A$7–8 per GJ or more." [606]

Costly gas pipelines won't make expensive gas cheaper

Former WA Premier Colin Barnett floated the idea of a gas pipeline from WA to QLD. Analysts have estimated that such a pipeline would deliver gas to the east coast at around $13 a gigajoule, including $4 per gigajoule of pipeline costs.[607]

Jemena plans to build the 'Northern Gas Pipeline' from Tennant Creek in the NT to Mount Isa in QLD. There's not enough conventional gas in the NT to make this pipeline viable without unconventional gas.[608] Production costs for NT unconventional shale gas have been estimated at $7.50 a gigajoule – just to get the gas out of the ground.[609] Add in pipeline costs and any profits extracted by Jemena (an unregulated monopoly), and it's easy to see why analysts Wood MacKenzie predicted that NT unconventional gas would be delivered to the east coast market at around $12-13 a gigajoule.[610]

A pipeline from the NT to SA makes even less economic sense, given that Jemena initially considered it as an alternative to the Northern Gas Pipeline and rejected it as more expensive.[611]

Gas companies abuse their market power

"Cheap gas is a thing of the past and pathetically, insiders knew it was coming." – AFR, March 17 2017

Even when there is plenty of gas to go around, a handful of energy companies with too much market power take every opportunity to rip off local homes and businesses. In its interim gas market report, ACCC notes that current gas contract offers to commercial and industrial users are "well in excess of competitive prices"[612] – a polite way of saying they're price gouging their customers. The ACCC also notes that just two of the 23 large commercial and industrial consumers they surveyed were able to get offers from more than one supplier for gas in 2018.[613]

The CEO of Orica, the biggest gas customer in NSW, recently said the gas industry "hides behind sophisms" to defend an indefensible situation where local prices are higher than export prices.[614] The companies are able to charge as much as local buyers can bear without going bankrupt. As Orica's Alberto Calderon put it:

"The domestic natural gas price is not determined by the internationally traded gas prices, but by the opportunity cost of not having those last cubic feet of gas for either manufacturing or power generation…That is why we have seen domestic gas prices significantly in excess of 100 percent of Japanese prices. It is the gas price of desperation, not the fair tradeable prices that Australia should have."

According to Manufacturing Australia, three-quarters of Australia's gas reserves and 90% of gas production is controlled by a small handful of gas companies.[615] These companies hide information about gas reserves and have been known for making alarming public statements about gas shortages while simultaneously reassuring shareholders that they had plenty of supply up their sleeves.

Similarly, gas generators have been gaming our electricity markets. A report by energy economist Bruce Mountain provides clear evidence that electricity prices in SA were pushed up by a handful of companies with too much market power.[616] The behaviour of gas generators on July 7 provided the smoking gun – a handful of generators deliberately held out for sky-high prices at a time when they had almost 1,000 MW of spare capacity. The prices they charged were $1,700 to $8,500 more per megawatt hour than would be expected in a competitive market. A Melbourne Energy Institute report similarly found that the degree of market concentration in SA is well in excess of levels normally flagged by the ACCC for competition issues.[617]

Overturning state-based fracking bans would have done nothing to prevent this kind of behaviour. The problem is not one of supply but one of market structure, as a handful of companies control both the gas market and the electricity generation market.

It's time to get off gas

Gas is like a nasty addiction – it's expensive, it's harmful to our health and environment, and the companies that control its production are taking advantage of us in every way they can. So, it's time for Australia to kick the habit once and for all and get off gas.

Table 15: Total annual gas consumption by sector, in PJ

Sector	2016	2021
Residential and commercial	190	186
Industrial	264	238
Gas Power Generation (GPG)	122	104
Liquefied Natural Gas (LNG)	1,006	1,430
Unaccounted for Gas (UAFG)	14	14
Total	**1,595**	**1,972**

Source: AEMO, National Gas Forecasting Report for Eastern and South-Eastern Australia, p. 4

That means taking immediate action to cut gas consumption across the power, industry, and commercial and residential building sectors. Fortunately, cleaner and cheaper alternatives are on hand – and with renewable energy sources getting cheaper almost as fast as gas is getting more expensive, we've got economic tailwinds behind us. AEMO's conservative forecasts already indicate that gas demand will decline across all three domestic sectors – and increase substantially for LNG exports.[618]

So how do we accelerate these trends and minimise the financial impact of rising gas prices on households and businesses and reduce environmental and climate impacts at the same time? We need to get our electricity, household and industry sectors off gas!

In Repower the Country with Renewable Energy, we outlined a detailed plan of action to replace all fossil fuels (gas as well as coal) from the electricity sector with cleaner and cheaper electricity from renewables like the wind and the sun. The main policies we propose are:

- **Build the right renewables in the right places with reverse auctions:** Reverse auctions have proven highly successful at getting renewables and increasingly large-scale storage deployed quickly at the lowest possible cost, and they could be particularly useful for getting renewables with storage built in Australia. Such 'dispatchable' or 'on-demand' renewables could compete directly with gas generators to provide the peak electricity demand, ending their ability to game the market and raise prices unchallenged. These auctions can be held at the state or federal level.
- **Set an expanded 2030 Renewable Energy Target:** It will also be important to stimulate competition in bulk electricity provision by supporting the rapid deployment of least-cost variable renewable energy, as particularly in SA where gas turbines are running most of the time. The RET currently fulfils this function, but the large-scale component of the RET is capped at 33,000 GWhs by 2020. Since planning new electricity generation projects takes years, not months, it is essential that new policy for 2020 onwards be legislated as soon as possible as a matter of urgency.

Power generation covers a big chunk of natural gas consumption, but there are still a lot of homes that use natural gas for heating, as well as businesses that use it for 'process heat' in the production of goods ranging from aluminium to food to textiles. Because the technology solutions for getting off gas are different for each of these end uses, they merit their own separate discussions. This section is dedicated to that purpose, with a series of recommendations for government action to reduce the pain caused by rising gas prices to household budgets, business bottom lines, and the broader economy.

3.2 Promote renewable heat for industry

Provide targeted support for the demonstration and deployment of renewable alternatives for industrial process heating needs.

Beyond the gas-fired electricity it uses, Australian industry burns an enormous amount of gas to heat everything from cement production to baking bread, as well as using gas as a chemical feedstock. In fact, a report by IT Power commissioned by ARENA estimates that industry consumes nearly half of all gas used in Australia.[619] The Australian Industry Group (AIG) has warned of a "double hit" many companies face from gas price rises impacting both electricity and heating needs, with an estimated $1.9 billion in extra costs from the direct use of gas for heat or feedstock.[620] This dependence on gas has put a significant portion of the economy and a massive number of jobs at risk, creating an urgent need for government support to transition as many of these industries away from fossil gas as possible.

There's no use sugar-coating it – compared to the (relatively!) clear and easy path forward for power sector and home gas use to be replaced with cheaper renewable electricity, replacing gas use in industrial processes is a much harder slog. To understand the potential for renewables to address this challenge in a practical way in the near term, we first need to understand the problem in more detail: what are the process heat applications that fossil gas is currently used for, and who is using it?

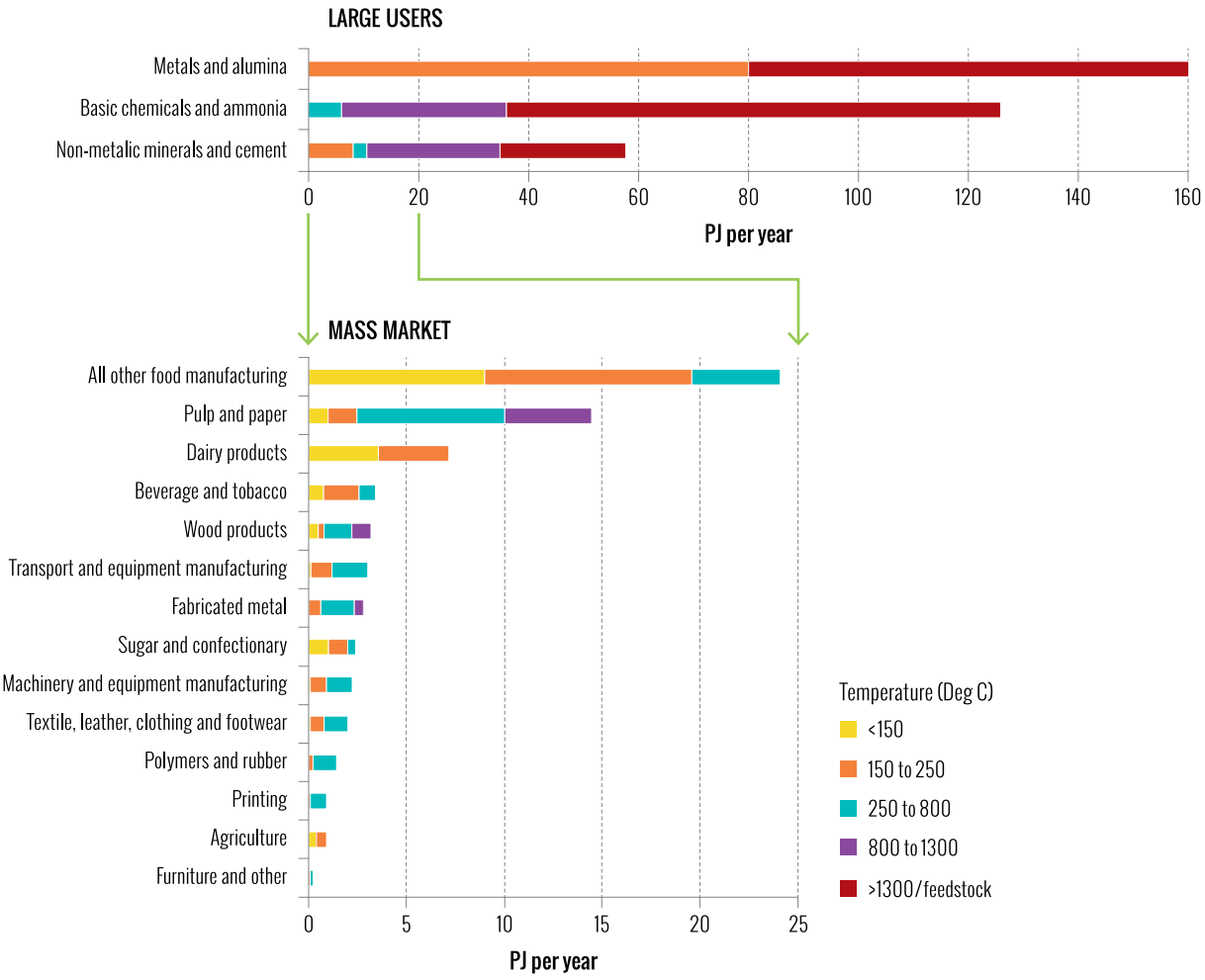
Gas isn't just for manufacturing

When you think of 'industry,' you probably first think of big manufacturing plants. And when it comes to industrial gas consumption, you'd be right – manufacturing accounts for nearly 80% of the total gas used by industry in Australia, primarily for the production of metals and alumina, chemicals, and cement.[621] These are dominated by a handful of very large users that use gas mostly for high-temperature applications (above 250 °C) in kilns and furnaces. For instance, the vast majority of metals and alumina sector gas use occurs

at just five large aluminium plants.[622] These users are generally connected to the long-distance gas transmission system and have the market power to purchase gas at wholesale prices, which means they are less impacted by recent and future price rises.

However, the remaining 20% of industrial gas consumption is from over 2,000 users nationwide that encompass many sectors that are much less front of mind when you think of 'industry,' including dairy, food processing, textiles, paper and pulp, agriculture, and more.[623] This diverse group of end-users burns gas for a wide range of mostly low-temperature applications (less than 250°C), from steam to food processing to drying. Because they are smaller gas users connected to local gas distribution systems – or, in some cases, forced to rely on even more expensive LPG – they are generally forced to pay high retail prices for gas and are very vulnerable to market spikes.

Figure 27: Who uses gas in Australia?



Source: ITP/ARENA [624]

When you consider that these smaller end-users tend to pay the highest prices for gas contracts, have less capacity to invest in alternatives themselves, and are spread throughout communities nationwide, it's plain to see that these are the companies we should be helping first. Fortunately, it just so happens that the lower-temperature applications they rely on most have the best opportunities for renewable alternatives.

Solar and bioenergy alternatives lead the way

While technologies exist to replace every joule of industrial gas use with renewable alternatives, the fact is that costs matter and some process heat applications are much more economically feasible to replace than others. Under current technology and gas market conditions, ARENA estimates that it would be feasible to replace roughly a quarter of current industrial gas use, or about 50-100 PJ of gas per year – a market value of up to $900 million at gas prices of $9/GJ.[625] Considering the fact that smaller users are likely to be facing gas prices at the upper end of the $10-$16 range cited by AEMO,[626] the opportunity for switching to renewable heat sources is likely much larger.

As noted by Beyond Zero Emissions (BZE), replacing gas-fired heating with renewable alternatives has wider economic development advantages beyond savings for individual companies. In an increasingly carbon-constrained world, Australia can seize a long-term, international competitive advantage by leading the way in developing renewable heat technologies for domestic industries. And, by eliminating the need for connections to the gas grid, renewable heat alternatives create new possibilities for economic development in rural areas.[627]

The IT Power report to ARENA identifies solar thermal and bioenergy as the two most promising technologies for renewable process heat, although solar is primarily viable for lower-temperature applications. Geothermal energy is another potential source of renewable heat, but this resource is only available at sufficient temperatures in certain parts of the country – primarily the Great Artesian Basin and, to a lesser extent, the Perth region.[628] Vic also has warm aquifers underlying the Bellarine and Mornington Peninsulas, the Werribee Plains, and the Latrobe Valley.[629]

Solar thermal energy: The use of solar thermal energy has long been used for household water heating applications in Australia, and the use of well-established flat plate and evacuated tube solar collector technologies can be used to provide heat for industrial uses as well. IT Power found that solar thermal technology is suitable and provides a good economic rate of return for process heating temperatures of up to 100°C when gas prices are above $5/GJ, and is viable in most parts of Australia for temperatures up to 150°C.[630]

Providing temperatures of over 200°C with solar thermal technology is possible, but requires the use of more expensive concentrator systems similar to those used for solar thermal power plants. SA recently became host to the world's first concentrating solar tower system used for electricity, greenhouse heating, and desalination at the Sundrop Tomato Farm (see below), and this type of configuration is an example of what would be needed to provide higher-temperature heat. Moreover, solar thermal can be used to 'pre-heat' water for steam and other processes, which doesn't completely eliminate the need for gas but can significantly reduce the amount required.[631] Luckily enough, CSIRO operates one of the world's premiere research facilities for high-temperature solar thermal energy, making Australia a perfect place to push this concept further.[632]

Examples:

- **Sundrop Farms:** In a first-of-its kind project, Sundrop Tomato Farm near Port Augusta in SA recently began using a concentrating solar tower to produce electricity as well as heat for its greenhouses. The farm grows 15 million kg of truss tomatoes a year for sale to Coles under an exclusive 10-year arrangement, and supports 175 local jobs.[633]
- **De Bortoli Winery:** The family run De Bortoli Winery in NSW has been using solar to generate process heat for bottling since 2013. The winery utilises evacuated tube solar collectors from Australian-owned Apricus Australia for thermal energy, along with a 200 KW solar PV installation for electricity.[634]

Sustainable bioenergy: Bioenergy is perhaps the most versatile solution for providing industrial process heat – as well as the most difficult to make generalisations about. There are a wide range of solid and liquid feedstocks that can be used, including agricultural and forestry wastes, organic landfill materials, food waste, wastewater, and energy crops like bagasse and mallee. The local availability of low-cost feedstocks is paramount to the economics of bioenergy; IT Power found that switching from gas to bioenergy process heat can deliver strong returns when the bioenergy feedstock is available for less than $5/GJ.[635]

Bioenergy from waste streams offers potentially low costs and the greatest environmental benefits, since this avoids the cultivation of new land, eliminates methane emissions from the decomposition of organic materials, and can even produce useful by-products like renewable fertilisers.[636] Another good solution according to IT Power

is short cycle crops like oil mallee, which can be produced at a cost of $5-$7/GJ today and as low as $3/GJ with a mature industry, making this a potentially economic solution as well.[637]

However, dedicated bioenergy crops like mallee must be grown carefully to avoid pitfalls such as stressing water supplies, competing with food crops, harming biodiversity, or interfering with efforts to restore soil quality. If done well, mallee can be a positive addition to an integrated crop management plan, providing dryland salinity control benefits and serving as shelter belts to protect against wind erosion in addition to producing bioenergy.[638] Above all bioenergy should *definitely* not come from logging our native forests. As recognised by the Clean Energy Council, the lack of any process in Australia for certifying the sustainable management of native forests means that forestry wastes from these areas are not a suitable bioenergy feedstock.[639]

As with feedstocks, the mode of heat production from bioenergy varies, with the most common pathways coming either via direct combustion or through the production of biogas from an anaerobic digester. The choice depends in part on the feedstock used – for example, wastewater, manure, and other liquid feedstocks are obviously only suitable for use in a digester. However, it also depends on the end use; for low temperatures, the simple combustion of biomass sources can often do the job, while biogas from a digester can often be used as a direct substitute for fossil gas in higher-temperature applications.

Regardless of the pathway used for heating, it is common for industrial facilities to combine heating with onsite electricity generation (known as cogeneration or trigeneration) which can further improve the economics of a project.

Examples:

- **Australian Tartaric Products:** ATP uses grape wastes to produce natural tartaric acid for use by winemakers. With the help of a grant from the Australian government Clean Technology Fund, it is now using these wastes to produce process heat for steam as well as electricity on-site instead of the LPG the rural Vic company previously depended on.[640]
- **XXXX Brewery:** The iconic XXXX Brewery in Milton, Brisbane is one of the oldest breweries in Australia, as well as a pioneer in the use of bioenergy for process heat. Wastewater from the plant is recycled and fed into an on-site anaerobic digester that produces biogas for use in the brewery boiler. Importantly, this system has also helped to reduce the overall water consumption of the facility by 70%.[641]

Industrial heat pumps: Another technology that can be used to provide process heat at relatively low temperatures are electric heat pumps, which capture ambient heat from outdoors with a very high level of efficiency. As discussed below in Cash For Gas Guzzlers, heat pumps are commonly found in households and called 'reverse cycle air conditioners' (RCACs), but they can also be built on a large scale for industrial applications.[642]

While heat pumps can potentially provide heat of up to 150°C, standard commercially available models typically provide heat up to 100°C. The economics of heat pumps are more complex than purely thermal solutions, however, in general ITP estimates that heat pumps are currently economic for temperatures of up to 100°C when gas prices are $10/GJ.[643]

It should be noted that heat pumps are only as renewable as the electricity used to power them. Switching from gas to electricity creates the possibility of purchasing renewable power from the grid or from onsite solar PV. However, it's important that companies installing industrial heat pumps don't result in an increased demand for coal-fired electricity.

Policies to promote renewable heating alternatives

So, we know that solar and bioenergy alternatives are out there for industrial process heat needs, we know that low-temperature applications like food processing and agriculture have lots of immediate near-term potential, and we know that higher-temperature applications like aluminium and cement production will require more challenging, longer-term technologies. With all that in mind, here are steps policymakers can take to promote renewable alternatives to gas for industry.

- **Targeted CEFC loans for renewable process heating:** Replacing gas with renewable solar, bioenergy, or heat-pump process heating makes economic sense for many low-temperature applications, but the upfront costs often pose a barrier to small and medium-sized businesses that are at greatest risk from gas price increases. CEFC and its partners should create a new targeted loan program specifically for renewable process heat along the lines of its existing energy efficiency financing partnerships[644] and partner with industry groups to promote it in sectors like food processing and dairy industries that can benefit most.
- **Large-scale technology demonstrations:** As discussed above, the technology exists for large-scale concentrating solar thermal facilities that can produce the high-temperature heat needed for end-users like aluminium and cement manufacturing; however, it

is currently unproven at scale. Australia has every reason to lead the world in the demonstration and deployment of this technology – and, with CSIRO's solar thermal research hub,[645] it has the scientific resources to do just that. High-temperature solar thermal demonstration projects could be funded as part of the existing Australian Solar Thermal Research Initiative (ASTRI)[646] or else as part of a similar, parallel initiative with dedicated funding.

- **Renewable industry precincts:** Some renewable heat production projects can require significant nearby demand to make the economics work. While some large end-users may provide sufficient demand on their own – think of an aluminium smelter or a big cement manufacturer – in many cases it is necessary to aggregate demand from multiple smaller end users. Similarly, the economics of bioenergy projects often requires the provision of low-cost waste feedstocks from several sources – for instance, manure from a farm as well as food waste from local shops and residents.

These economies of scale for both supply and demand create the opportunity for a new type of industrial development zone: a Renewable Industry Precinct, with multiple end users co-located around a mid to large-scale renewable heat project. The potential of this strategy has been proven by the Austrian town of Guessing, where a biomass gasification plant that generates electricity as well as process heat has attracted 60 new businesses.[647]

State governments should identify potential locations based on feedstock availability as well as interest from local industries. Once a Renewable Industry Precinct has been identified, governments can provide appropriate support measures including favourable zoning and planning rules (state), access to concessional loans, and co-funding heating network infrastructure for the precinct (state or federal).

3.3 Cash for Gas Guzzlers

Help homeowners make smart investments to switch away from gas for heating.

Nearly half of all Australian households are connected to mains gas, and gas provides about a third of all residential energy use.[648] While this was thought to be the cheapest solution for space and water heating for many years – an idea promoted by gas companies with the help of government – the reality is that short-sighted policies and corporate profit-seeking have turned gas dependence into a huge financial liability for Australian families.

According to figures from the Australian Industry Group, Australian households could be on the hook for an extra $800 million every year from increasing gas bills.[649] As always, low-income households will be hit 'first and worst' by these impacts, as they often lack the resources to invest in new appliances or are unable to because they live in rental properties. These challenges are compounded by the fact that low-income households are more likely to have inefficient appliances and are twice as likely to live in an uninsulated home.[650]

New, efficient alternatives to gas appliances are making economic sense for more and more Australian homeowners, especially for homes with solar power. Still, we need to accelerate the rate of adoption dramatically if we're going to stop the bleeding from Aussie homeowners currently trapped in the gas system. That's why we need a program to enable Australian households to replace their gas appliances with efficient alternatives as soon as possible – starting with the oldest equipment and the most vulnerable households.

The need for an accelerated transition

Switching away from gas is an increasingly smart investment. According to a 2014 study conducted by the Alternative Technology Association (ATA), it is cost-effective[651] to replace gas space heaters with highly efficient reverse cycle air conditioner (RCAC) units – also known as heat pumps – in every state in Australia.[652] In fact, Melbourne Energy Institute research indicates that there are already up to a million households in Australia that already have RCACs installed but are using them only for cooling – and missing out on an average of $658 a year in savings on heating compared to gas![653] **Increasing awareness of this latent gas-free heating resource lying dormant in many homes is perhaps the lowest of low-hanging fruit in reducing Australian gas use.**

ATA also found that heat pump hot water systems are cost-effective in areas where weather is warmer and/or gas prices are relatively higher than electricity. In a recent update to this research, ATA has found that heat pump hot water systems can even save money in colder areas of Australia (e.g. southern Vic and Tas) when it can take advantage of free rooftop solar generation.[654]

Unfortunately, even with favourable economics, it will take decades for Australians to make this critical transition unless governments intervene. According to the same ATA study, just one in 10 Australian homeowners replace their space or water heaters in a given year, and the majority choose a 'like for like' replacement that simply upgrades their existing system without considering the economic benefits of switching to electricity. Moreover, rental properties face a special challenge due to the 'split incentive' problem, since landlords have no economic incentive to replace the increasingly expensive gas appliances that their tenants pay the bill for.

Providing direct financial incentives for homeowners to make the switch away from gas would also go a long way towards supporting the COAG National Energy Productivity Plan (NEPP) target of increasing the Commonwealth's energy productivity by 40% by 2030.[655] The 2016 NEPP annual report found that energy productivity increased just 1.48% in 2014-2015, worse than the 15-year average of 1.69% and far below the 2.26% annual improvement required to meet the 2030 goal.[656] With efficient heat pump space and water heaters consuming five to seven times less energy than the most efficient gas appliances,[657] this transition offers one of the highest-leverage opportunities for improving the energy productivity of the residential sector.

In recognition of this opportunity, there has been a growing chorus of support for directly incentivising energy efficiency and the gas-to-electricity transition, particularly for low-income households. Organisations recommending these types of policies include the Australian Energy Efficiency Council in its 2017-2018 Policy Priorities,[658] Beyond Zero Emissions in its Zero Carbon Australia Buildings Plan,[659] the Melbourne Energy Institute in its Switching Off Gas study,[660] and the Australian Council of Social Services in its Energy Efficiency and Low Income Households report.[661]

How Cash for Gas Guzzlers would work

A Cash for Gas Guzzlers program would be an innovative twist – and an improvement – on scrappage schemes for vehicles, which have been used successfully in countries around the world (including Australia) to encourage consumers to replace older vehicles with more fuel-efficient ones through systems of rebates or analogous mechanisms. By providing similar financial incentives to replace gas space and water heaters with efficient alternatives, the Commonwealth (and/or state governments) could establish itself as a leader in delivering similar – and much more urgently needed – results for residential energy use.

To improve upon previous 'cash for clunkers' programs for vehicles, and to ensure that funds for this program provide the maximum possible benefit, Cash for Gas Guzzlers rebate levels should be optimised based on several factors.

1. **Recipient income:** Rebates for homeowners qualifying for energy concession schemes, as well as landlords with low-income tenants, should receive rebates covering the full cost (or close to it) of the appliance replacement. At the other end of the spectrum, rebates would not be available for households over a certain income threshold. Middle income households would receive roughly 50% of the costs of replacement, enough so that the investment pays off in five years or less.
2. **Efficiency improvement:** Rebates could be scaled based on the relative energy efficiency of the new electric appliance compared to the old gas appliance. Thus, consumers would receive rebates covering close to 100% of costs if they purchase a highly efficient heat pump or electric appliance that replaces a very inefficient gas appliance – and closer to 0% if they're purchasing a less-efficient electric appliance to replace a relatively efficient gas appliance. The improvement factor can be calculated based on ratings from the Energy Efficiency Council's Energy Rating Label program.
3. **Age of equipment:** To avoid providing excessive incentives for replacing gas appliances that are already nearing the end of their useful life, rebates would also be scaled based on age. Gas appliances purchased within the past five years would receive a rebate for the highest proportion of costs, while the replacement of appliances that are 15 years or older would receive no rebate.

There are several options for the administration and funding of a Cash for Gas Guzzlers program. At the federal level, it could be included as part of City Deal negotiations in the Smart Cities Plan, along with allocations of the $100 million Sustainable Cities Investment Fund. It would also have been suitable for inclusion in the $100 million Low Income Energy Efficiency Program, which was discontinued in the 2013 federal budget. Given the new urgency provided by the gas crisis, the return of dedicated funding programs to address this issue is essential.

At the state level, Cash for Gas Guzzlers could potentially be funded through an expansion of existing energy efficiency incentive schemes, such as the South Australian Retailer Energy Efficiency Scheme (REES), the NSW Energy Savings Scheme (ESS) and the Victorian Energy Upgrades Program (VEUP). Funding and administration could also be included within the Regional Energy Hubs established under the Smart Energy Communities Program (see Part 3, Section 3.5).

There are doubtlessly other options for the design of Cash for Gas Guzzlers programs at every level of government, providing a real opportunity for policymakers to address a mounting crisis for Australian households in a highly visible way that delivers immediate, long-term financial relief. This innovative policy would also be an opportunity for Australia to demonstrate global leadership that befits its recent election to chair the International Energy Agency's Energy Efficient End-Use Equipment program.

3.4 No gas for new buildings

Make sure the transition away from gas is a one-way street by ensuring new homes don't get hooked on the stuff.

Finally, as with other nasty habits, the easiest way to get off gas is to avoid getting addicted in the first place. Back in 2014, the ATA found that it was not cost effective to connect a new home to mains gas, and that doing so risks locking households into higher energy costs for the long term.[662] With gas prices going up faster and higher than anyone predicted, this is certainly even truer now than it was four years ago.

Some homebuilders are already getting the message. At the NSW/ACT border, the planned community of Ginninderry will encompass over 11,000 housing units spread across four suburbs – all without connecting to the gas system.[663] The joint venture between the ACT Land Development Agency and Riverview Developments was founded with environmental sustainability at its core,[664] but going gas free would also result in considerable cost savings for residents. Ginninderry estimates that its households will save $1,500 a year on energy bills compared to the average ACT home, with a payback time of just three years for the added costs.[665]

Governments should help all homebuilders 'just say no' to gas – by making it the law. That means *mandating* that new housing developments and eventually all new residential buildings should not connect to the gas network. This would include removing gas as an essential service from development and planning documents and regulations. State governments have the power to make these changes, making this a great opportunity for bold leadership at that level – who will be the first state to make a clear stand for a gas-free future for its residents?

Box 31: How going gas-free is saving Jay $1,000 a year

Jay from Adelaide

Gas free since 2016. Saving $250 per quarter ($1,000 annually).

Appliances: Reverse-cycle air conditioning for cooling and heating; electric stove top; hot water heat pump.

“

Part of getting off gas was installing a 2.8 kW solar system. We use as much energy as we can during the day including heating/cooling where necessary whilst the solar panels are still producing power. We also took steps to address air leakage by draught proofing, good curtains, and new insulation.

By setting timers to only charge the hot water tank during the period 10am to 4pm, we effectively use excess solar supply to heat water to 60 degrees. It basically works as a 'battery' of sorts for our power and our effective cost of running hot water is zero.

By eliminating gas completely, we save roughly $250/quarter on gas bills, while our electricity bills have stayed about the same.

Knowing about the big increase in gas prices as well as Australia's increased usage of fracking for gas supply, removing myself completely from gas grid was a great way to make my small mark on addressing climate change and moving to something smarter, more sustainable and affordable.

”

4. Stop propping up polluters with public money

"Fossil fuel subsidies are public enemy number one for green energy."

Fatih Birol,
International Energy Agency Chief Economist in 2013 [666]

4.1 Make polluters pay

Shift money from polluters to problem-solvers.

The biggest fossil fuel subsidy of all is the failure to charge polluters for damaging our health or for making the climate unsafe for human civilisation. The International Monetary Fund (IMF) estimates that the world's taxpayers are effectively footing the bill for US$5.3 trillion dollars in environmental and health damage caused by the fossil fuel industry every year. Topped up with a vast range of direct handouts and tax incentives, this adds up to $10 million dollars a minute worldwide. The IMF found that the coal industry is the biggest beneficiary of these 'effective' or 'post-tax' subsidies, given the combination of its disproportionately high health and environmental damage and the fact that, compared to transport fuels, few countries tax its consumption.[667]

Here in Australia, GetUp! estimated that the top 12 most polluting power plants in Australia, dubbed the 'Dirty Dozen', are free-riding to the tune of around $6.45 billion worth of climate damage every year.[668] The Climate Institute estimated that Australia's major carbon polluters are making the rest of us foot the bill for up to $39 billion a year in unpriced damage and risks to our environment, health, economy and security.[669] This free-rider problem has a known solution – one which is increasingly common worldwide. Putting a price on carbon pollution allows citizens to shift some of the burden of climate change and other environmental damage off our own shoulders and back where it belongs, onto the books of the handful of big polluters who are doing the lion's share of the damage. **When Australia revoked its carbon price, it effectively increased public subsidies of the fossil fuel industry in the form of a free permit to pollute.**

To make matters worse, a wide range of other perverse incentives are fuelling the big polluter free-for-all. In 2009, the member countries of the G20, including Australia, committed to phase out inefficient fossil fuel subsidies "over the medium term".[670] Since then Australia has claimed to the G20 that it does not have any subsidies which fall within the scope of the agreement. Yet the Turnbull Government first attempted to derail and then refused to sign a pledge to phase out fossil fuel subsidies at the Paris climate conference.[671]

You may have noticed that Australian governments are a bit strapped for cash. But somehow, in their persistent search for budget savings, they keep missing the multi-billion savings they could make by winding back fossil fuel subsidies. Every year, federal and state governments send billions of dollars' worth of bad signals to investors and consumers about the future of fossil fuels. Over three quarters of Australians support ending these subsidies, which are propping up Australia's dirtiest energy sources and most inefficient technologies.[672]

At a state level, the Australia Institute calculated government subsidies to the minerals and fossil fuels industries at around $18 billion over six years. This included direct payments, like the $10 million NSW government 'assistance package' paid to coal companies in 2009, as well as free or discounted infrastructure, like the QLD government's $1 billion discount on rail services to the coal industry from 2012-13 to 2013-14.[673] State governments are also in the habit of selling coal to generators at cut-price rates, another subsidy that tilts the playing field away from renewable generators.[674]

At the federal level, some of the most perverse incentives come in the form of tax discounts on the production and consumption of fossil fuels, like the diesel fuel rebate, discounted fuel excise for airlines, tax write-offs for exploration and prospecting by fossil fuel companies, and accelerated depreciation for the oil and gas sector. All of these tax incentives fit the World Trade Organisation's definition of a subsidy under the Agreement on Subsidies and Countervailing Measures, which states that "A subsidy shall be deemed to exist if... government revenue that is otherwise due is foregone or not collected (e.g. fiscal incentives such as tax credits)".[675]

4.2 Shift money from polluters to problem-solvers

Phase out the tax concessions that push spending in the wrong direction.

Big producers and consumers of fossil fuels should pay their fair share of tax – especially given that, without a carbon price, they aren't being charged for the damage fossil fuels inflict on humanity's only habitat. By ditching the following federal tax lurks we can free up much-needed revenue, in the order of **$6.4 billion a year**, and tilt the economic playing field towards clean energy. Priorities to address this must include the following:

- **Cut fuel tax concessions to big companies.** Capping diesel fuel rebates at $20,000 per claim would incentivise big mining companies to save fuel and invest in cleaner alternatives, while ensuring that the rebate is still available to most farmers. It would also deliver a federal budget saving of around **$15 billion over the next four years.**[676] Australia's fuel taxes are already among the lowest in the 'developed' world.[677] There is no need to make them even lower for coal mining companies and other large diesel-guzzling businesses.[678]
- **End accelerated depreciation for fossil fuel companies** and extend it to renewable energy projects with at least 10% community ownership (see Part 2, Section 2.2). Accelerated depreciation, otherwise known as 'statutory effective life caps', allows companies to write off assets while they still have a long working life ahead of them. The effect is something like getting an interest-free loan from the tax office, a benefit that is not available to businesses in many other sectors, including, so far, renewable energy. In 2014 the Australian Conservation Foundation estimated that the oil and gas and petroleum sector's share of this subsidy would cost the budget **$349 million in 2016-17**.[679]
- **Eliminate exploration and prospecting deductions for fossil fuel companies.** Around $650 million dollars[680] goes to mining exploration and prospecting deductions every year, and a large part of that goes to fossil fuel companies. There is no possible justification for subsidising companies to go hunting for new fossil fuel reserves, given that more than 80% of the reserves we already know about have to stay in the ground if we are to head off dangerous climate change.[681] Yet Australia still provides substantial tax assistance for oil, gas and coal exploration.[682] The 2013 budget eliminated one loophole: the ability for companies to write off mining rights and information as soon as they bought them, instead of over the life of the mine. But the same tax lurk remains for mining rights and information bought directly from the government.
- **Close the loopholes in the Petroleum Resource Rent Tax.** A series of changes made to the Petroleum Resource Rent Tax (PRRT) allow oil and gas companies to dodge tax on billions of dollars in revenue every year. One of these loopholes can easily be closed by eliminating the unjustifiable 'uplift rates' used to inflate the exploration expenses that oil and gas companies deduct from their tax obligations by 15%. Imagine you're hunting for an investment property, and you get to deduct the value of your time and travel costs on your tax return – plus, say, 15% on top, just because. Whacking an arbitrary 15% onto the cost of looking for a flat in the suburbs wouldn't add up to much, but when applied to what Chevron spends drilling holes along Australia's coastline, it turns into serious money. Treasury estimates the cost of this loophole at up to **$100 million a year**,[683] more than enough to fund the Community Powerhouses and Indigenous Clean Energy programs proposed under Part 2: Repower Australia. The "starting base and uplift rate for capital assets" inflates PRRT deductions for other oil and gas spending by a similarly arbitrary 5%, and results in around the same cost to the budget. In addition these over-the-top tax deductions can be even more excessive, if a project is classified as a so-called "frontier offshore development." For these developments, the tax offsets can be up to 150%. For example, before BP withdrew from the Great Australian Bight, every $1 it spent on eligible drilling activities in these areas, could have led to $1.50 deduction for PRRT purposes.[684] That means they could actually have made money back from looking for more fossil fuels.
- **Remove or redirect the aircraft fuel excise discount.** The airline industry gets to take home an extra **$1.25 billion this year** because of a federal government discount on its rate of fuel excise.[685] In line with the move towards doubling Australia's energy productivity by 2030 (see Part 2, Section 2.1), this discount should be eliminated, saving around $6 billion over the next four years[686] and increasing airlines' motivation to increase fuel efficiency. A second option would be to convert the fuel excise discount to a direct grant (potentially linked to passenger numbers). This could

likewise incentivise airlines to invest in fuel efficiency by making fuel a more expensive input, while initially maintaining the benefit of the existing discount to consumers. Over the next four years this amount could be redirected into:

- buying land along the east-coast high-speed rail corridor identified by the High Speed Rail Advisory Group in 2013 (or the cheaper corridor option identified by BZE in 2014), thereby ensuring that Australia is ready to leap into action as soon as political will lines up with expert advice that road and air travel alone will not be sufficient to meet our future transport needs[687] and
- R&D and commercialisation grants for aircraft fuel efficiency and solar fuels (thereby helping to establish Australia as a pioneer in the renewable synthetic fuel industry).

- **Rule out the use of public finance from the Northern Australia Infrastructure Facility for fossil fuel projects.** There is no possible justification for wasting public money on losing propositions like the proposed Carmichael coal mega-mine on the land of the Wangan and Jagalingou people in QLD, or on infrastructure that is primarily intended to assist such projects. Furthermore, doing so is highly unpopular.
- **Rule out the use of the Export Finance and Investment Corporation (EFIC) to fund fossil fuel projects in Australia or overseas.** Our export credit agency has been devoting close to **$100 million a year** to financing for fossil-fuel exploration here and overseas.[688] The World Bank set a positive precedent in 2013 by moving away from financing coal projects.[689] Australia should follow suit.

In addition, coal and gas companies are some of the biggest corporate tax dodgers around. Organisations from Adani to Anglo American, Chevron to Santos – all of which make hundreds of millions if not billions of dollars from extracting coal and gas, polluting our air, waterways and ecosystems – in 2014-15 did not pay 1c in tax to the Australian government.[690] In a landmark case brought by the Australian Taxation Office, the Federal Court found that US gas giant Chevron was routing the Australian public to the tune of more than $300 million.[691] They were able to do so through a dodgy loan from the US parent company to the Australian arm of Chevron. Outrageously, this behaviour has been standard practice, a practice that needs to end across the board, but particularly for our biggest polluters. The ATO court case is an important first step, but much more needs to be done by the federal government to ensure companies operating in Australia pay their fair share of tax.

ENDNOTES

Introduction

1. Vaughan, A. (2017) 'Time to shine: Solar power is fastest-growing source of new energy', The Guardian, October 4
2. Bloomberg New Energy Finance (2017) 'Global wind and solar costs to fall even faster, while coal fades even in China and India', June
3. Reputex Carbon (2017) 'A cost curve for abatement & energy storage in the Australian power sector', March
4. Parkinson, G. (2015) 'Australian households installed rooftop solar system every 2.8 minutes in 2014', January 16
5. Vorrath, S. (2017) 'Australia installs 98 MW rooftop solar in August – soaring above 6 GW total', RenewEconomy, September 8
6. Teske, S., Dominish, E., Ison, N. and Maras, K. (2016) '100% Renewable Energy for Australia – Decarbonising Australia's Energy Sector Within One Generation', Institute for Sustainable Futures, March
7. Thompson, A. (2017) '2016 Was the Hottest Year on Record', Scientific American, January 18
8. Heede, R. (2014) 'Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854–2010', Climatic Change, January, Volume 122, Issue 1, pp. 229–241
9. Steffen, W. and Fenwick, J. (2016) 'The Heat Marches On', Climate Council, March 2
10. Green, D. et al (2009) 'Risks from Climate Change to Indigenous Communities in the Tropical North of Australia', Commonwealth Department of Climate Change and Energy Efficiency
11. Or, in the words of the Paris Agreement: "Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science", COP21, Article 4.1
12. Leaton, J. (2011) 'Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?', Carbon Tracker. This analysis was based on a 2□ target. A 1.5□ target means that over 90% of known fossil fuel reserves are unburnable. See analysis by Carbon Brief (2014) 'Six years worth of current emissions would blow the carbon budget for 1.5 degrees', November 13. Given the dangerous feedback loops which have already kicked in at the current level of warming, there is also a strong argument that our carbon budget is already overdrawn, and that the true size of the carbon bubble equates to 100% of known reserves.
13. "Meeting a 1.5 C target without CCS or asset stranding would have required that all additions to the electricity sector were zero carbon from 2006 onwards, at the latest." Pfeiffer, A., Millar, R., Hepburn, C., and Beinhocker, E. (2016) 'The '2 C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy', p. 6
14. Climate Change Authority (2014) 'Reducing Australia's Greenhouse Gas Emissions: Targets and Progress Review', Part C, Chapter 9, p. 126
15. All figures rounded to the nearest megatonne. These figures are taken from the National Greenhouse Gas Inventory, which excludes land use, land-use change and forestry. See Australian Government (nd) 'National Greenhouse Gas Inventory – Kyoto Protocol classifications', Department of Environment and Energy.
16. The Climate Equity Reference Calculator, developed by Stockholm Environment Institute and EcoEquity, allows users to estimate each country's overall share of the global mitigation task by applying the UNFCCC's effort-sharing principles, and to adjust a number of factors including the start date for cumulative emissions, a development threshold, and the overall level of ambition.
17. Hill, J. (2014) 'Power Corrupts', The Monthly, July
18. Australian Energy Market Operator (2013); Australian National University (2017); Alternative Technology Association (2016); Beyond Zero Emissions (2010, 2015); ClimateWorks (2017); CSIRO and Energy Networks Australia (2017); Institute for Sustainable Futures (2015); University of New South Wales (2012, 2013, 2016); University of Sydney (2016); WWF (2016)
19. AEMO (2013) '100 Per Cent Renewables Study – Modelling Outcomes', July
20. Riesz, J., Elliston, B., Vithayasrichareon, P., MacGill, I. (2016) '100% Renewables in Australia: a research summary', UNSW Centre for Energy and Environmental Markets
21. CSIRO and Energy Networks Australia (2017) 'Electricity Network Transformation Roadmap: Final Report', April
22. Riesz, J. et al (2016) Op cit 20
23. Blakers, A., Stocks, M., Lu, B., Anderson, K., and Nadolny, A. (2017) 'An atlas of pumped hydro energy storage', ANU, September
24. Vorrath, S. (2017) 'EnergyAustralia outlines plans for 100MW pumped hydro plant in SA', RenewEconomy, February
25. Beyond Zero Emissions (2010) 'Zero Carbon Australia Stationary Energy Plan', July
26. CSIRO and Energy Networks Australia (2017) Op cit 21

27. Alternative Technology Association (2016) '100% Renewable Grid – Feasible? Discussion Paper,' December
28. Vorrath (2017) 'Horizon Power extends WA off-grid solar and storage trial', One Step Off the Grid, May
29. Reverse-cycle air conditioners are the most common kinds of heat pumps.
30. CO2CRC (2015) 'Australian Power Generation Technology Report', p. 252
31. Schneider, M., Froggatt, A. et al (2015) 'World Nuclear Industry Status Report'
32. Riesz, J. et al (2016) Op cit 20
33. CO2CRC (2015) Op cit 30
34. ibid, p. 23
35. Armstrong, F. (2012) 'Our Uncashed Dividend', Climate and Health Alliance
36. Shearman, D. (2016) 'Why coal fired power stations need to shut on health grounds', The Conversation, November 28
37. AER (2017) 'State of the energy market – May 2017'
38. Lannin, S. (2017) 'Business investment 'disappointing, pointing to weak GDP growth', ABC News, February 22
39. Teske, S. et al (2016) Op cit 6
40. Bloomberg New Energy Finance (2017) 'Clean Energy Investment End of Year 2016', January
41. Ferroukhi, R. et al (2016) 'Renewable energy benefits: Measuring the economics', IRENA
42. Teske, S. et al (2016) Op cit 6
43. Drew, G. et al (2015) 'Renewable Energy Superpower', Beyond Zero Emissions
44. Green, J. (2015) 'The danger of stranded assets lurks for unwary coal producers', The Conversation, November 11
45. Carbon Tracker (2014) 'Unburnable Carbon: Is Brazil avoiding the carbon bubble?', and Kepler Cheuvreux (2014) 'Stranded assets, fossilised revenues', April 24
46. Bond, K. (2017) 'Revolution not Evolution: Marginal Change and the Transformation of the Fossil Fuel Industry', University of Oxford, February
47. Commonwealth of Australia (2007) 'Prime Ministerial Task Group on Emissions Trading: Final Report', May
48. CSIRO and Energy Networks Australia (2017) Op cit 21
49. ibid
50. ClimateWorks (2017) 'Power Up', July
51. REN21 (2017) 'Renewables 2017 Global Status Report – Policy Landscape', March
52. RE100 (2017) 'Companies'
53. ACT Government (2018) 'Renewable energy target legislation and reporting'
54. Tasmanian Government (2017) 'National report confirms Tasmania's strong energy security position', September
55. Vorrath, S. (2014) 'Danish report finds 100% renewables feasible by 2050', RenewEconomy, May 26
56. National Energy Authority (2017) 'Energy Statistics in Iceland 2016', October
57. Watts, J. (2015) 'Uruguay makes dramatic shift to nearly 95% electricity from clean energy', The Guardian, December 3
58. New Zealand Government (2011) 'New Zealand Energy Strategy 2011–2021', August
59. Stevens, W. (1942) 'The Well Dressed Man with a Beard'
60. The National Energy Guarantee is a policy put forward by the Turnbull Government as a mechanism to combine climate and energy policy. It has been widely criticised, including for its very negative impact on renewable energy.
61. Department of Industry, Innovation, and Science (2016) 'Australian Energy Update 2016'
62. Note that the line between transmission and distribution isn't as clear-cut in other countries, and is partly an artifact of how our electricity market is set up.
63. AEMO (2017) 'Fact Sheet – The National Electricity Market'
64. Bureau of Resources and Energy Economics (2015) 'Energy in Australia'
65. Mey, F. and Ison, N. (2015) 'Briefing paper – Mini Grids', Community Power Agency

Part 1: Rewrite the rules

66. Roberts, D. (2013) 'What's threatening utilities: Innovation at the edge of the grid (with dik-diks!)', Grist, May 29
67. For example, it took over three years from when the Demand Management Incentive Scheme was first recommended by the Power of Choice Review in 2012 to the point when the rule change was approved by AEMC, and implementation of the scheme has been pushed back until 2019 at the earliest. See Section 1.3.2 for more on this.
68. AEMO (nd) 'National Electricity Law'
69. St. John, J. (2014) '5 Proposals for New York's Grid Transformation', Greentech Media, September 9
70. Essential Research (2015) 'Privatisation', Essential Report, February 10
71. Australian Competition and Consumer Commission (2017) 'ACCC Retail Electricity Pricing Inquiry: Preliminary Report', October 16, p. 6
72. Inflation-adjusted Australian electricity indices for households and industry, base year 1998. Source, analysis by Drew, G. et al (2015) Op cit 43, based on Australian Bureau of Statistics (2015) 'Consumer Price Index, Australia'
73. Vertically integrated refers to when all the main functions within the electricity system – retailing, generating and network provision are combined into a single organisation.
74. AEMC (2017) 'AEMC publishes the Schedule of Reliability Settings for 2017–2018', February 23
75. AEMO (2017) 'Data Dashboard'
76. Note this is not a Federal Law, but rather a law passed by states – this works by a lead state – in this case SA passing the law and then every other participating jurisdiction passing the same legislation (in this case all states and territories other than NT and WA).
77. Read Jess Hill's excellent article in The Monthly for more details on how the AER and AEMC came to be and what that's meant. Hill, J. (2014) Op cit 17
78. Australian Competition and Consumer Commission (2017) Op cit 71, p. 6
79. Environment Victoria (2018) 'Hazelwood FAQs'
80. Lazzaro, K. (2016) 'Worksafe notices detail extent of repairs needed at Hazelwood power station', ABC News, November 30
81. Clean Energy Council (2014) 'Lost Opportunity and Big Costs: The Impacts of an Unresolved RET Review', November, p. 1
82. Elton-Pym, J. (2017) 'Turnbull's new energy plan to reserve on-demand power and abolish subsidies for renewables', SBS, October 17
83. Letts, S. (2017) 'Gas prices: Deal done but the days of cheap gas are long gone', ABC News, September 29
84. Mountain, B. (2016) 'South Australia's wholesale electricity market: what really happened in July 2016?', Carbon + Energy Markets, August
85. Australian Competition and Consumer Commission (2017) Op cit 71, p. 2
86. Drew, G. et al (2015) Op cit 43, p. 55
87. Parry, T. (2002) 'Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services Final Report', Independent Pricing and Regulatory Tribunal, October
88. Hill, J. (2014) Op cit 17
89. Drew, G. et al (2015) Op cit 43, p. 55
90. Australian Competition and Consumer Commission (2017) Op cit 71, p. 6
91. Hill, J. (2014) Op cit 17. It's worth noting that cash-strapped state governments have been complicit in driving up the costs of the network companies they own, treating them more as a source of de-facto electricity consumption taxes than a public-interest utility. At least some of that money has made its way into schools and hospitals, however, though there are certainly less regressive ways to fund them.
92. Akerman, P. (2017) 'Discounted electricity offers may not save you money, study finds', The Australian, September 27
93. Australian Competition and Consumer Commission (2017) Op cit 71, p. 8
94. Thwaites, J. et al (2017) 'Independent Review into the Electricity & Gas Retail Markets in Victoria', August 2017, p. ix
95. Australian Competition and Consumer Commission (2017) Op cit 71, p. 7
96. Mountain, B. (2016) Op cit 84, pp. 2–3
97. Such services have what economists call very low 'price elasticity'.
98. Productivity Commission (2013) 'Electricity Network Regulatory Frameworks', April 9
99. Saddler, H. (2013) 'Power Down: Why is electricity consumption decreasing?', The Australia Institute, December, p. 4
100. Department of Industry, Innovation, and Science (2016) Op cit 61, p. 10
101. AER (2015) 'State of the Energy Market 2015', p. 9
102. AER (2017) Op cit 37, p. 26
103. Carbon + Energy Markets (2014) 'Down, right? Privatisation and the regulatory valuation of electricity distribution network service providers in New South Wales: Evidence and issues', October, p. 22

104. Australian PV Institute (2017) 'Australian PV market since April 2001', July
105. Carbon + Energy Markets (2014) Op cit 103
106. Carbon + Energy Markets (2015) 'Rooftop solar PV and network tariffs: Information and discussion', June, p. 12
107. This could be in the form of customers disconnecting from the grid as the 'Leaving the Grid' scenario of CSIRO's Future Grid project sets out. CSIRO (2013) 'Change and choice: The Future Grid Forum's analysis of Australia's potential electricity pathways to 2050'. Alternatively, it could be in the form of 'load defection', where customers significantly reduce the amount of electricity they use from the grid through solar, energy efficiency and storage, but remain connected.
108. Institute for Sustainable Futures (2014) 'A level playing field for local energy', November 28
109. Carbon + Energy Markets (2015) 'A critique of the Victorian retail electricity market', June, p. 18
110. Edis, T. (2015) 'Would you like solar with your energy contract? Be wary', Climate Spectator, September 3
111. CSIRO and Energy Networks Australia (2017) Op cit 21
112. As the new energy paradigm emerges, it's unclear which types of organisations should deliver which energy services and play what role. We need to tread carefully here and not allow networks to abuse their monopoly power to squeeze the competition out of emerging markets. But there is still a role for networks in Electricity 2.0 and we do need to ensure they have a viable business model; just not one that robs consumers blind.
113. Wood, T. (2015) 'Energy policy lacks clear direction', Australian Financial Review, July 8
114. Stock, A. (2014) 'Australia's Electricity Sector: Ageing, Inefficient and Unprepared', Climate Council, June
115. For example ClimateWorks (2017) 'Australia's electricity sector needs to 'decarbonise' faster to meet emissions reduction targets', July
116. Wiseman, J. (2013) 'Climate Change: reconnecting politics with reality' in Lyons, M. (ed.) 'Pushing Our Luck: ideas for Australian Progress', Centre for Policy Development
117. New York State (2012) 'Reforming the Energy Vision: About the Initiative', Department of Public Service
118. Secretary of State for Energy and Climate Change (2012) 'Electricity Market Reform: Policy Overview', November, p. 9
119. Ropenus, S. and Klinge Jacobsen, H. (2015) 'A Snapshot of the Danish Energy Transition. Objectives, Markets, Grid, Support Schemes and Acceptance', Agora Energiewende and DTU Management Engineering
120. Federal Ministry for Economic Affairs and Energy (2015) 'An electricity market for Germany's energy transition'
121. AEMO (nd) Op cit 68
122. Ison, N., Usher, J., Cantley-Smith, R., Harris, S. and Dunstan, C. (2011) 'The NEM Report Card: How well does the National Electricity Market serve Australia?', Institute for Sustainable Futures and the Monash University Faculty of Law for the Total Environment Centre, p. 12
123. Conlon, P. (2007) 'Parliamentary Debates: South Australian Minister for Energy, South Australia,' of Assembly, September 27, 964
124. Stone, C. (2013) 'False economies: decoding efficiency', Centre for Policy Development
125. McAuley, I. and Lyons, M. (2015) 'Governomics: Can we afford small government?'
126. Total Environment Centre et al (2017) 'Group submission to Independent Review into the Future Security of the National Electricity Market in relation to the National Electricity Objective', February 24
127. COAG Energy Council (2015) 'Meeting Communique', 23 July, p. 2
128. Vertigan, M., Yarrow, G. and Mortan, E. (2015) 'Review of Governance Arrangements for Australian Energy Markets', Final Report to the COAG Energy Council, p. 19–20
129. ibid, p. 5
130. Total Environment Centre et al (2017) Op cit 126
131. Finkel, A. et al (2017) 'Independent Review into the Future Security of the National Electricity Market: Blueprint for the Future', p. 176
132. Rocky Mountain Institute, 'Why eLab'
133. Competing with old written-off power stations is a different story, a point covered in the Part 3, Section 2.1 on coal clean-up.
134. Vertigan, M. et al (2015) Op cit 128
135. Australia's lack of coordination between energy and environmental policies is sometimes blamed on the Commonwealth-state divide. It's worth noting that Germany also has a federal system, but performs much better on this front.
136. Ropenus, S. and Klinge Jacobsen, H. (2015) Op cit 119
137. Kenna, S. (2017) 'Power Ledger: The Aussie Company That's Using Blockchain To Digitise Energy', HuffPost Australia, October 5
138. deX 'Why join deX'
139. Morris, J. (2015) 'REV-ing it up in New York: A Look Under the Hood of the Reforming the Energy Vision Track I Order', Switchboard: Natural Resources Defense Council, March
140. Cross-Call, D. and Hansen, L. (2014) 'Bringing a Distribution System Operator to Life', RMI Outlet, September 8

141. Market Design and Platform Technology Working Group (2015) 'Report of the Market Design and Platform Technology Working Group', New York State Department of Public Service
142. St. John, J. (2014) Op cit 69
143. Market Design and Platform Technology Working Group (2015) Op cit 141
144. AER (2017) Op cit 37, p. 130
145. ibid, p. 138
146. Australian Competition and Consumer Commission (2017) Op cit 71, p. 82
147. ibid, p. 97
148. Thwaites, J. et al (2017) Op cit 94, p. 53
149. ibid, p. 23
150. ibid, p. 24
151. ibid, p. 25
152. Australian Competition and Consumer Commission (2017) Op cit 71, p. 75
153. Australian Competition and Consumer Commission (2017) Op cit 71, p. 105
154. MacDonald-Smith, A. (2017) 'Kerry Schott calls out AGL Energy's market power under NEG', Australian Financial Review, November 12
155. Thwaites, J. et al (2017) Op cit 94, pp. 54–55
156. SBS (2017) 'Changes to media ownership laws', September 14
157. Quiggin, J. (2017) 'The case for renationalising Australia's electricity grid', The Conversation, March 6
158. Riesz, J. et al (2016) Op cit 20
159. Hydropower has traditionally played both roles.
160. Teske et al (2016) Op cit 6
161. Water authorities are major users of electricity, mainly for pumping. They buy electricity wholesale, and on most days can pump when electricity is cheap, shifting their load to off-peak times.
162. We note that other jurisdictions have considered and are now rejecting capacity markets as an alternative approach. Capacity markets along the lines that exist in WA have proved to be economically inefficient, serving only to prop up dinosaur fossil fuel generators.
163. Federal Ministry for Economic Affairs and Energy (2015) Op cit 120
164. Energinet DK (2015) 'Market Model 2.0: Final Report', September
165. California's approach was known as decoupling because it helped sever the link between consumption and profits. Unfortunately, for various reasons, Australia's version is less likely to achieve California's success. For a good explanation of the California model, see Brownstein, R. (2009) 'The California Experiment', The Atlantic, October.
166. AER (2014) 'Overview of the Better Regulation reform package', Australian Energy Regulator, p. 4
167. Craig Memery quoted in White, A. (2017) 'Support for reforms could help lower power costs', The Australian, October 4
168. In the latest round of regulatory determinations, the three NSW network companies' proposals ran to over 44,000 pages. Henley, M. (2015) 'Changing the DNA of network tariff setting in Australia', UnitingCare Australia, p. 9
169. Parkinson, G. (2015) 'Networks to spend another $50 billion on Australia's dumb and dumber grid', RenewEconomy, October 30. Note that this figure combines capital and operating expenses, and the network infrastructure spending component is likely to be lower than in the last regulatory period.
170. Public Interest Advocacy Centre (2017) 'Craig Memery on power price hike', June 17
171. White, A. (2017) Op cit 167
172. ibid
173. We note that consumers who have already installed solar panels shouldn't bear the burden for this change, given that the system wasn't set up to encourage the reduction of peak demand at the time when they made their installation decisions.
174. AEMC (2012) 'Power of choice review – giving consumers options in the way they use electricity', November, p. vi
175. Dunstan, C., Downes, J. and Sharpe, S. (2013) 'Restoring Power: Cutting bills & carbon emissions with Demand Management', Institute for Sustainable Futures
176. Dunstan, C. (2015) 'A simple rule change can save billions for power networks and their customers', The Conversation, March 13
177. Choice (2015) 'Submission to the Australian Energy Market Commission: Demand Management Incentive Scheme rule change request'
178. AEMC (2012) Op cit 174, p. vi
179. AEMC (2015) 'New rules for a demand management incentive scheme – Information sheet', August, p. 1
180. ibid, p. 2
181. Parkinson, G. (2015) Op cit 169
182. Byrne, M. (2015) 'AEMC draft rule determination, Demand management incentive scheme', Total Environment Centre
183. ARENA (2017) 'Demand Response'

184. Changes along these lines were recommended in Dunstan, C., Downes, J. and Sharpe, S. (2013) Op cit 175
185. Pages 56–57 of Dunstan et al (ibid) summarise international demand management schemes, many of which impose compulsory targets with fines for non-compliance that are directed into energy efficiency funds.
186. Henley, M. (2015) Op cit 168, p. 13
187. UnitingCare envisaged the AER leading this process, but it would also be a good job for the Energy Transition Agency.
188. Henley, M. (2015) Op cit 168, p. 15
189. Parkinson, G. (2015) 'SA Networks want solar homes to pay $100/year more for grid', RenewEconomy, May 27
190. Parkinson, G. (2015) 'Network tariff changes to slash rooftop solar uptake by half', RenewEconomy, October 27
191. NSW Networks (2015) 'Electricity Tariff Reform in NSW – Have your say', p. 21
192. Parkinson, G. (2015) 'NSW networks back away from "solar tax" on households', RenewEconomy, November 24
193. QLD Productivity Commission (2015) 'Issues Paper: Electricity Pricing in Queensland', p. 7–8
194. Hill, J. (2014) Op cit 17
195. Kalukas, V. (2015) 'WA's solar households decry 'unfair' tax', Perth Now, December 1
196. Vorrath, S. (2016) 'WA Premier rules out solar tax as "fantasy"', RenewEconomy, February 19
197. Parkinson, G. (2015) 'Solar tariff rip-offs, and why utilities may never learn', RenewEconomy, June 5
198. Orton, F. and Nelson, T. (2015) 'Relief in sight: Why residential electricity costs in Eastern Australia may fall between 2015 and 2020', Economic Analysis and Policy, Volume 48, December, p. 57–70
199. Carbon + Energy Markets (2015) 'Network tariffs applicable to households in Australia: empirical evidence', January, p. 21
200. Hill, J. (2014) Op cit 17
201. The gap between the prices paid by residential and business consumers is widening. See for, example, Swoboda, K. (2013) 'Energy prices – the story behind rising costs', Parliamentary Library.
202. Total Environment Centre (2010) 'Demand Management and Energy Policy Development: a case study of New South Wales', May, p.11
203. The Australian PV Institute's proposal for peak demand pricing, with a demand charge/reward component that would be applied only over the peak demand months and only for three hours a day, would be a good starting point.
204. Australian PV Institute (2015) 'APVI Discussion Paper on SA Power Network's Pricing Proposal', p. 5
205. Fitzgerald, G., Mandel, J., Morris, J. and Touati, H. (2015) 'The Economics of Battery Energy Storage', Rocky Mountain Institute, September
206. Newcomb, J., Lacy, V. and Hansen, L. (2013) 'New Business Models for the Distribution Edge: The Transition from Value Chain to Value Constellation', Rocky Mountain Institute, p. 18
207. Community Solar Hub (2017) 'Community Solar: A New Kind of Solar'
208. Munsell, M. (2017) 'America's Community Solar Market Will Surpass 400 MW in 2017', Greentech Media, February 6
209. Rutovitz, J., Langham, E., Atherton, A. and McIntosh, L. (2015) 'Building a Level Playing Field for Local Energy: Local Network Charges and Local Electricity Trading Explained', Institute for Sustainable Futures, p. 7
210. Australian PV Institute (2017) 'Australian PV market since April 2001', July
211. Australian Bureau of Statistics (2017) 'Employment in Renewable Energy Activities, Australia, 2015–16', March
212. German Renewable Energy Foundation (2015) 'Factsheet: Renewables from Germany'
213. Leidreiter, A. (2014) 'The Feed-in Tariff is better than is commonly understood', Energy Transition, July 31
214. German Renewable Energy Foundation (2015) Op cit 212
215. COAG (2013) 'Revised National Principles for Feed-In Tariff Arrangements', March
216. Thanks to Jack Gilding for his advice on the key elements of fair Feed-In-Tariffs.
217. Backroad Connections (2017) 'Determining a fair value for distributed generation: Research Report and Bibliography', April 10, p. 16
218. Gilding, J. (2017) 'Victoria solar FiT: A turning point in recognising value of solar', RenewEconomy, February 28
219. Victorian Essential Services Commission (2017) 'Minimum Electricity Feed-In Tariff to Apply From 1 July 2017 – Decision (Final)', p. 9
220. Gilding, J. (2017) Op cit 218

221. Victorian Essential Services Commission (2017) Op cit 219, p. 8
222. Backroad Connections (2017) Op cit 217, p. 29
223. Victorian Essential Services Commission (2017) 'Feed-in tariff 2018–19 draft decision', December 19
224. Riley, J. (2016) 'NSW opens doors to tech SMEs', InnovationAus, December 5
225. Australian Securities and Investments Commission (2017) 'Regulatory Sandbox'
226. Clean Energy Council (2015) 'Best practice facilitation of clean energy by Australian electricity networks', November, p. 5
227. Butler, T. (2012) 'Submission to the Transmission Frameworks Review', Clean Energy Council, p. 12
228. German Ministry of Economic Affairs and Energy (2014) 'Renewable Energy Act 2014', Part 2, Section 1, Paragraph 8
229. Though we note that even large-scale renewables can be more decentralised and as such there will also be a role for distributed large-scale renewables near population centres.
230. Garnaut, R. (2011) 'The Garnaut Review 2011: Australia in the Global Response to Climate Change', Chapter 19: Network Infrastructure, Cambridge University Press
231. Thornton, K. (2015) 'Briefing package for Energy Ministers: COAG Energy Council – Reforms to facilitate new technologies', Clean Energy Council, November 13
232. Finkel, A. et al (2017) Op cit 131, p. 5
233. AEMO (2018) 'Integrated System Plan'
234. Such projects are highly likely to meet the Evaluation Criteria which Infrastructure Australia applies to the Building Australia Fund, including a) 'Project proposal should demonstrate a positive impact on national productivity and economic growth', and b) 'project is expected to assist in: developing Australia's cities or regions; and/or enhancing international competitiveness; and/or improving Australia's ability to address climate change and adaptation effects.' Commonwealth of Australia (2008) 'BAF Evaluation Criteria', formulated under s.120 of the Nation-building Funds Act 2008.
235. Recommendations 1, 3, 4 and 5 are drawn from Clean Energy Council (2015) Op cit 226
236. Institute for Sustainable Futures (2017) 'Network Opportunity Maps'

Part 2: Repower with clean energy

237. ABC (2015) 'Fact check: Is Australia the sunniest continent on Earth?', August 11
238. Teske et al (2016) Op cit 6
239. Green Energy Market (2017) 'Renewable Energy Index – December 2017'
240. Adapted from Greenpeace (2015) 'Energy [r]evolution: A Sustainable World Energy Outlook 2015 – 100% renewable energy for all', Greenpeace International, p. 34
241. Drew, G. et al (2015) Op cit 43
242. Henderson, H., Sanquiche, R. and Nash, T. (2015) 'Breakdowns Driving Breakthroughs: 2015 Green Transition Scoreboard Report', Ethical Markets Media
243. Clean Energy Council (2014) 'Clean Energy Australia Report 2014' p. 20
244. Nelson, J. and Simshauser, P. (2013) 'Is the Merchant Power Producer a broken model?', Energy Policy 53, p. 298–310
245. This is because they often have the qualities of 'public goods' in the economic sense of the term, making it either impossible or inefficient to impose user charges that cover costs. See Quiggin, J. (2014) 'Electricity Privatisation in Australia', report commissioned by the Victorian Branch of the Electrical Trades Union.
246. McAuley, I. and Lyons, M. (2015) Op cit 125, p. 157–159.
247. Green Markets Australia (2018) 'Renewable Energy Index', January, p. 7 and Johnstone, W. (2017) '9 PV records broken in Australia in 2017', RenewEconomy, December 8
248. ARENA (2017) 'Large Scale Solar PV Projects'
249. Parkinson, G. (2018) 'Powershop signs huge deal for solar, wind projects – "stunned" by low prices', RenewEconomy, Feb 1
250. Vorrath, S. and Parkinson, G. (2016) 'Coalition, Labor agree to slash $500m from ARENA budget', RenewEconomy, September 13
251. Mountain, B. (2016) Op cit 84
252. Carbon + Energy Markets (2018) 'A description and critique of the National Energy Guarantee: Briefing prepared for the Australian Conservation Foundation', January
253. Morris, D. (2016) 'Ray Kurzweil: Here's Why Solar Will Dominate Energy Within 12 Years', Fortune, April 16
254. The amount of power that is saved through energy rather than used.

255. The NEPP target takes a base year of 2015, which equates to an 80% improvement on 2010, compared to the 100% improvement that ClimateWorks and others have demonstrated is well within our reach. Pears, A. (2016) 'Australia's energy productivity plan promises more bang for our buck, but lacks commitment', The Conversation, January 29
256. COAG Energy Council (2015) 'National Energy Productivity Plan 2015–2030', December, p. 13
257. Essential Research (2013) 'Survey of Community Views on Energy Affordability – Australia'
258. ClimateWorks (2015) 'Australia's Energy Productivity Potential', March
259. Gjerek, M. (2016) 'Energy productivity in freight transport: Technical potential versus practical reality', Movement
260. Alternative Technology Association (2014) 'The future of GEMS: Recommendations from the consumer sector'
261. Berry, S. et al (2007) 'Modelling the Relationship of Energy Efficiency Attributes to House Price: The case of detached houses sold in the Australian Capital Territory in 2005 and 2006', Department of the Environment, Water, Heritage and the Arts
262. ACIL-Tasman (2013) 'Energy Efficiency Opportunities Program Review', prepared for the Department of Resources, Energy and Tourism, Canberra
263. Eyre, D. (2016) 'Doubling agricultural energy productivity: what would it take?', NSW Farmers, February
264. Ison, N. and Lyons, M. (2016) 'The Repower Australia Plan', GetUp! And Solar Citizens, pp. 76–77
265. This is the cap and trade version. Carbon Pollution Reduction Scheme (CPRS) is an example of an ETS.
266. Parkinson, G. (2017) '30 reasons to question the National Energy Guarantee. And it's not just politics', RenewEconomy, October 23
267. Slezak, M. (2017) 'Finkel's target boosts coal industry and does little to cut emissions, modelling shows', The Guardian, June 14
268. Climate Council (2017) 'New modelling: The NEG will reduce energy jobs by thousands', November 20
269. United Nations Framework Convention on Climate Change, 'Climate Neutral Now'
270. Clean Energy Regulator (2015) 'Australian carbon credit units', August
271. United Nations Framework Convention on Climate Change, 'Go Climate Neutral Now! Frequently Asked Questions'
272. Jotzo, F. and Mazouz, S. (2017) 'Will the National Energy Guarantee hit pause on renewables?', The Conversation, October 20
273. Jacobs, R. (2013) 'The Forest Mafia: How Scammers Steal Millions Through Carbon Markets', The Atlantic, October 11
274. Palmer, B. (2016) 'Should You Buy Carbon Offsets?', National Resources Defense Council, April 28
275. Steffen, W. (2016) 'Land Carbon: No Substitute for Action On Fossil Fuels', Climate Council, September 29
276. Carbon Offset Research & Education (2011) 'Additionality'
277. Hannam, Peter (2016) '$200m tipped into landfill firms by government's Direct Action dubbed a 'waste'', Sydney Morning Herald, June 29
278. Palmer, B. (2016) Op cit 274
279. Environmental Investigation Agency (2013) 'China deal will prevent 8bn tonnes of greenhouse gases', April 24
280. Hodgkinson, D. and Johnston, R. (2015) 'DIY climate action might make us feel good, but it won't solve the problem', The Conversation, October 27
281. Kemp, L. and Jotzo, F. (2015) 'Wait and pay: action on climate change is cheap, delay is costly', The Conversation, May 28
282. Lantz, E. and Tegen, S. (2009) 'Economic Development Impacts of Community Wind Projects. A Review and Empirical Evaluation', National Renewable Energy Laboratory and Gottschalk, M., Hoppenbrock, C., Kucharczak, L., Schäfer, S., and Wetzel, H. (2016) 'Regionale Wertschöpfung in der Windindustrie am Beispiel Nordhessen', Kassel
283. Sapphire Wind Farm (2017) 'Community' and Victoria State Government (2017) 'Community Engagement and Benefit Sharing in Renewable Energy Development. A Guide for Renewable Energy Developers'
284. Mey, F., Diesendorf, M., and MacGill, I. (2016) 'Can local government play a greater role for community renewable energy? A case study from Australia', Energy Research & Social Science, 21, pp. 33–43
285. Hicks, J. et al. (2017) 'Discussion Paper – Enhancing Positive Social Outcomes from Wind Development in Australia: Evaluating Community Engagement & Benefit Sharing'
286. ibid
287. NSW Government (2017) 'Community Consultative Committees', Department of Planning & Environment
288. Lane, T. and Hicks, J. (2017) 'Community Engagement and Benefit Sharing in Renewable Energy Development. A Guide for Renewable Energy Developers', Department of Environment, Land, Water and Planning, Victoria State Government
289. Teske et al. (2016) Op cit 6
290. AEMO (2013) Op cit 19
291. Elliston, B., Diesendorf, M. and McGill, I. (2012) 'Simulation modeling of 100% renewable energy in the Australian national electricity market', University of New South Wales

292. Parkinson, G. (2016) 'Wind energy not to blame for South Australia power outage', RenewEconomy, March 4 and 'South Australia's energy price hikes: Blame inflated bills, not renewables', RenewEconomy, March 10

293. ClimateWorks Australia (2014) 'Industrial demand side response potential: Technical potential and factors influencing uptake', Australian Government Department of Industry, February

294. Denis, A. (2017) 'Managing demand can save two power stations' worth of energy at peak times', The Conversation, May 25

295. The Australia Institute (2017) 'Australians prefer demand response over new power stations: Poll', October 12

296. Riesz, J. et al (2016) Op cit 20

297. ibid

298. Parkinson, G. (2014) 'Ergon says unsubsidised battery storage to cut grid upgrades by one third', RenewEconomy, October 14

299. AAP (2017) 'That's a record': South Australia's Tesla battery responds to coal-fired plant failure', News.com, 17 December

300. Riesz, J. et al (2016) Op cit 20, p. 9

301. Note that projects undertaken through a reverse auction between now and 2020 should be additional to the RET and thus ineligible for RECs.

302. REN21 (2016) 'Renewables 2016. Global Status Report'

303. Bundesnetzagentur [Federal Network Agency] (2017) 'Die Bundesnetzagentur'

304. The Australian (2017) 'Palaszczuk orders less profits, more energy, lower bills', June 6

305. NSW Parliamentary Research Service (2017) 'Privatisation in NSW: a timeline and key sources', June

306. The Australian (2017) 'AGL will be the last to exit coal-fired power', September 15

307. Ison, N. (2017) 'Energy Security Target Submission', Developed for Solar Citizens, GetUp, Australian Conservation Foundation and the Conservation Council of South Australia, Community Power Agency

308. Finkel, A. et al (2017) Op cit 131, p. 99

309. O'Shanassy, K. (2018) 'A description and critique of the National Energy Guarantee Briefing', Carbon + Energy Markets, January, p. 4

310. ARENA (2016) 'About ARENA'

311. NYSERDA (2015) '83 Communities selected for feasibility studies', July

312. New York State (2015) 'Governor Cuomo Announces Awards to 83 Communities Across New York to Support Local Clean Energy and Resiliency', July 8

313. ARENA (2016) 'Governance and funding profile'

314. Taylor, L. (2016) 'The good, the bad and the shell game – what Turnbull's clean energy shift means', The Guardian, 23 March

315. ARENA (2015) 'Perth Wave Energy Project'

316. ARENA (2015) 'The Australian Renewable Energy Mapping Infrastructure (AREMI) project'

317. The Prime Minister flagged that ARENA could fund "low-emissions" technologies, a term often used as greenwash for nuclear energy and fossil fuels.

318. Clean Energy Finance Corporation (2017) 'CEFC Annual Report 2015/16 – Performance – Year in Review'

319. Clean Energy Finance Corporation (2017) 'CEFC Annual Report 2015/16 – Performance – Detailed Analysis of 2015–16 Performance'

320. Edis, T. (2015) 'Board of Clean Energy Bank being told to break the law', Climate Spectator, July 14

321. Australian Government (2015) 'Welcome to the Ideas Boom: National Innovation and Science Agenda'

322. Australian Government (2013) 'Energy Use in the Australian Government's Operations 2011–12', Department of Resources, Energy and Tourism

323. Energy productivity is the ratio of output of an organisation, economy or process to the energy consumed. In this case it refers to the ratio of Australia's GDP to our primary energy consumption.

324. NSW Government (2016) 'Government Resource Efficiency Policy' Office of Environment and Heritage

325. Parkinson, G. (2016) 'NSW tenders for renewable energy projects to power Sydney Metro rail' RenewEconomy, January 22

326. Government of South Australia (2015) 'Ideas sought for low carbon energy supply', Department of State Development

327. Productivity Commission (2013) Op cit 98

328. Translation of Scheer, H. (2009) Inauguration of IRENA Speech, January 26

329. Trade Unions for Energy Democracy (2017) 'About the Initiative'

330. REScoop (2017) 'About our federation'

331. Vorrath, S. (2014) 'Australian coal prospects dim as Modi turns spotlight on solar', RenewEconomy, May 20

332. REN21 (2017) 'Renewables 2017: Global Status Report', p. 25

333. Marcacci, S. (2018) 'India Coal Power Is About To Crash: 65% Of Existing Coal Costs More Than New Wind And Solar', Forbes, January 30

334. Comparison of retail electricity prices in Australian capital cities with the Levelised Cost of Energy (LCOE) for rooftop solar PV (excluding Feed-in-Tariffs and including a 5% discount rate). Source: Drew, G. et al (2015) Op cit 43, p. 46
335. Australian Energy Council (2014) 'Renewable Energy In Australia How Do We Really Compare?'
336. Australian PV Institute (2017) 'Australian PV market since April 2001', July 2017
337. Australian Bureau of Statistics (2017) Op cit 211
338. Petrkovic, M. (2017) 'Impact of small solar PV on the NSW wholesale electricity market', Energy Synapse, October 12
339. Parkinson, G. (2017) 'Record solar, wind "save" NSW consumers as coal, gas went missing', RenewEconomy, February 13
340. Parkinson, G. (2017) 'Melting in the sun: How fossil fuel generators failed in summer heat-wave', RenewEconomy, April 7
341. Community Power Agency (2017) 'Community Energy Map & Database'
342. Hunt, E. (2017) 'Most Australians want renewables to be primary energy source, survey finds', The Guardian, June 27
343. Energy Supply Association of Australia (2015) 'ESAA Solar Report – December 2015', p. 4
344. Australian Council of Social Service (2017) 'Poverty'
345. Australian Council of Social Service (2014) 'Preventing shocks and addressing poverty'
346. Feldman et al (2015) 'Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation', National Renewable Energy Laboratory
347. According to the Australian Bureau of Statistics, 29.6% of Australian households have a tenure status of "Rented" and 13.6% of dwellings have a structure of "Flat, unit or apartment" (ABS, '2011 Census QuickStats'). Assuming some overlap, we can conservatively surmise that more than 30% of households are currently 'locked out' of Australia's rooftop solar market. Note that this does not include the household statistics for those with unsuitable roofs or low-income households.
348. Clark, T. (2015) 'Energy giants more disliked than banks, poll finds', The Guardian, January 26
349. Consumer Action Law Centre (2016) 'Power Transformed', July
350. Martinelli, A. and Yang, A. (2016) 'Future Powered Families Report', Environment Victoria
351. Community Power Agency (2016) 'Renewables for All: A Priority Energy Policy Agenda for Australia', January
352. Investor Group on Climate Change (2017) 'Coal, Carbon and The Community', October, p. 25
353. Environment Justice Australia (2017) 'Toxic and Terminal: How the regulation of coal-fired power stations fails Australian communities'
354. Smith, S. (2017) 'Just Transitions: A Report for the OECD', Just Transition Centre, May
355. Hooper, F. (2017) Speech to the Community Energy Congress
356. Australian Council of Trade Unions (2016) 'ACTU Policy Discussion Paper – A Just Transition for coal-fired electricity sector workers and communities', November
357. Australian Council of Social Service, Brotherhood of St. Laurence, and The Climate Institute (2017) 'Empowering Disadvantaged Households to Access Affordable Clean Energy', July
358. Victoria State Government (2017) 'Home Energy Assist Program', Department of Environment, Land, Water and Planning
359. Vorrath, S. (2017) 'Queensland opens rooftop solar market to low-income and rental households', One Step Off the Grid, October 24
360. Spencer, D. (2017) 'Government owned non-profit retailer could lower bills & provide access to clean energy for vulnerable South Australians', Solar Citizens, October 28
361. Community Power Agency (2015) 'Renewables for All – Resources'
362. Environment Victoria (2018) 'One Million Homes Alliance'
363. Sydney Alliance (2017) 'Meet Our Action Teams'
364. Finkel, A. et al (2017) Op cit 131, p. 25
365. Nockolds, T., Rutivitz, J. and Ison, N. (2017) 'Social Access Solar Gardens proposal'. Note conservative estimate.
366. Translation from Scheer, H. (2010) 'Der energethische Imperativ', Kunstmann, p. 15
367. Klein, N. (2014) 'This Changes Everything', Penguin Books
368. CO2CRC (2015) Op cit 30, p. 130
369. Clean Energy Council (2015) 'Off-grid Renewables'
370. ARENA (2014) 'Media Release: Solar solution for remote community', August 15
371. Hodgetts, D. (2014) 'Crikey Clarifier: how can the government 'close down' WA communities?', Crikey, December 2
372. CO2CRC (2015) Op cit 30, p. 130
373. Empowered Communities (2018) 'About Empowered Communities'
374. Case Study written by April Crawford-Smith of Pingala and The Valley Centre.
375. Hathway, K. (2010) 'Community power empowers', Urban Forum, p. 44
376. Walker, G., Hunter, S., Devine-Wright, P., Evans, B. and Fay, H. (2007) 'Harnessing community energies: explaining and evaluating community-based localism in renewable energy policy in the UK', Global Environmental Politics, Vol 7, pp. 64–82

377. Costing based on M. Jackson and N. Ison analysis.
378. Northern Territory Government (2016) '2015–2016 Northern Territory Budget – BP3: The Budget – Part 2: Community Service Obligations', Department of Treasury and Finance
379. Interview with DICE CEO Ray Pratt, February 1, 2016
380. Australian Council of Social Service, Brotherhood of St. Laurence, and The Climate Institute (2017) Op cit 357
381. ibid pp. 152–153
382. Thwaites, J. et al (2017) Op cit 94
383. ibid p. 119
384. AER (2017) Op cit 37, p. 147
385. Australian Council of Social Service, Brotherhood of St. Laurence, and The Climate Institute (2017) Op cit 357
386. ibid
387. Tasmanian Government (2016) 'Electricity', Discounts & Concessions
388. Government of South Australia (2018) 'Energy bill concessions'
389. Victoria State Government (2017) 'Concessions & benefits', Department of Health and Human Services
390. ABC News (2017) 'Further power bill relief planned under SA proposal to bulk-buy from energy retailers', July 26
391. Russell-Bennett, R. et al (2017) 'Power Shift Project One Report: Driving Change – Identifying what Caused Low-Income Consumers to Change Behaviour', GEER Australia
392. LIEEP took place across all states and territories in Australia (except ACT) it comprised 44 initiatives designed by 20 consortia and involved 32,466 people.
393. Nance, A. (2017) 'Energy Access and Affordability Policy Research', The Energy Project, March
394. The Obama White House (2016) 'Ida Went Solar (You Can, Too)', July 19
395. The White House (2016) 'FACT SHEET: Obama Administration Announces Clean Energy Savings for All Americans Initiative', July 19
396. U.S. Department of Energy (2016) 'National Community Solar Partnership',
397. Hogan, C. and Salt, B. (2017) 'The rise of energy poverty in Australia: census insights', KPMG, December
398. CEFC (2016) 'Financing energy efficient community housing', Februrary
399. Eastern Alliance for Greenhouse Action (2016) 'Solar PV for low income households: Directions paper – building the business case for action', June
400. Our Power (2017) 'About'
401. BBC News (2015) 'Non-profit energy supplier launches', July 16
402. Chapman, B. (2017) 'Scotland to set up publicly-owned, not-for-profit renewable energy company', The Independent, October 11
403. Australian Bureau of Statistics (2011) '2011 Census QuickStats'
404. Assumes 2.6 people per household, as per ABS.
405. Victoria State Government (2017) 'Affordable Retrofits Program'
406. Queensland Government (2017) 'Solar for rental properties'
407. CEFC (2015) 'New finance gives NSW community housing a clean energy boost', September
408. Australian Council of Social Service, Brotherhood of St. Laurence, and The Climate Institute (2017) Op cit 357, p. 47
409. Bedggood, R. et al (2017) 'The Living Conditions of Aboriginal People in Victoria', International Conference on Improving Residential Energy Efficiency
410. Crawford, R. and Wrigley, K. (2016) 'Renters are being left out in the cold on energy savings: here's a solution', The Conversation, October 10
411. Bedggood, R. et al (2017) Op cit 409
412. Queensland Council of Social Service (2017) 'Choice and Control? The experiences of renters in the energy market', June, p. 12
413. Crawford, R. and Wrigley, K. (2015) 'Bridging the gap: energy efficiency improvements for rental properties', The Architectural Science Association and The University of Melbourne, p. 5
414. Victoria State Government (2009) 'January 2009 Heatwave in Victoria: an Assessment of Health Impacts', Department of Human Services, p. 12
415. Gasparrini, A. et al (2015) 'Mortality risk attributable to high and low ambient temperature: a multi-country observational study', Lancet, Vol. 386, p. 369
416. Environment Victoria (2017) 'Bringing rental homes up to scratch: Efficiency standards to cut energy bills, reduce pollution and create jobs', pp. 18 and 20
417. ibid, p. 21
418. Crawford, R. and Wrigley, K. (2016) Op cit 410
419. Australian Council of Social Service, Brotherhood of St. Laurence, and The Climate Institute (2017) Op cit 357
420. Environment Victoria (2017) Op cit 416
421. Environment Victoria (2018) 'One Million Homes Alliance'
422. Crawford, R. and Wrigley, K. (2016) Op cit 410
423. Environment Victoria (2017) Op cit 416, p. 27
424. ibid

425. Australian Council of Social Service, Brotherhood of St. Laurence, and The Climate Institute (2017) Op cit 357, p. 50
426. SunTenants (2018) 'Sun Powered Rentals'
427. Harmsen, N. and Dayman, I. (2017) 'SA power: State Opposition releases $100m home battery plan to 'reduce energy costs'', ABC News, October 10
428. The Greens (2016) 'Powering Up Battery Storage for Households and Business – Powering the new economy with clean energy'
429. Solar Citizens (2018) 'Sharing the Savings: A voluntary buyout of Premium Feed-in Tariff schemes'
430. Coalition for Community Energy (2015) 'National Community Energy Strategy'
431. Community Power Agency (2018) 'Community Energy Map and Database'
432. Hicks, J. and Ison, N. (2012) 'Community Energy Generation', The Home Energy Handbook, Centre for Alternative Energy
433. Landcare Australia (2016) 'What is landcare?'
434. Australian Government (2016) 'National Landcare Programme. Regional Stream', Department of the Environment and Department of Agriculture
435. There should be flexibility on the exact governance arrangement, clean energy programs delivered, and actors involved. Existing relationships and institutional structures should be leveraged from Regional NRM organisations, councils, regional development authorities, community organisations, etc. However, existing groups on the ground shouldn't be a requirement, as the purpose of this program is to seed new organisations that will hopefully exist beyond the length of the program.
436. Klein, N. (2014) p. 446
437. See the Community Power Agency's Renewables for All project for case studies of these and other models of socially beneficial clean energy provision. Community Power Agency (2015) Op cit 361
438. McKenzie, P. (2013) 'Community Renewable Energy Fund', Marsden Jacobs and Associates
439. Costings N. Ison analysis.
440. NSW Government (2015) 'A Brief History of Landcare Support in NSW'
441. Byron Shire Council (2015) 'Byron Shire aims to become Australia's first Zero Emissions community'
442. Lombard, D. (2016) 'Empowering the Future: Appropriate regulation and consumer protection in emerging energy markets', Alternative Technology Association
443. Consumer Action Law Centre (2016) Op cit 349
444. Clean Energy Council (2014) 'Solar Retailer Code of Conduct'
445. Lombard, D. (2016) Op cit 442
446. Quinn, T. (2015) 'The Next Boom: A surprise new hope for Australia's economy', Future Business Council
447. REN21 (2017) 'Another Record Breaking Year for Renewable Energy'
448. Drew, G. et al (2015) Op cit 43
449. Wiggins, J. (2017) 'Blackrock says coal is dead as it eyes renewable power splurge', Australian Financial Review, May 24
450. Drew, G. et al (2015) Op cit 43
451. Geoscience Australia and Australian Bureau of Agricultural and Resource Economics (2010) 'Australian energy resource assessment', p. 268
452. Australian Government (2013) 'Land use – Australia', Australian Natural Resource Atlas
453. Australian Trade Commission (2010) 'Australian Clean Energy', Intersolar, 9–11 June 2010
454. Campbell, A., Blakers, A., and Blanch, S. (2013) 'The north's future is electrifying: powering Asia with renewables', The Conversation, August 21
455. Green, D. and Minchin, L. (2010) 'Screw Light Bulbs: Smarter ways to save Australians time and money', UWA Publishing
456. Garnaut, R. (2016) 'Australia After Paris: Will we use our potential to be the energy superpower of the low-carbon world?', public lecture hosted by the Young Energy Professionals State Theatre Centre of Western Australia, January 21
457. ibid
458. Grudnoff, M. and Denniss, R. (2014) 'Will we let the sunshine in? Trends in the Australian Solar Industry', The Australia Institute
459. Rutovitz, J. et al (2015) 'Calculating global energy sector jobs: 2015 methodology update', Institute for Sustainable Futures
460. Potter, B. (2017) 'Cheap wind and solar will make a Australia a magnet – Bloomberg', Australian Financial Review, June 15
461. AEMO (2017) 'National Electricity & Gas Forecasting'
462. AEMO (2018) 'Business Consumption'
463. Based on NGER data release, for 2014–15.
464. Macdonald-Smith, A. (2017) 'Telstra's solar contract part of bigger power play', Australian Financial Review, May 31
465. Vorrath, S. (2017) 'Sun Metals say new solar farm will underpin zinc refinery expansion', RenewEconomy, May 17
466. Parkinson, G. (2017) 'Time for Australia to wake up to the scale and pace of clean energy transition', RenewEconomy, November 1
467. Parkinson, G. (2017) 'Nectar Farms on 100% renewables: "Why would you do it any other way"', One Step Off the Grid, June 28

468. Vorrath, S. (2017) 'No small beer: Foster's, VB to go 100% renewable by 2025', One Step Off the Grid, August 3
469. Potter, B. (2017) 'NAB, NEXTDC, join City of Melbourne bid to underwrite Pacific Hydro wind farm', Australian Financial Review, November 22
470. Energy Exchange (2018) 'Energy Efficiency Opportunities Program', Australian Government
471. EV-Volumes (2017) 'USA Plug-in Vehicle Sales for Q2 and Year to Date'
472. Lambert, F. (2017) 'Norway is reaching tipping point for electric vehicles as market share reaches record breaking 37%', Electrek, February 15
473. RAC (nd) 'The RAC Electric Highway'
474. Jeremic, S. (2017) 'WA's electric car-charging network to expand', The West Australian, July 10
475. Queensland Government (2017) 'Media Statement: The future is electric for Queensland motorists', July 27
476. Deloitte (2011) 'Unplugged: Electric vehicle realities versus consumer expectations', October
477. Cass, D. and Grudnoff, M. (2017) 'If you build it they will charge', The Australia Institute, October
478. Emerson, C. (2015) 'The big switch to electric cars', Australian Financial Review, November 10
479. Electric Vehicle Council (2017) 'Submission to Ministerial Forum on Vehicle Emissions', March 10
480. Research and Markets (2017) 'Global Ammonia Market Analysis 2014–2025 – Market is Anticipated to Reach $76.6 Billion', November 27
481. ARENA (2017) 'Power to gas trial to inject hydrogen into Australia's gas grid,' August 7
482. South Australian Government (2017) 'Our Energy Plan: Hydrogen', September 8
483. Community Power Agency (2017) Various presentations
484. Labor Environment Activist Network (2017) 'Public Renewable Energy in Northern Queensland'
485. Queensland Labor (2017) 'Powering Queensland's Future: Affordable, Stable and Balanced', p. 12
486. Doyle, J. (2017) 'International students studying in Australia reach record number, Education Department figures show', ABC News, February 22
487. An exception is the UEE41611 – Certificate IV in Renewable Energy.
488. This should also apply, over time, to all other relevant Training Packages.
489. See Section 5.1 of the Repower Australia Plan V1 for more detail on the types of training packages and areas that are needed.
490. Hutchens, G. (2016) 'Australia lobbies infrastructure bank to invest in coal and nuclear power', The Guardian, December 6

Part 3: Replace the polluters

491. Any refurbishment that significantly extends the life of an existing coal or gas fired power plant should also be ruled out. Note that this refers to combined cycle gas turbines, and exceptions may be made for open cycle gas turbines to provide rarely-used gas-fired peaking generation. The 'Advanced Renewable' Scenario modelled by the Institute for Sustainable Futures demonstrates the technical feasibility and economic benefits of directing 99 percent of new capital investment to renewables and cogeneration. Teske et al (2016) Op cit 6
492. Stock, A. (2014) Op cit 114
493. Nelson, T., Reid, C. and McNeill, J. (2014) 'Energy-only markets and renewable energy targets: complementary policy or policy collision?' AGL Applied Economic and Policy Research. Working Paper No. 43, p. 15
494. Caldecott, B. Dericks, G. and Mitchell, J. (2015) 'Subcritical Coal in Australia: Risks to Investors and Implications for Policymakers', Working Paper, Smith School of Enterprise and the Environment, Oxford University, p. 12
495. ibid p. 5. NB: combustion processes tend to result in fine particles (PM2.5 – particles of up to 2.5 microns in diameter) rather than coarse particles (PM10).
496. ibid
497. ibid
498. Sub-critical coal plants are an older style of coal plant which burn coal at lower temperatures and pressure to newer super critical coal models.
499. Denniss, R. and Campbell, R. (2015) 'Two Birds, One Little Black Rock: Solving the twin problems of incentives for retirement of coal fired generation and funding rehabilitation liabilities', The Australia Institute, December
500. ABC News (2015) 'Alinta Energy to close power stations at Port Augusta and coal mine at Leigh Creek', June 11
501. Parkinson, G. (2016) 'Origin: World moving quickly to renewables as solar costs plunge', RenewEconomy, February 18
502. ABC News (2017) 'Powering Past Coal Alliance: 20 countries sign up to phase out coal power by 2030', November 16
503. Ogge, M. and Aulby, H. (2017) 'Can't Stand the Heat', The Australia Institute
504. Nelson, T., Reid, C. and McNeill, J. (2014) Op cit 493 p. 15
505. Nelson, T. (2015) 'Energy-only markets and renewable energy targets: complementary policy or policy collision?', Economic Analysis and Policy, Volume 46, June, pp. 25–42
506. Chambers, M. (2015) 'AGL Energy turns its back on coal-fired power', The Australian, April 17

507. Parkinson, G. (2015) 'Hazelwood owner promises no new coal fired power stations', RenewEconomy, October 15
508. Note that Origin Energy initially committed to "not investing in any future fossil fuel assets", but later told Climate Spectator that they were in fact ruling out further coal investments, and that their comments did not apply to gas: Edis, T. (2015) 'Reality Check: Origin Energy's Green Commitments', Climate Spectator, October 23
509. Chambers, M. (2015) Op cit 506
510. Reputex Carbon (2017) Op cit 3
511. Dunstan, C. et al (2017) 'Beyond Coal – Alternatives to Extending Liddell Power Station', Institute for Sustainable Futures, November
512. The fact that brown coal is basically a big layer of dirt just under the surface, also makes it cheap.
513. Environment Victoria, (2016) Submission to the Senate Inquiry into Coal Retirement, November
514. King, T. (2016) 'Sub-Critical Australia: Risk from imbalance in the Australian National Electricity Market', Institute for Energy Economics and Financial Analysis, May
515. In economic language, this form of market failure is known as a 'collective action problem'. See Nelson, T. (2015) Op cit 505
516. Costs of closure are somewhere in the range of $100–$300 million (ibid)
517. Environment Victoria (2017) '$300 million increase in mine rehabilitation bonds to protect environment, Victorian taxpayers and Latrobe Valley community', October 6
518. Jotzo, F. and Mazouz, S. (2015) 'Brown coal exit: a market mechanism for regulated closure of highly emissions intensive power stations', Centre for Climate Economic & Policy, Crawford School of Public Policy, Australian National University
519. Teske, S. (2016) Op cit 6
520. As recognised by the addition of a 1.5 degree ambition to the Paris Agreement, 2 degrees is itself a dangerous level of warming.
521. Caldecott, B. et al (2015) Op cit 494
522. ibid and Stock, A. (2014) Op cit 114, p.14
523. Stock, A. (2014) Op cit 114, p. 8
524. Beyond Zero Emissions (2014) 'Carbon Capture and Storage Information Paper'
525. Stock, A. (2014) Op cit 114
526. In 2015 dollars. Source: CO2CRC (2015) Op cit 30, p. 252
527. Kohler, B. (1996) 'Sustainable development: a labor view – The real choice is not jobs or environment. It is both or neither', Presentation at the Persistent Organic Pollutants Conference, December 5
528. Paris Agreement (2015) Annex to Decision /CP., FCCC/CP/// Add., Preamble, December 12
529. Adapted from a presentation delivered by Lisa Abbott (Kentuckians for the Commonwealth) and Justin Maxson (Mary Reynolds Babcock Foundation) 'Working Toward a Just Transition in Central Appalachia'.
530. Beer, A. (2015) 'Structural adjustment programmes and regional development in Australia', Local Economy, Vol 30(1) p. 23
531. Long, S. (2017) 'How a power station sold for peanuts became a $730 million asset', ABC News, October 24
532. Environment Victoria (2017) 'Media background: Hazelwood closure', March 27
533. Parliament of Australia (2017) 'Retirement of coal fired power stations – Final Report', March 29
534. Lyell, Kim (2010) 'Swanbank coal-fired power station to close', ABC News, March 25
535. Synergy (2017) 'Synergy to Reduce Generation Capacity by 380 MW', May 5
536. Mercer, D. (2017) 'Collie's Muja AB power station to close in multi-million dollar loss', The West Australian, September 13
537. Investor Group on Climate Change (2017) Op cit 352, p. 25
538. Australian Council of Trade Unions (2016) 'Sharing the challenges and opportunities of a clean energy economy: A Just Transition for coal-fired electricity sector workers and communities', November
539. Latrobe Valley Authority (nd) 'A stronger future for the Latrobe Valley'
540. For example the aging workforce (50–60% above 45 years) and long single trade careers – see Investor Group on Climate Change (2017) Op cit 352, p. 28
541. See the Latrobe Valley Worker Transfer Scheme for an example of a redeployment scheme applied on a small scale. Latrobe Valley Authority (nd) 'Worker Transfer Scheme'
542. ABC News (2017) 'Solar Thermal Power Plant Announced for Port Augusta – Biggest of It's Kind in the World', August 14
543. Repower Port Augusta (2017) 'Community Celebrates Premier Weatherill and SA government's Decision to Back Building Solar Thermal in Port Augusta', August 18
544. ibid
545. See, for example, Fairley, P. (2015) 'Zombie coal plants reanimated to stabilize the grid', IEEE Spectrum, July 24
546. Investor Group on Climate Change (2017) Op cit 352, p. 3
547. U.S. Environmental Protection Agency (2014) 'Regulatory impact analysis for the Proposed Carbon Pollution Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants', June
548. Jotzo, F. and Mazouz, S. (2015) Op cit 518

549. Denniss, R. and Campbell, R. (2015) Op cit 499

550. Caldecott, B. et al (2015) Op cit 494

551. Environmental Justice Australia (2017) 'Toxic and Terminal: How the regulation of coal-fired power stations fails Australian communities', August

552. Senate Community Affairs References Committee (2013) 'Impacts on Health of Air Quality in Australia', Parliament of Australia, p. 3

553. Begg, S., Vos, T., Barker, B., Stevenson, C., Stanley, L. and Lopez, A. (2007) 'The burden of disease and injury in Australia 2003', Australian Institute of Health and Welfare, p. 96

554. Biegler, T. (2009) 'The Hidden Costs of Electricity: Externalities of Power Generation in Australia', Australian Academy of Technological Sciences and Engineering, March

555. Environmental Justice Australia (2017) Op cit 551

556. Chakaraborty, J. and Green, D. (2014) 'Australia's first national level quantitative environmental justice assessment of industrial air pollution', Environmental Research Letters, 9

557. Australian Government (2017) 'National Pollutant Inventory', Department of the Environment and Energy

558. ibid

559. Centre for Air Quality & Health Research and Evaluation (2013) 'Submission no 29 to Senate Community Affairs References Committee', Parliament of Australia, Impacts on Health of Air Quality in Australia, pp 10–11

560. NSW Environment Protection Authority and Office of Environment and Heritage (2016) 'Consultation Paper: Clean Air for NSW', p. 21

561. Farnsworth, S., Morris, M. and Whitson, R. (2014) 'Hazelwood mine fire pollution blamed for 11 deaths', ABC News 7:30 Victoria, September 13

562. Environmental Justice Australia (2017) Op cit 551, p.16

563. Climate and Health Alliance (2015) 'Coal and health in the Hunter: Lessons from one valley for the world', February

564. Parkinson, G. (2017) Op cit 340

565. Gribbin, C. (2017) 'Liddell power station on 'sliding scale to oblivion', AGL general manager says', ABC News, September 19

566. Sky News (2017) 'Concerns over Liddell station workers' safety', September 22

567. Institute for Sustainable Future (2017) 'Beyond Coal: Alternatives to Extending the Life of L7ll Power Station', November, p. 36

568. SBS (2017) 'Wind, batteries in AGL Liddell exit plan', September 27

569. Parkinson, G. (2017) 'AEMO says fossil fuel failures, renewable delays biggest threat to grid', September 5

570. Knight, E. (2017) 'AGL digs its heels in against Turnbull's plans for Liddell coal power plant', Sydney Morning Herald, September 27

571. Environmental Justice Australia (2017) Op cit 551, p. 61

572. National Environmental Protection Council (2011) 'National Environment Protection (Ambient Air Quality) Measure Review – Review Report', September 16, p. 28

573. Australian Government (2014) 'Inaugural Alan Hunt Oration', Department of Environment and Energy, March 7

574. Australian Government (2015) 'National Clean Air Agreement', Department of Environment and Energy, December 15

575. Environmental Justice Australia (2017) Op cit 551

576. ibid, p. 3

577. ibid, p. 27

578. ibid, p. 34

579. See Australian Panel of Experts on Environmental Law (2017) 'Environmental Governance' for a detailed discussion of the Commonwealth's powers to take such measures.

580. West, M. (2017) 'Gas crisis? Or glut? Why Japan pays less for Australian LNG than Australians do' The Conversation, March 14

581. Letts, S. (2017) 'Gas prices: Deal done but the days of cheap gas are long gone', ABC News, September 14

582. Australian Competition and Consumer Commission (2017) 'Gas Inquiry 2017–2020 – Interim Report', September, p. 19

583. Forcey, T. and McConnell, D. (2017) 'A Short-Lived Gas Shortfall: A review of AEMO's warning of gas-supply 'shortfalls'', Australian-German Climate & Energy College, May, p. 3

584. MacDonald-Smith, A. (2017) 'Cheap gas is a thing of the past and pathetically, insiders knew it was coming', Australian Financial Review, March 17

585. National Toxics Network (2013) 'Toxic Chemicals in the Exploration and Production of Gas from Unconventional Sources', April

586. Hildenbrand, Z.L. et al (2015) 'A Comprehensive Analysis of Groundwater Quality in The Barnett Shale Region', Environmental Science & Technology, 49 (13) pp. 8254–8262

587. Llewellyn G. T. et al (2015) 'Evaluating a groundwater supply contamination incident attributed to Marcellus Shale gas development', Proceedings of the National Academies of Sciences, 112, pp. 6325–30

588. Alawattegama, S. K. et al (2015) 'Well water contamination in a rural community in southwestern Pennsylvania near unconventional shale gas extraction', Journal of Environmental Science and Health Part A: Toxic/Hazardous Substances and Environmental Engineering, 50, pp 516–528

589. DiGiulio, D. C. and Jackson, R. B. (2016) 'Impact to underground sources of drinking water and domestic wells from production well stimulation and completion practices in the Pavillion, Wyoming, Field', Environmental Science & Technology, 50, p. 8
590. National Toxics Network (2013) Op cit 585
591. Khan, S. and Kordek, G. (2014) 'Coal Seam Gas: Produced Water and Solids', Office of the NSW Chief Scientist and Engineer (OCSE) May 28, p. 54
592. Australian Resources (2014) 'Santos fined for Pilliga spill', January 13
593. Climate Council (2017) 'Pollution and Price: The Cost of Investing in Gas', p. 8
594. California Air Resources Board (2017) 'Short-Lived Climate Pollutant Reduction Strategy', March 24, p. 7
595. Center for Biological Diversity (2017) 'Natural Gas Fact Sheet'
596. LaFleur, D. et al (2016) 'A review of current and future methane emissions from Australian unconventional oil and gas production', University of Melbourne, September, pp. 6–7
597. Long, S. (2017) 'Methane emissions from coal seam gas development raise climate change concerns', ABC News, March 2
598. Lloyd, G. (2017) 'Australia can have a vast, untapped gas bonanza', The Australian, February 8
599. Hutchens, G. (2017) 'Voters back fracking bans despite pressure on states to drop them', The Guardian, October 3
600. Bell, F. (2017) 'Fracking ban to be introduced in Victoria after Coalition backs Government legislation', ABC News, February 6
601. Woolf, K. (2017) 'To Frack Or Not To Frack', Mix 104.9, September 11
602. See, for example, National Institute of Economic and Industry Research (2012) 'Large scale export of East Coast Australia natural gas: Unintended consequences'
603. Segorbe, J. and Lambert, P. (2017) 'Meeting east Australia's gas supply challenge', McKinsey Australia, March, p. 43
604. West, M. (2015) 'Far from free, gas is becoming the 'risible' market – all the way to the bank', Sydney Morning Herald, April 25
605. Core Energy Group (2015) 'Gas Production and Transmission Costs – Eastern and South Eastern Australia', AEMO, February, p. 9
606. Segorbe, J. and Lambert, P. (2017) Op cit 603, p. 23
607. Chambers, M. (2015) 'LNG shipping cheaper than gas pipeline', The Australian, April 25
608. Marks, L. (2017) 'Second Northern Territory gas pipeline not viable without fracking, APPEA says', ABC News, April 1
609. Core Energy Group (2016) 'Cooper-Eromanga Basin Outlook 2035', October, p. 18
610. Robertson, B. (2016) 'Pipe Dream: A financial analysis of the Northern Gas Pipeline', Institute for Energy Economics and Financial Analysis, May, p. 30
611. MacDonald-Smith, A. (2017) 'NT-SA gas pipeline 'doesn't add up': Jemena', Australian Financial Review, April 3
612. Australian Competition and Consumer Commission (2017) Op cit 582, p. 19
613. Sims, R. (2017) 'Shining a light: Australia's gas and electricity affordability problem', Australian Competition and Consumer Commission, September 20
614. Stevens, M. (2017) 'Untruths fuel 'gas price of desperation'', Australian Financial Review, August 24
615. Manufacturing Australia (2015) 'Reforming the East Coast gas market: Solutions to keep gas-intensive manufacturing in Australia', April, p. 4
616. Mountain, B. (2016) Op cit 84
617. McConnell, D. and Sandiford, M. (2016) 'Winds of Change – an analysis of recent changes in the South Australian electricity market', Melbourne Energy Institute, August, p. 4
618. Australian Energy Market Operator (2016) 'National Gas Forecasting Report for Eastern and South-Eastern Australia,' December, p. 4
619. IT Power (2015) 'Renewable Energy Options for Australian Industrial Gas Users', Australian Renewable Energy Agency, September, p. 2
620. Australian Industry Group (2017) 'Energy Shock: No Gas, No Power, No Future?', February, p. 12
621. ARENA (2015) 'Renewables for industrial processes'
622. ITPower (2015) Op cit 619, p. 8
623. ARENA (2015) Op cit 621
624. ITPower (2015) Op cit 619, p. 7
625. ARENA (2015) Op cit 621
626. Australian Competition and Consumer Commission (2017) Op cit 582, p. 19
627. Beyond Zero Emissions (2017) 'Electrifying Industry – Project Introduction', September, p. 3
628. ITPower (2015) Op cit 619, p. 25
629. Melbourne Energy Institute (2016) 'Victorian Geothermal Assessment Report 2016', p. 4
630. ITPower (2015) Op cit 619, p. 23
631. U.S. Environmental Protection Agency (nd) 'RHC for Industrial Processes'
632. CSIRO (2016) 'Building Australia's largest solar thermal research hub', December 19

633. Vorrath, S. (2016) 'World-first solar tower powered tomato farm opens in Port Augusta', RenewEconomy, October 7
634. Vorrath, S. (2013) 'De Bortoli to launch Oz wine industry's largest solar system', RenewEconomy, October 15
635. ITPower (2015) Op cit 619, p. 16
636. Clarke, W. and McCabe, B. (2017) 'Capturing the true wealth of Australia's waste', The Conversation, August 24
637. ITPower (2015) Op cit 619, p. 15
638. Ison, N. et al (2013) 'New South Wales North Coast Bioenergy Scoping Study', Sustain Northern Rivers, p. 17
639. Clean Energy Council (2014) 'CEC position on native wood waste'
640. Australian Government (2016) 'Customer Story – Australian Tartaric Products', Business.gov.au, May 23
641. Hertle, C. et al (nd) 'Water Recycling in the Australian Food & Beverage Industry A Case Study – Reduced Environmental Footprint', GHD
642. Forcey, T. (2015) 'Reverse-cycle Air Conditioners: Australian Renewable Energy Giants', Alternative Technology Association, December 22
643. ITPower (2015) Op cit 619, pp. 27–28
644. CEFC (2018) 'Business asset finance'
645. CSIRO (2016) Op cit 632
646. CSIRO (2016) 'Australian Solar Thermal Research Initiative'
647. Guevara-Stone, L. (2013) 'Güssing, Austria Powered Entirely By Renewable Energy', CleanTechnica, October 16
648. Beyond Zero Emissions (2013) 'Buildings Plan', p. 12
649. Australian Industry Group (2017) Op cit 620, p. 12
650. Australian Council of Social Service (2013) 'Energy Efficiency & People on Low Incomes', p. 2
651. Meaning a meaning a positive net present value over a 10-year lifespan, where net present value (or NPV) subtracts the costs of installing a new technology today from the value of the costs saved over time, with future benefits discounted using expected interest rates or other factors.
652. Alternative Technology Association (2014) 'Are we still Cooking with Gas?', November, p. 5
653. Forcey, T. (2015) 'Switching off gas – An examination of declining gas demand in Eastern Australia', Melbourne Energy Institute, August 26, pp. 24–25
654. Lombard, D. and Price, K. (2017) 'Gas vs electricity – Which fuel is cheapest?', ReNew, Issue 140, July–September 2017, pp. 44–47
655. COAG Energy Council (2015) 'National Energy Productivity Plan 2015–2030', December, p. 4
656. COAG Energy Council (2016) 'National Energy Productivity Plan 2015–2030: Annual Report 2016', December, p. 15
657. Alternative Technology Association (2014) Op cit 652, p. 8
658. Energy Efficiency Council (2017) 'Save Energy, Cut Bills, Improve Reliability – 2017–18 policy priorities for an energy efficient Australia'
659. Beyond Zero Emissions (2013) Op cit 648
660. Forcey, T. (2015) Op cit 653
661. Australian Council of Social Service (2013) Op cit 650
662. Alternative Technology Association (2014) Op cit 652, p. 5
663. ACT Suburban Land Agency (2017) 'Ginninderry – The Case for a No Gas Community', July 25
664. Ginninderry (nd) 'Sustainability'
665. ACT Suburban Land Agency (2017) Op cit 663
666. Birol, F. the Chief Economist (now Executive Director) of the IEA (2013) speaking at the European Wind Energy Association conference
667. David Coady et al (2015) 'How Large Are Global Energy Subsidies?', International Monetary Fund
668. GetUp! (2016) 'The Dirty Dozen: How Australia's 12 worst polluting coal power plants are taking taxpayers for a $6.45 billion ride'
669. The Climate Institute (2014) 'Counting All the Costs – Recognising the Carbon Subsidy to Polluting Energy'
670. Government of Canada (2009) 'Leaders' Statement: The Pittsburgh Summit'
671. Arup, T. (2015) 'Paris UN Climate Conference 2015: Australia rejects fossil fuel pledge', Sydney Morning Herald, December 1
672. Poll conducted by Essential Media, released 27 November 2015
673. Peel, M. et al (2014) 'Mining the age of entitlement: State government assistance to the minerals and fossil fuel sector', The Australia Institute
674. See, for example, the NSW Government's ill-fated Cobbora coal mine, built to supply cheap coal to a privatised power station, at what amounted to an effective subsidy of $4 billion at the time. Parkinson, G. (2013) 'Origin wins as NSW coal subsidy scandal unwinds', RenewEconomy, July 2
675. Global Subsidies Initiative (2010) 'Policy Briefing: Defining Fossil-Fuel Subsidies for the G-20: Which Approach is Best?', International Institute for Sustainable Development
676. Australian Conservation Foundation (2016) 'Priorities for the Federal Budget 2016–17', January 27. Note that this is a gross saving – net budget savings are likely to be a little lower because company tax liabilities will be reduced accordingly. The ACF based its proposed $20,000 cap on the fact that the average claim from the agricultural sector is in the order of $2,000.

677. Australian Institute of Petroleum (2017) 'International Price Comparisons'

678. While fuel taxes were once linked to spending on roads, they have long since evolved into an important source of general public revenue, and have often been adjusted to reflect social objectives, like lowering rates for some fuels to diversify fuel sources, or providing diesel rebates to hospitals. There is no strong social argument for maintaining mining companies' access to the diesel rebate.

679. Australian Conservation Foundation (2014) 'Giving with both hands', p. 3

680. $650 million in 2016–17, according to analysis undertaken by the Parliamentary Budget Office.

681. Leaton, J. (2011) 'Unburnable Carbon – Are the world's financial markets carrying a carbon bubble?', Carbon Tracker

682. Commonwealth of Australia (2017) 'Tax Expenditures Statement 2016,' p. 58

683. In the annual Tax Expenditures Statement, the Commonwealth Treasury gives detailed estimate for around half of Australia's tax expenditures, providing only an order of magnitude for the rest. The PRRT tax subsidies are estimated at $10–100 million a year. If we take the midpoint of this range ($55 million) it would be more than enough to cover the cost of the Community Powerhouses program.

684. Based on The Wilderness Society's submission to the Senate Inquiry into Oil or Gas Production in the Great Australian Bight.

685. Commonwealth of Australia (2017) Op cit 682, p. 9

686. Gross savings would be around $6 billion, while net savings would be somewhat less due to lower corporate tax liabilities.

687. High Speed Rail Advisory Group (2013) 'On track: implementing high speed rail in Australia', and Drew, G. and Hearps, P. (2014) 'Zero Carbon Australia High Speed Rail', Beyond Zero Emissions, Melbourne Energy Institute and German Aerospace Centre

688. Makhijani, S. (2014) 'Fossil fuel exploration subsidies: Australia, Country Study', Overseas Development Institute, p. 4

689. Hunt, C. (2013) 'World Bank kicks coal, but will the rest of the world follow?' The Conversation, July 29

690. Liddy, M. (2016) 'Who pays what? ATO names large companies who paid zero tax in 2014–15', ABC News, December 9

691. Long, S. (2017) 'US oil giant Chevron faces $300 million tax bill after ATO court victory', ABC News, April 21

Published by the Australian Conservation Foundation, GetUp!, Solar Citizens, Environment Victoria, Nature Conservation Council of NSW and 350.org, 2018.

The Repower Australia Plan is an updated version of the Homegrown Power Plan, first published by GetUp! and Solar Citizens in 2016.

Cite as: Ison, N., Lyons, M. and Atkinson, J. (2018) 'Repower Australia Plan', Australian Conservation Foundation, GetUp!, Solar Citizens, Environment Victoria, Nature Conservation Council of
NSW and 350.org, Melbourne, Australia.

AUSTRALIAN CONSERVATION FOUNDATION

GetUp!

350 Australia

SolarCitizens

community power agency

environment victoria

Nature Conservation Council