THE HOMEGROWN POWER PLAN

How we can repower the country with renewable energy, reboot our failing electricity system and remove the roadblocks holding back the renewables boom.

GetUp! SolarCitizens

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

Australia is at a crossroads. We can unleash the power of the sun and wind to provide clean, safe, affordable and reliable energy for all. Or we can choose to keep burning fossil fuels that pollute our atmosphere and warm our planet, causing extreme weather and threatening our health, our economy, and the places we love, like the Great Barrier Reef. Continuing to burn fossil fuels is unaffordable, in every sense.

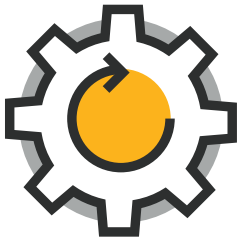
The Homegrown Power Plan, a joint project between GetUp! and Solar Citizens, shows how we can repower the country with renewable energy, reboot our failing electricity system and remove the roadblocks holding back the renewables boom. We must:

Reboot the system, rewiring our laws to deliver affordable, 100% renewable electricity.

- Stop old energy dinosaurs from squashing their cleaner competitors
- Reward people for contributing to the 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.

Repower the country, turbo-charging our existing renewable energy policies and adding some missing parts.

- Restore the certainty needed for investors to build big renewable energy projects
- Unleash the innovation we need to reclaim our place in the renewables race
- Enable a people-powered energy revolution, where no-one is locked out of the renewables boom



Remove the roadblocks, ensuring new renewables aren't held back by the legacy of a bygone era.

- Level the playing field for renewable investment
- Plan the gradual and orderly closure of coal-fired power with a just transition for workers and communities
- Improve energy efficiency, making the transition easier and cheaper for all of us

When our politicians dismiss a 100% renewable future as impossible, what they really mean is it's uncomfortable. Uncomfortable to stand up to the companies who fund their election campaigns and fill the halls of Parliament. Uncomfortable to champion a better future when appealing to fear of the unknown is so much easier. The Homegrown Power Plan punches through their flimsy excuses and reveals what's really possible.

A move to 100% renewable power is practical, achievable, economically sound and overwhelmingly popular.

Governments are being left behind by citizens voting with their feet (or their rooftops). It's time they caught up. It's time to harness Australia's bountiful clean energy resources to repower our country, create jobs, generate investment and ensure a safe, clean future for our children and grandchildren.

A move to 100% renewable power is practical, achievable, economically sound and overwhelmingly popular.

100% RENEWABLE ENERGY FOR AUSTRALIA

Decarbonising Australia's Energy Sector within one generation
A report by the Institute for Sustainable Futures, University of Technology, Sydney[1]

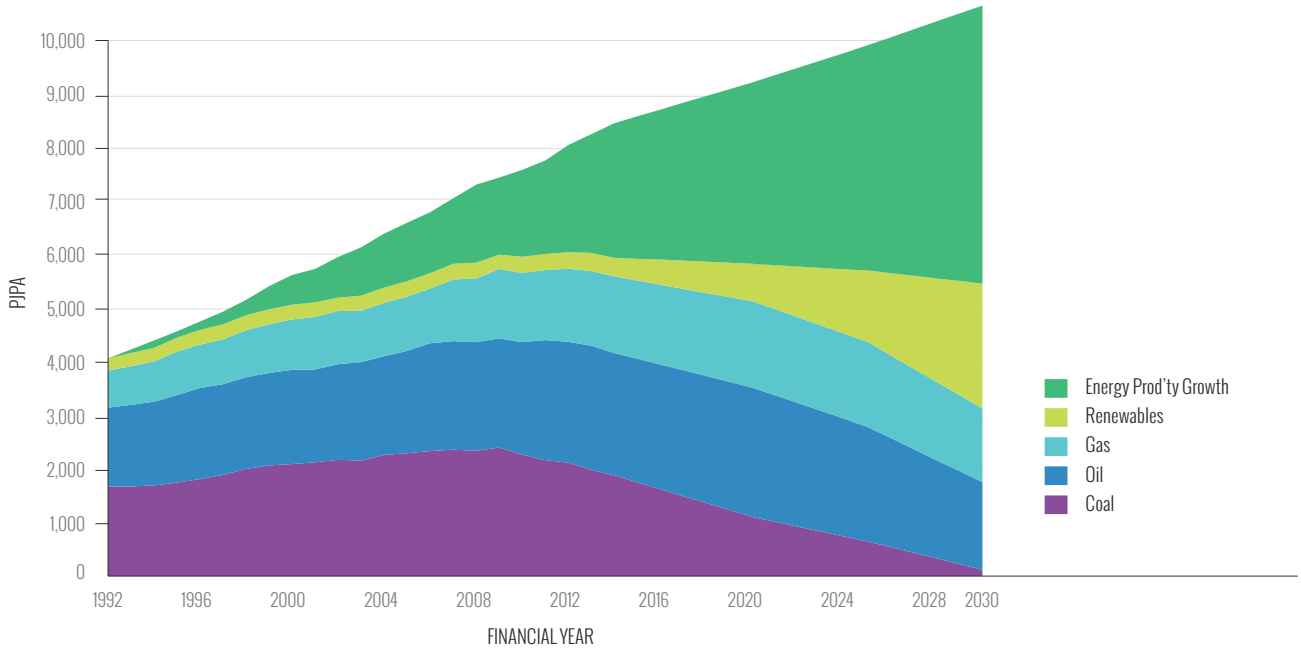
GetUp! and Solar Citizens commissioned a team of researchers at the UTS Institute for Sustainable Futures to find out how fast Australia can clean up its energy system. Their conclusion? A transition to 100% renewable energy within one generation is both technically feasible and economically responsible.

We can do this:

- By 2030, we can power all of Australia's homes and businesses with 100% renewable electricity.[2]
- By 2035, we can meet around 40% of our transport needs with renewable energy as well.
- By 2050 the whole energy system can be completely decarbonised. 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 renewable 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.
- The transition sees a smooth, stable expansion of renewables, well within what the industry says it can deliver, if the right policies are put in place now.

Australian Energy Consumption and Energy Productivity 1992 - 2014

and projection until 2030 under the 100% Renewable electricity scenario



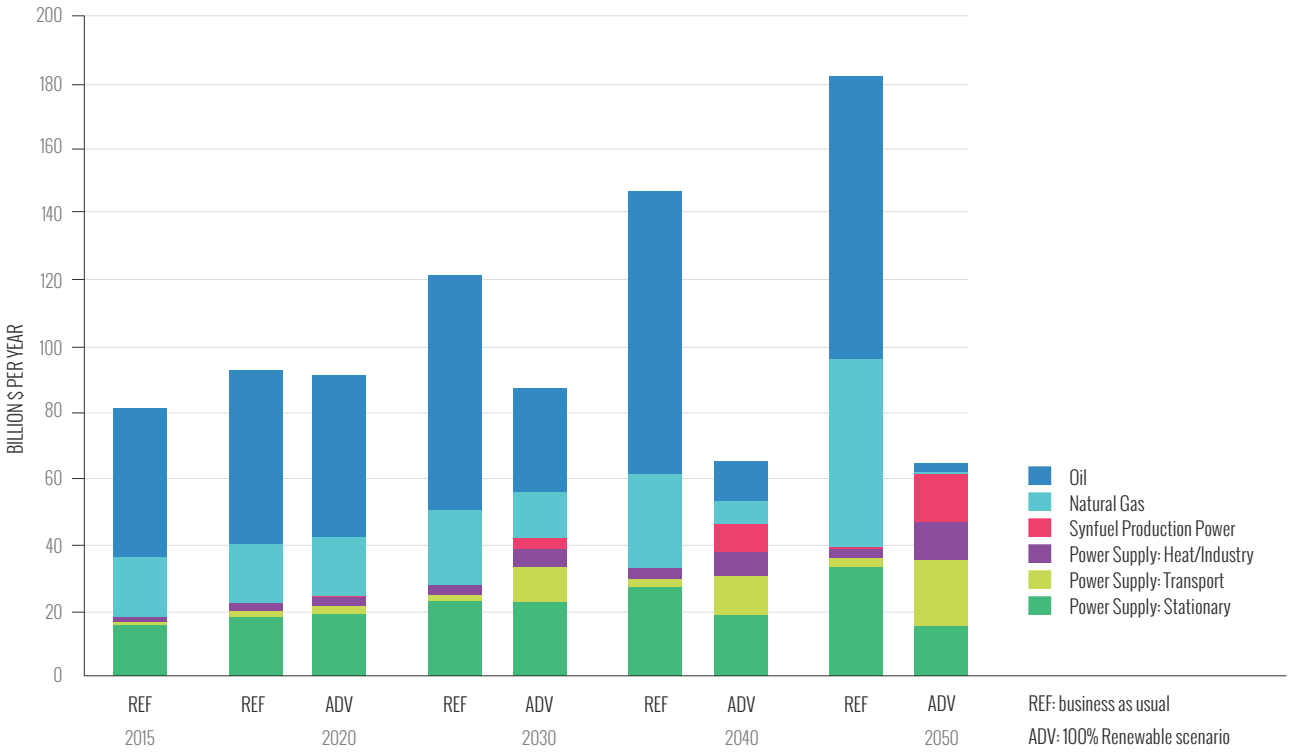
1 Teske, S. et al, (2016) '100% Renewable Energy For Australia: Decarbonising Australia's Energy Sector Within One Generation', Institute for Sustainable Futures, UTS. 2 Excludes additional electricity demand from increased electrification of the transport sector.

The numbers add up:

- Decarbonising our entire energy system by 2050 means Australia gets a $800 billion slice of the global renewables investment boom, and all the jobs that come with it.
- Investing more in renewables means spending less on fuel. 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. Australia would save, on average:
  - » $9 billion a year on power sector fuel costs
  - » $11 billion a year on transport fuel costs
- On the path to a clean energy future, our investment in fuel-free electricity starts paying itself off in lower prices as early as 2025, and by 2040 at the latest. Bargain.

Electricity and Fuel Costs by Sector

Assumed low coal and gas prices in [billion $ per year]



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REBOOT THE SYSTEM

Our electricity market is 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.

It's old, outdated and it's not getting better. Its institutions were designed for a centralised era, populated by passive consumers and powered by fossil fuels.

It's a system dominated by a few controlling power companies. It's a system so off it caused Australians, over the last decade, to spend $75 billion dollars building far more electricity network infrastructure than we needed.

That's why the Homegrown Power Plan begins with a blueprint for transforming how our electricity system is governed: without sorting out the rules of the game and how these rules are enforced, it is very hard for renewables to get on the field, let alone succeed. The electricity market needs a reboot, not just reform. To transition to 100% renewable power we must completely redesign Australia's antiquated electricity system. Here's how.

1 Forge a cross-party commitment to a full energy transition

Taking the politics out of energy means we can get on with the job of switching over to clean, renewable power in an efficient and affordable way. We also need to make it someone's job, by setting up an Energy Transition Agency to coordinate the orderly phase-in of renewables and phase-out of fossil fuels.

2 Put 100% renewable energy in the one sentence that rules them all

Why we need it: The National Electricity Objective (NEO) dictates how the market works. **Our current NEO was explicitly designed not to include the environment or social justice,** which means the innovative renewable projects we urgently need are being overlooked. Time for an overhaul.

How it works: Federal and state governments rewrite the NEO so that it reads as follows: 'Deliver an affordable, efficient, reliable, safe and fair electricity system that is powered by 100% renewable energy.'

3 Make the electricity network act more like the internet

Why we need it: Right now consumers are completely beholden to a clunky, centralised system and the handful of companies that dominate them. By shifting the electricity network business model from analog to digital, millions of us could trade renewable energy locally, instead of a few big centralised generators selling us their polluting power from far away.

How it works: The Energy Transition Agency helps network companies to transform themselves into local energy trading platforms. Imagine a website that lets you 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:
Network fees make up half of the average household's bill. When you follow the money, it's easy to see why: **network companies earn more if they can spend more of their customers' money on poles and wires.** These companies should be required to set targets for cutting unnecessary spending by helping people use less energy at peak times. If they don't meet their targets, they should be penalised.

Give citizens a real seat at the table on the decisions that affect us:
For every consumer group or concerned citizen trying to promote renewables or keep down prices, there is a swarm of highly paid industry lobbyists running over the top of us. The Federal Government must establish a level playing field for consumer, community and industry representatives to negotiate fair tariffs that reward households for saving energy.

Create a fair national feed-in tariff:
We need feed-in tariffs that reward people for contributing to the grid, not anti-solar fees and charges that punish them until they leave it. Local renewables are worth more than five cents a kilowatt hour, but their many benefits aren't reflected in the price solar households receive. The Federal Government must step in to create, or coordinate, a fair national feed-in tariff.

Ensure equal access to the grid:
It's too easy for network companies to abuse their market power and charge unfairly high fees when a new wind or solar project wants to connect to the grid. We should put the task of planning the grid in independent hands, set fair national standards for grid connection, and audit network companies to make sure they play by the rules.

Photo: Ray Pratt

Without sorting out the rules of the game and how these rules are enforced, it is very hard for renewables to get on the field, let alone succeed.

FOLLOW **THE MONEY**

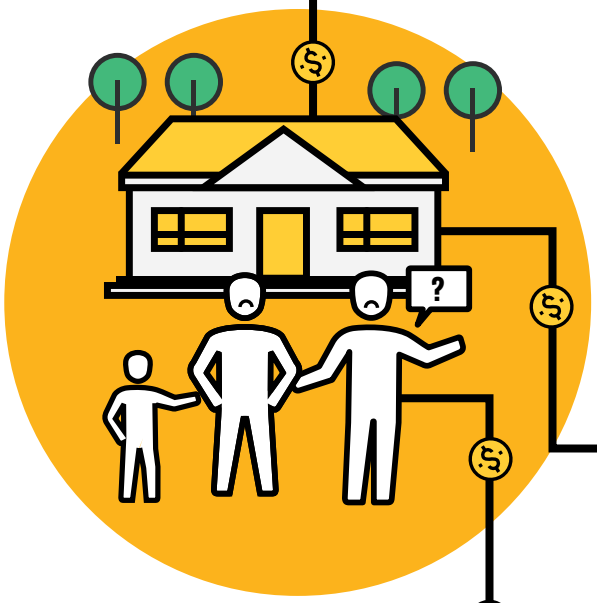
Big power companies are milking extraordinary profits at the expense of consumers. They do it because the system lets them. Here's how it works:

GENERATORS MAKE MORE MONEY WHEN THEY:

Sell super expensive electricity at peak times. Renewables make these peaks smaller, so it's in the dirty generators' interests to squash the competition.

Sell as much electricity as they can produce, no matter how dirty the source.

Persuade governments to let them pollute for free.

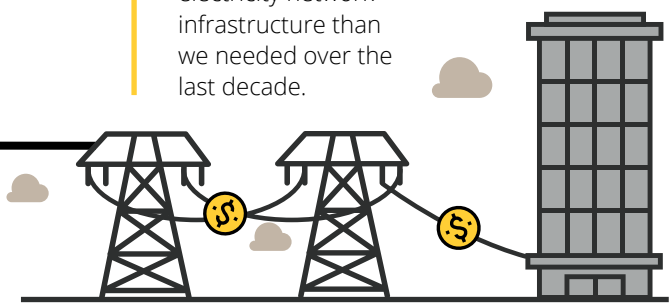


NETWORK COMPANIES MAKE MORE MONEY WHEN THEY:

Are allowed to charge customers more for the stuff they are planning to build, or have already built.

Build more stuff so they can transport more electricity, even when we don't need it. That's why we've spent $75 billion dollars building far more electricity network infrastructure than we needed over the last decade.

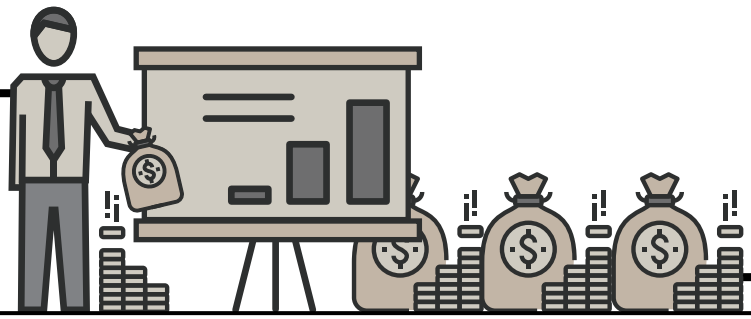
Charge more for services people have no choice but to use, like connecting to the grid.



RETAIL COMPANIES MAKE MORE MONEY WHEN THEY:

Sell as much electricity as possible.

Charge much more for electricity than they pay for it themselves. (Easier when they also own generators.)



When you follow the money, you see how the system makes a few huge companies richer while the rest of us pay the price. It's wasteful, it's outdated and it's holding us back. Time for an overhaul.

REPOWER THE COUNTRY WITH **RENEWABLE ENERGY**

Australia is the sunniest continent on earth, and one of the windiest. In the race to repower the world with renewables, we've got an edge.

With the right policies in place, our renewable future looks bright. 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 is now cheaper than building coal and gas, and households can generate electricity on their own rooftops for less than what retailers charge.

The transition to renewables is inevitable. What's not inevitable is a transition that takes place fast enough to stop polluting the planet, or one that shares the benefit of renewables with all Australians. We need to:

UNLEASH THE RENEWABLES BOOM

1 Build the right renewables in the right places with reverse auctions

Why we need it: The existing Renewable Energy Target is a great way to deliver lots of low-cost wind and solar power. To put us on the path to a stable, affordable, 100% renewable system, we're also going to want some complementary technologies, including storage, in the right locations. Reverse auctions have a proven track-record: the ACT government's auctions have delivered some of the lowest renewable prices in Australia.

How it works: Holding regular national clean energy auctions, starting in 2017, would be a cost-effective way to get a head start on the essential elements of a stable, affordable, 100% renewable grid. The Federal Government should let the experts figure out what technologies are most needed where, and then run national reverse auctions to deliver the outcomes the grid needs at an affordable price.

2 Set an expanded 2030 Renewable Energy Target

Why we need it: Long-term renewable energy targets work. The existing 2020 RET is expected to cut electricity bills, unleash $40.4 billion worth of investment and create 15,200 jobs. A majority of Australians want to see Australia transition to 100% renewables by 2030, and a 100% Renewable Energy Target is a reasonable, cost-effective and straightforward way to get there.

How it works: Leave the existing 2020 RET as it is and introduce an expanded target of 100% by 2030.

WALK THE TALK ON INNOVATION

Turbo-charge the Australian Renewable Energy Agency

Why we need it: ARENA plays an essential role in clean energy innovation, and Australia would be even further behind in the global renewables race if it did not exist. The Abbott Government tried to abolish ARENA, but it was saved by the Senate. Now the Turnbull Government wants to defund it and stop it from giving out grants. Without ARENA's grants, Australia misses out on everything from research funding for printable solar panels to the early-stage commercialisation of technologies like the Carnegie Wave energy pilot in Perth.

How it works: To ensure that ARENA can build on its strong track record of funding renewable energy innovation, all federal politicians must commit to increasing its 2016-2022 budget from $1.3 billion to $2 billion and giving it permission to make grants again.

FIVE MORE WAYS TO GET INNOVATIVE WITH CLEAN ENERGY:

Give the Clean Energy Finance Corporation (CEFC) more choice about what it invests in, by lowering how much interest it has to charge on the loans it makes

Add a micro-finance division to the CEFC so that ordinary citizens and smaller projects can access its low-interest loans

Hold a Race to Renew, a clean energy business model innovation prize

Unlock equity crowdfunding in the clean energy sector, to allow thousands of people to invest in and benefit from local renewable projects

Create a clean energy service agency to help the Federal Government cut energy waste and switch to renewables

PEOPLE'S POWER-UP

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. But a new energy future is afoot, and it's powered by people.

1 Community Powerhouses

Why we need it: Already, well over 4 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.

How it works: The Community Powerhouses program would support 'solar gardens' for renters, farmer bioenergy hubs, community wind farms and low-income energy efficiency and solar. It should be funded by the Federal Government to help kick-start community clean energy projects in towns and suburbs across Australia.

2 A Clean Power Program designed by Indigenous communities

Why we need it: People on the frontlines of climate change and the fight against fossil fuel extraction should be first in line to benefit from renewable energy.

How it works: A collaboratively-designed, well-funded national Indigenous Communities Clean Power Program could ensure that all Aboriginal and Torres Strait Island communities have access to clean, affordable, local renewable electricity.

3 PowerAccess: a public-interest retailer for people who need it most

Why we need it: Rising electricity prices have hurt those who could least afford it. Many households were able to control their bills by buying more efficient appliances or installing solar, but this option is out of reach for many. What if there was a retailer designed to deliver clean, affordable power to those who need it most?

How it works: The Federal Government, in partnership with the states, sets up PowerAccess, a non-profit retailer specifically for low-income households. PowerAccess would supply electricity and energy efficiency upgrades, solar PV and more to low-income households across Australia.

REMOTE ABORIGINAL COMMUNITY SOLAR IN NSW[3]

With rising energy costs and an unpredictable power supply, three Aboriginal communities in remote northern NSW invited The Valley Centre and Pingala to work with them to overhaul their energy system and empower the community.

Electricity bills range from $2,000 to $5,000 for each household and in some cases can be 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?" Now, these communities are working with AllGrid, an Indigenous-owned renewable energy company, to design a solar power and battery backup system for the 60 houses across the communities.

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 "Anything you can own, gives you pride... and if you can own; your own power!"

3 Case Study written by April Crawford-Smith of Pingala and The Valley Centre.

REMOVING THE ROADBLOCKS TO A **RENEWABLES TRANSITION**

It might seem obvious, but given the disproportionate influence of big fossil fuel companies over Australian politics, we need to spell it out: fossil fuels have no place in a 100% renewable future.

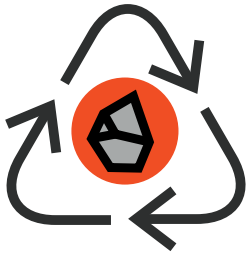
Photo: SolarReserve

To fully unleash the renewables boom, we need to get fossil fuels out of the market and into the history books. We also need to undo the legacy of years of industry lobbying, like our lax efficiency standards and wasteful fossil fuel subsidies.

Outmoded coal is holding us back

Australia's power sector is like an overgrown tree. We need to prune out the dead wood for the new shoots to grow. The Federal Government should give workers and industry certainty with a plan for phasing out all coal-burning power by 2030, starting with the orderly closure of the oldest and dirtiest coal-burning power plants in the next term of government. And it should ensure that the right measures are in place to guarantee that affected workers and communities get the help they deserve during the transition.

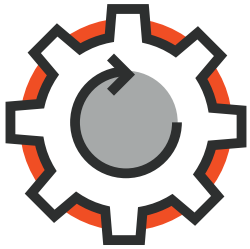
HERE'S HOW TO DO IT:



1 Start the coal power clean up ASAP

Why it's needed: Australia's fleet of coal-burning 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.

How it works: The Federal Government should hold Coal Clean-Up auctions to enable the closure and full rehabilitation of the most polluting coal-burning generators to be funded by other polluting generators from the windfall gains they will receive when their competitors shut down.



2 Ensure a just transition for coal communities

Why it's needed: A carefully managed phase-out of coal-fired power will ensure that affected workers and communities get the help they deserve instead of being abandoned by the big power companies. Examples like the snap closures in Port Augusta show that the foundations of a post-coal future must be put in place today if workers are to thrive through the transition.

How it works: Federal and state governments should work with unions, employers, and community groups to ensure that retraining is offered well before a plant closes, that early retirement offers are fully funded, that redeployment options are available, and that community-driven economic renewal plans are in place ahead of time.

3 Implement a National Air Pollution Control Act with teeth

Why it's needed: More than 3,000 people die from urban air pollution in Australia every year. The Centre for Air Quality & Health Research and Evaluation includes people who live near industrial pollution sources, such as coal mines, coal-burning power stations and smelters, among those most at risk.

How it works: Federal and state governments should make fossil fuel companies and other polluters responsible for their own mess, through A National Air Pollution Control Act with real teeth. Tighter regulations would force the most polluting coal-burning power plants to close if they can't comply with the new standards.

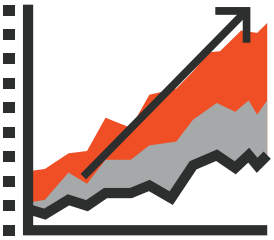
REPOWERING PORT AUGUSTA

Suffering from disturbingly high rates of lung cancer and facing unemployment from the snap closure of its two coal-burning power stations, the community of Port Augusta wants its future to be solar powered.

For 5 years the community has been campaigning to replace the power stations with a concentrated solar thermal plant.

As current power station worker Gary Rowbottom puts it, "the world will transition away from fossil fuels, that's not a hard concept to grasp. Therefore we need to replace it with something else".

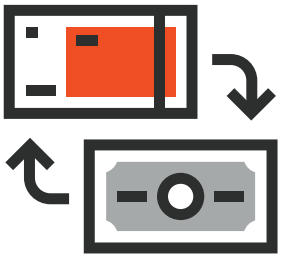
It's estimated that a solar thermal plant would create at least 1000 jobs during the construction phase and 50 permanent jobs going forward. Exactly the kind of opportunity a community freeing itself from coal-burning power needs.



4 Double Australia's energy productivity by 2030

Why it's needed: The cleanest energy of all is the energy we never use. The bad news is that Australia is appallingly inefficient in the way we use energy, and getting to a 100% renewable future will be much harder than it needs to be if we go on wasting energy like we do today. The good news is that there's no shortage of opportunities to save money and save energy at the same time.

How it works: Stringent vehicle emissions standards could give us the cleanest and most efficient cars in the world, tougher building codes could bring energy independence within reach of more households and businesses, stronger appliance standards could protect consumers from inefficient products and an Energy Efficiency Disclosure program could help heavy industry find the millions of dollars in energy savings hiding down the back of the couch.



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

Why it's needed: In their persistent search for budget savings, Australian governments keep missing 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 much-needed revenue.

How it works: 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.

The good news is that there's no shortage of opportunities to save money and save energy at the same time.

THE **HOMEGROWN POWER** PLAN

REMOVE THE ROADBLOCKS, ENSURING NEW RENEWABLES AREN'T HELD BACK BY THE LEGACY OF A BYGONE ERA.

- Level the playing field for renewable investment
- Plan the gradual and orderly closure of coal-burning power with a just transition for workers and communities
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REBOOT THE SYSTEM, REWIRING OUR LAWS TO DELIVER AFFORDABLE, 100% RENEWABLE ELECTRICITY.

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- Reward people for contributing to the system instead of punishing them so they flee the grid
- Stop old energy dinosaurs from squashing their cleaner competitors

REPOWER THE COUNTRY, TURBO-CHARGING OUR EXISTING RENEWABLE ENERGY POLICIES AND ADDING SOME MISSING PARTS.

- Restore the certainty needed for investors to build big renewable energy projects
- Unleash the innovation we need to reclaim our place in the renewables race
- Enable a people-powered energy revolution, where no-one is locked out of the renewables boom

Authors

Nicky Ison is a Founding Director of the Community Power Agency, a Senior Research Consultant at the Institute for Sustainable Futures at the University of Technology, Sydney and Coordinator of the Coalition for Community Energy. She is an expert in the field of energy policy and community renewable energy and has worked with and visited over 50 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. She is the former Convenor of the Solar Citizens Steering Committee. 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 has recently joined GetUp! as a Renewable Energy Campaigner. 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.

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All conclusions and any errors that remain are the authors' own.

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Paul Oosting, National Director, GetUp!

Fossil fuels make us sick. They are cooking our planet. They displace people, poison our water, and exploit first nations people across the world. They destroy the precious places we love. They are responsible for devastating coral bleaching across the Great Barrier Reef and burning 1,000 year old trees from the ancient growth forests of Tasmania.

They are responsible for extreme weather events and food shortages. They are responsible for the record-high temperatures we seeing getting worse year after year. They have led us to the brink of catastrophic climate change.

It's happening because our Governments bend hopelessly to the will of our worst polluters. Because they lack the political courage to make the ambitious change we desperately need.

We have reached a crossroads. Australia has signed up to the Paris climate target of limiting global warming to 1.5 degrees, but we must act urgently to meet it. The door to avoid the catastrophic effects of climate change remains ajar, just.

Because there is another force at play. Renewable energy is booming at a speed no one ever thought possible. Even the most wildly optimistic analysts have underestimated how fast renewable power would bloom across the world.

And the Australian people are ready to be part of it.

People from all walks of life are ready for the future. People have started taking the power back into their own hands, and support for renewables has never been stronger. That's why 1.5 million Australian homes have already gone solar.

But our Government remains hell-bent on shackling us to outdated fossil fuels while the rest of the world moves on and cashes in.

When our politicians dismiss a 100% renewable future as impossible, what they really mean is it's uncomfortable. Uncomfortable to stand up to the companies who fund their election campaigns and fill the halls of Parliament. Uncomfortable to champion a better future when appealing to fear of the unknown is so much easier.

They create false walls and barriers, obfuscating and excusing their way out of doing the one thing we need them to do most desperately. That's where the Homegrown Power Plan comes in.

It's time to take our power back. Our right to a safe climate. Our right to have children who can breathe clean air and drink clean water. Our right to have a say in how we power our world.

Claire O'Rourke, National Director, Solar Citizens

Imagine a time when Australian homes, businesses, schools and hospitals are powered by clean, cheap energy from the sun and the wind. A time when families in communities across our country are active consumers, taking control of their own power generation, trading their electricity and reducing their power bills. When we are using the sun and wind to ensure our air and water is clean and our children and grandchildren have a safe, healthy future.

If Australia, the sunniest continent on earth, makes the decision to grasp the opportunity here in front of us, this point in time is a lot closer than you think.

It's what most Australians want to see. Polling consistently demonstrates strong and ongoing support for clean power. Research Solar Citizens commissioned in February 2016 found 57% of voters would be more likely to support a party with a policy to transition Australia to 100% renewables by 2030.

Our best and brightest are already getting to work. In February our nation reached 5GW of solar PV installed in Australia, on 1.5 million rooftops. There are now 23 million solar panels installed, almost as many panels as there are citizens of this country. It's a promising start.

However impediments to a full transition remain, including out of date regulation, an energy market overwhelmingly set to centralised generation and excess dirty power clogging up the system. Most policy-makers agree that despite its complexity, the transition is inevitable.

This plan shows how the transition to clean, renewable power can deliver sound, long-term policy for businesses and good jobs, uphold and strengthen consumer rights and ensure the most vulnerable in our communities can access affordable, clean power.

It's important for Australia to be ambitious and chase down the goals we want to achieve. Technology is advancing and the economic and social barriers to clean power are quickly falling away. The world is rapidly moving away from fossil fuels and towards renewables. If we have the political will to make the most of this shift, Australia will reap the benefits for generations.

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INTRODUCTION

TRANSITION **IS INEVITABLE**

It's time to stop thinking small.

Renewables are an unstoppable force. They're the world's fastest-growing source of energy by far. In 2015, 90% of new electricity generation worldwide came from renewable energy.[1]

Plummeting prices are a game-changer. The cost of solar PV dropped 80 per cent over 5 years, and wind turbines by a third.[2] Wind power costs less than new-build coal or gas, and large-scale solar is likely to catch up by the end of the decade.[3] Rooftop solar is now cheaper than retail electricity, and an Australian household installs a rooftop solar system every three minutes.[4]

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 tap these everlasting resources, which nature bestows freely and in abundance? 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. Behind the scenes, 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 carbon pollution, it's also the easiest to replace. Along with energy efficiency, accelerating the shift from fossil fuels to renewables in the power sector is one of fastest ways to decarbonise the economy. And as the research from the Institute of Sustainable Futures shows, our investment in renewables will save us money along the way.[5]

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 MWh hulking rustbucket. 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 decentralised renewables literally put 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 Homegrown Power Plan.

This century, the world has already sweated its way through fourteen of the fifteen hottest years on record.[6] The carbon emissions produced by a small handful of major polluters is doing unprecedented damage to the climate, leaving the rest of us to deal with the consequences.[7]

In Paris, when Australia and almost 200 other countries committed to trying to keep dangerous global warming under 1.5 degrees, 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.[8]

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.[9]

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

- All emissions that can be eliminated, must be eliminated, as fast as possible;[10]
- More than 80 per cent of known fossil fuel reserves must stay in the ground;[11] and
- No more coal or gas-fired power plants should be built, starting yesterday.[12]

The Climate Change Authority, the Federal Government's main source of independent expert advice on climate policy, recommends that Australia cuts our greenhouse gas pollution by between 40 to 60 per cent below 2000 levels by 2030. They have also said that the stronger 60 per cent reduction could be appropriate if the world was working to limit warming to 1.5 degrees.[13]

Let's break that down:

- In 2000 Australia emitted 497 megatonnes of CO2 equivalent (which includes potent greenhouse gases like methane). In that year there were 326 megatonnes of CO2 from energy use alone.
- In 2030, reducing our greenhouse gas pollution by 60% below 2000 levels would mean emitting 199 megatonnes of CO2e. Reducing CO2 from energy use in line with all other sectors and all other greenhouse gases would mean emitting 131 megatonnes of CO2 from energy use. If we took the less ambitious target of 40% below 2000 levels, that figure would be 196 megatonnes.[14]

If we follow the pathway to 100% renewable energy outlined by Dr Sven Teske and the research team at the Institute for Sustainable Futures at UTS, then we would cut carbon pollution from energy used in the power, transport, industry and heating sectors to **196 megatonnes of CO2 in 2030 (see Figure 1)**. 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.

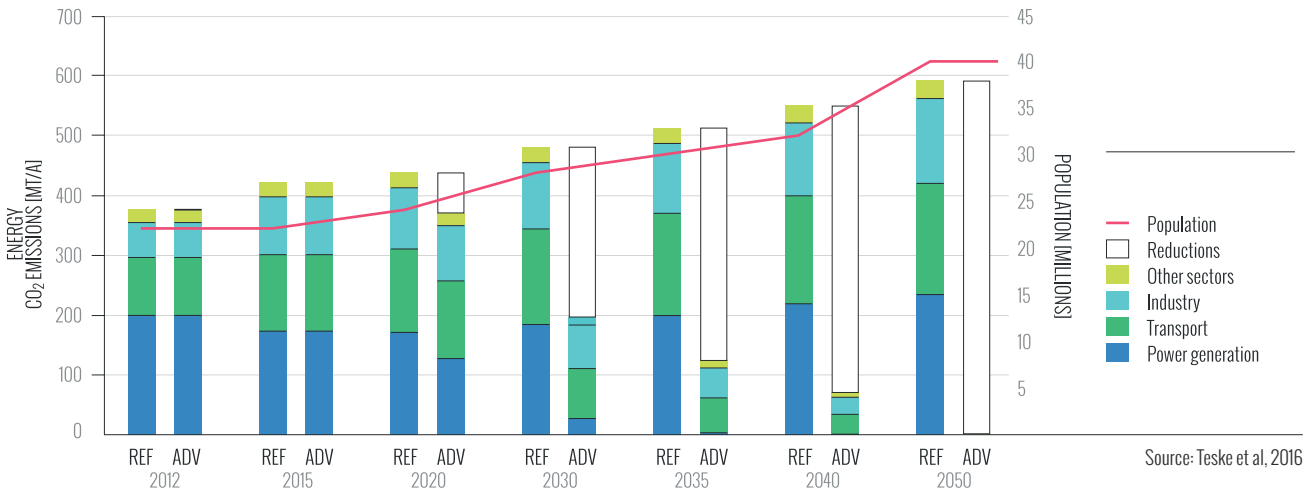
1.2 Transition is inevitable but justice isn't

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 – ensuring that the benefits of the renewables boom are widely shared and giving power back to all consumers. 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.

Figure 1: Australia's energy emissions pathways[6]



Source: Teske et al, 2016

1.3 The faster we transition, the sooner we benefit

We won't sugar coat it: getting to 100% renewable energy won't be easy, especially if much of the industry insists on denying the inevitable. But there are huge benefits in store if we can overcome the resistance to change.

The health benefits of phasing out fossil fuels for energy and transport are significant, measurable and increase the more emissions are reduced. In Australia, we could save up to $6 billion annually through a shift to clean energy and transport, just by avoiding the direct health costs of air pollution such as from lung and heart diseases.[18]

Last year Australia's economy saw the biggest drop in capital expenditure since 1992.[19] Committing to 100% renewable energy would generate a renewable investment boom, which would go a long way towards filling the gap left by the end of the mining investment boom.[20] A record $329 billion US was invested in clean energy globally in 2015.[21] The International Renewable Energy Agency has calculated that doubling renewable energy's share of the global energy market by 2030 would involve investment of $500 to $750 billion US a year.[22] Australia badly needs to diversify our economy, and our huge natural advantage as a sunny, windy country makes renewables a logical choice. 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 to the world.[23]

There are also major economic risks attached to continuing on our current path. Governments could cost the community billions by continuing to approve the construction of costly carbon-intensive infrastructure which will become unviable as soon as political reality catches up with climate reality. There is no shortage of evidence that countries that act early have lower long-term costs. Government modelling back in 2007 found a 15 per cent early-mover dividend for countries that take the lead on decarbonising their economies.[24] 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.

Both the challenges and opportunities further 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.

1.4 Others are leading the way

Across the world, countries, states, cities and organisations are all committing to transition to renewable energy (see Table 1). Since 2009, the number of countries with renewable energy targets has almost doubled.[30] Dozens of major international companies, including Apple, Google, Nike, Marks & Spencer, Microsoft, IKEA, Proctor & Gamble, Starbucks, Unilever and Walmart have also committed to procuring 100% of their power from renewable sources.[31]

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 degree target and here's what comes out: *minus* 89 megatonnes 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 Homegrown Power 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 fight against global warming. Or we can shift uncomfortably and stare at our feet while the rest of the world gets on with the job.

2. What is the Homegrown Power Plan?

The Homegrown Power 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 Homegrown Power Plan is underpinned by modelling commissioned by GetUp! and Solar Citizens and undertaken by a team of researchers at the UTS Institute for Sustainable Futures (ISF). The modelling shows that a transition to 100% renewable energy within one generation is both technically feasible and economically responsible. 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 decided to take it slower, the types of policies and the scale of action outlined in the Homegrown Power Plan would still be needed to step up our renewable energy ambition and deliver an affordable, climate-safe and reliable electricity system for all of us.

The Homegrown Power 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 Homegrown Power Plan feeds your imagination with ideas on Australia's bright, sunny, 100% renewable future.

2.1 The thinking behind the Homegrown Power 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, 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." [37]

Wallace Stevens

Each policy put forward in the Homegrown Power 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. Community Powerhouses 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.

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 Homegrown Power 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 Homegrown Power Plan focuses primarily on what the Federal Government should do to turn the transition to renewables into a transformative nation-building opportunity, but many of the policies outlined here can also be implemented at a state or local government level.

The choice between a Renewable Energy Target or a price on carbon pollution 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 degree 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 is no excuse for inaction. In the Renewable Energy Target we have a proven, popular, cost effective tool for cutting Australia's biggest source of carbon pollution. The existing 2020 target should remain set in stone, to restore some much-needed certainty after former Prime Minister Tony Abbott's war on renewable energy. In 2030, the sky's the limit.

Addressing one market failure, however, does not eliminate them all (see Box 2). 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 competitive advantages are both inherited and shaped, and then building on what's already working while planting the seeds of transformative change.

2.2 Other steps on the path to 100%

A pathway that gets us zero emissions **energy** by 2050 requires that we get to zero emissions **electricity** by 2030 (or 2035 if you include electric vehicles). 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. It's very important, therefore, that we shift rapidly to renewables in the power sector – no one wants to be running their electric car on coal-fired

Box 2: 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 Tasmania 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**

power. Our electricity system is the single biggest piece of Australia's carbon pollution problem and transforming such a complex beast will not be an easy task. That's why we've bitten off this piece in the Homegrown Power Plan and at around 60,000 words, we thought it was probably all we could chew on for now.

There are many other steps that also need to be taken to transition our entire energy system to renewables, including the following:

- **Transitioning away from gas.** While the Homegrown Power Plan proposes several measures that would help shift Australia away from gas-fired power generation, transitioning away from gas for domestic, commercial, industrial and transport is beyond the scope of this report. Like the electricity network, gas networks and customers are also entering a feedback loop of rising prices and falling demand.[38] Leaving the gas grid is both cheaper and easier for many households than getting off the electricity grid. If domestic gas prices continue to rise and the price of efficient electric induction stoves and heatpumps continue to fall, an exodus from the gas grid is well within the realm of imagination.[39] The Institute for Sustainable Futures modelling indicates that hydrogen and synthetic fuels generated from renewable electricity may create a sustainable use case for some of existing gas infrastructure, as the transition away from fossil fuels extends further into the transport and industrial process heat sectors, but it's likely to be a focus post-2030.
- **Facilitating fuel switching.** After energy efficiency, switching other uses of energy (transport, heating etc) over to renewable-powered electricity is one of the cleanest and most efficient ways to meet many of our other non-stationary energy needs. As our grid gets cleaner it makes sense to switch from other fuels to electricity. Examples include switching from:
  - Petrol to electric for vehicles; and
  - Gas to electric (or geothermal) heat-pumps for heating.

While a number of the policies in the Homegrown Power Plan will support fuel switching, including to electric vehicles, additional policies to accelerate this transition will be needed.

- **Moving to renewable-powered transport.** Transforming our transport sector to be powered by 100% renewable energy will require not only fuel switching, but mode-shifting to greater public and active transport. Delivering these outcomes would require its own additional suite of policies, covering a range of areas including urban planning.
- **Increasing industrial energy efficiency.** Aside from implementing a revamped Energy Efficiency Opportunities Act, more tailored policies are needed to stimulate innovation in the energy used for industrial processes and to increase their efficiency. The people that crack the code on making clean, energy-efficient steel will be onto a winner.

These steps should be made alongside the transition to renewables in the power sector.

Table 1: Who's giving it 100%?

Where	What they're working on
ACT	100% renewable electricity by 2025[32]
South Australia	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[33]
Scotland	100% net renewable electricity by 2020
Costa Rica	100% renewable electricity by 2021
Iceland	100% renewable electricity already[34]
Uruguay	94.5% renewable electricity already[35]
New Zealand	90% renewable electricity by 2025[36]

Box 3: 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 somewhat more expensive to build than wind or solar.[24] The very long construction timelines for nuclear power also rule it out of a scenario that involves rapid decarbonisation of the stationary power sector.[25]

Because variable renewables are cost-competitive today and expected to continue dropping in price, 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.[26] These needs can be met by a range of technologies, including hydro, pumped hydro, batteries, concentrating solar thermal with storage, geothermal and biomass technologies. Most projections of the overall cost of electricity in 2030 see rapid drops in the cost of these technologies, particularly concentrating solar thermal with storage.[27]

Gas with carbon capture and storage is potentially a low-emissions (but not zero-emissions) source of dispatchable power, but modelling from the Centre for Energy and Environmental Markets at the University of New South Wales indicates that "the optimal strategy for minimising costs, minimising cost risk and reducing greenhouse gas emission levels in the electricity sector involves minimising energy sourced from gas, and increasing renewable generation."[28] 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, or other dispatchable alternatives.

Table 2: A punter's guide to electricity jargon

Generation	The technologies that convert fuel (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 – 19% Gas – 22% Renewables – 15% (of which 7.5% is hydro, 4% wind and 2% solar), Other 2%[40]
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[41]	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.[42]
AEMC	The Australian Energy Market Commission (AEMC) 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 AER). The AEMC reports to and advises the Council of Australian Governments via the COAG Energy Council.
AER	The Australian Energy Regulator (AER) is the energy market referee, enforcing the rules made by the AEMC. It sits under the Australian Competition and Consumer Commission (ACCC). 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 NEM.
NEM	The National Electricity Market is both a physical electricity grid and a wholesale market for the trading of electricity. It is, confusingly enough, not actually national: it includes Queensland, New South Wales, the ACT, Victoria, Tasmania and South Australia. In 2012–13 the NEM covered 85% of Australia's electricity consumption.[43] (WA is coming into the market side of the NEM soon, though it will remain physically separate).
Grid parity	A 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 that 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 (see Part 2, Section 4.3).
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 them, 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.[44]
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 mins for 5-minute intervals. For each of those 5-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 conveyer 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	Electricity generation technologies that can "dispatch" or send electricity into the grid at the request 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

REBOOT
THE SYSTEM

1. Introduction

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 National Electricity Market 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 National Electricity Objective, 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 Homegrown Power 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;

The electricity market needs a reboot, not just reform

- Put 100% renewable electricity in the one sentence that rules them all, that is, by rewriting our National Electricity Objective; and
- 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; and
- 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 who have spent the last 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 6). 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 consumers or the planet into account.[46] They both have their hands tied by the National Electricity Objective (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.

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.

> ***"The electricity system is fun and fascinating! The beatings will continue until everyone agrees."***
>
> ***David Roberts, Grist***[45]

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.**

Breaking it down

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: SolarReserve

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, reliable 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."*[47]	*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 free natural resources: the sun, wind, waves etc. A mix of variable and dispatchable loads (both supply and demand).
Electricity users	Passive price takers, who are often discriminated against if they try and 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."[48] 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 10 years (see Figure 4).	Active managers of a wholesale market, as well as balancing intermittent and dispatchable 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 the majority of Australians,[49] 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 70 per cent in real terms between 2007 and 2012.**[50]

How did we get here? The simplest explanation is that 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. The real story takes a little longer to explain.

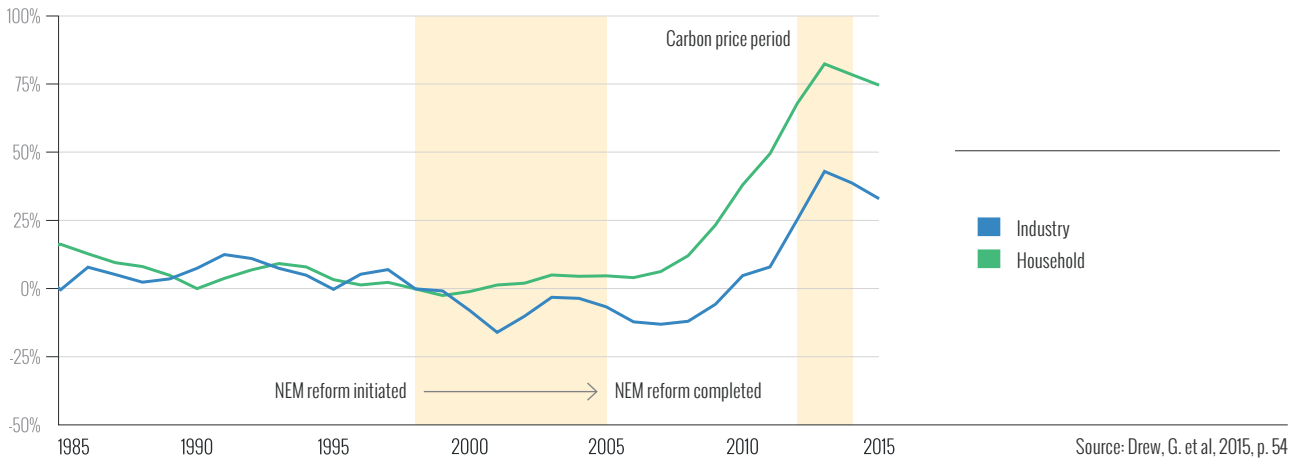
A brief history of the National Electricity Market

In the early days of electrification, a mix of local electricity suppliers 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.

Most states ended up combining the different elements of electricity supply into one publicly owned 'vertically integrated' corporation.[52] 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. New South Wales and Queensland 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 underinvest 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

Figure 2: Electricity prices, 1985-2015[51]



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

enthusiasts strongly encouraged privatisation.

This has led to:

- A growing number of retailers or electricity shop-fronts like Origin Energy, AGL and EnergyAustralia. They are mostly in private hands, but some remain state-owned in places like Western Australia, Tasmania and Queensland;
- One of the longest interconnected electricity grids in the world, running over 4,000 km from the north of Queensland down to Tasmania and west to South Australia. 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.
- 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 National Electricity Market (NEM). Physically the NEM is the connection of the NSW and ACT, Queensland, Victoria, Tasmania and South Australia 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 5 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 $13,100/MWh,[53] although given that the average spot market price is around $50/MWh, the roof is still pretty high.

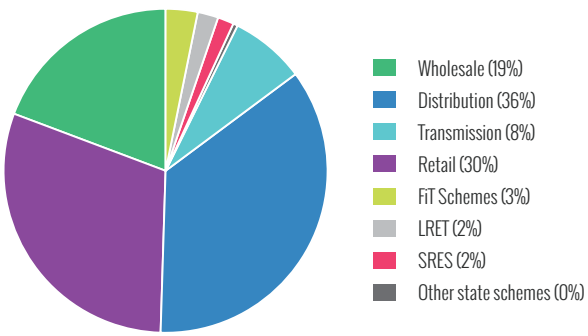
The wave of electricity market reforms which began in the 1990s also changed how electricity is governed and regulated. As recently as 2004 the network was regulated by 13 independent bodies. However, in 2005 when the National Electricity Law[54] was passed, network regulatory oversight was taken over by the newly established Australian Energy Regulator (AER), which sits under the ACCC. The Australian Energy Market Commission (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.[55]

So, what's up with our bills?

Competition is working pretty well in the wholesale market for generating electricity, and renewables are helping to drive down costs by outbidding fossil-fuel generators with higher running costs at peak times.

But any savings this might have delivered to households are quickly gobbled up by big 'gentailers'. Retailing has become an oligopoly dominated by AGL, Origin and EnergyAustralia. The effect of the big three gentailers' market power is easy to see in Victoria, where the potential benefit of lower spending on network infrastructure is masked by bigger retail margins.[57] Also, consumers now have to cover the additional costs of retailers spending customers' money to steal unsatisfied consumers away from each other, and then yet more money to lure them back, all to deliver what has been, until recently, an identical product.[58] As Figure 3 shows, retail costs and margins now make up about 30 per cent of your bill: more than the wholesale component (the cost of actually generating the electricity).

Figure 3: Components of retail electricity prices[56]



Source: Riesz, J. et al, 2016

The network sector, whose fees and charges make up almost half of the average customer's bill, is plagued by incentives that work against the public interest. It is still dominated by the same old inflexible, unresponsive monopolies, now often in the hands of big business instead of big government, bringing the extra costs of:

- Higher interest paid on the loans used to finance new infrastructure investment, given that governments can borrow more cheaply than the private sector;[59]
- Profits diverted into private hands instead of public services;
- Big fees for lawyers and consultants to browbeat regulators into letting them get away with daylight robbery (more on that to come).

Network companies: robbing us blind with the power of boredom

Cast your mind back to 2004 and imagine you have $75,000,000,000 to spend over the next 10 years.

What would you do with it? Build some schools, some hospitals, some train lines? Pay a bit extra off the mortgage? Blow it all on some massive parties?

Of course not. You'd build some high-voltage transmission lines. Or maybe some substations. I mean, who doesn't love a substation?

As Australians we have, collectively, spent $75 billion dollars over the past decade building far more electricity network infrastructure than we needed.[60]

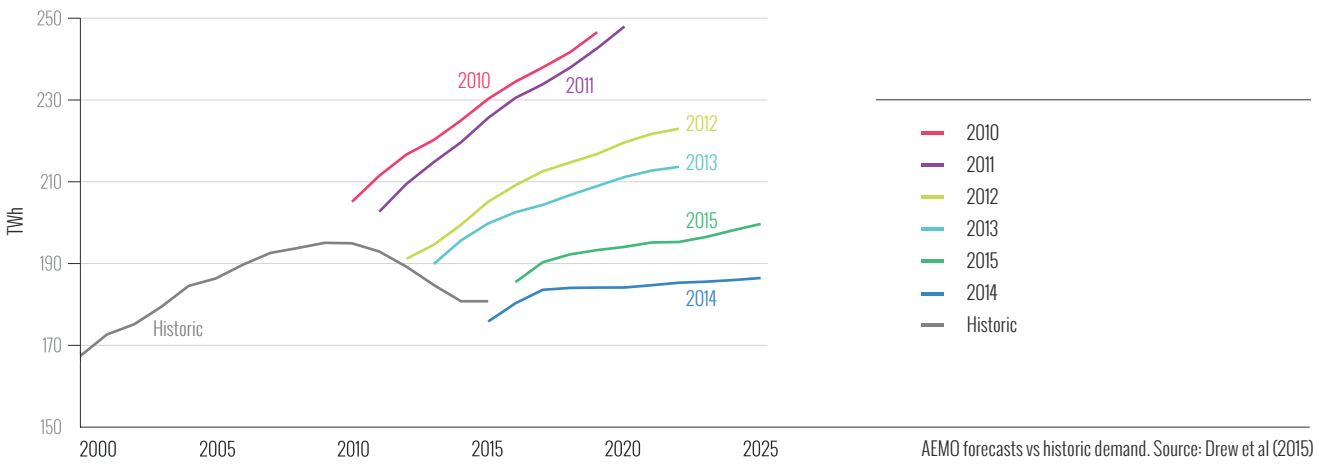
If this wasn't driven by a deep and abiding love of transmission lines and substations, then what did drive it? The answer is, frankly, pretty boring and complicated. And that's kind of the problem. If there is a pickpocketing technique based on spouting technical jargon until the victim is too bored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

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.

They were warned

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 through 'demand management' (measures that reduce electricity usage at times of maximum or 'peak' demand). They blamed this oversight partly on an outdated culture "which favours traditional 'build' engineering solutions and which pays little more than lip service to alternative options." And they also predicted the nasty consequences for people's power bills if the companies and networks failed to rein in the big blowout in the cost of the poles and wires, warning that "potentially massive increases in network expenditure to meet demand growth highlight the importance of getting demand management right."[61]

Figure 4: AEMO got it wrong[66]



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

But they ignored the warnings

Neither the companies nor their overseers took timely action to deal with the initial increase in peak demand. The result? **In NSW, up to one quarter of our electricity costs now come from infrastructure that sits around waiting for demand spikes that run for less than 40 hours a year.**[62] A large part of this was due to the rapid uptake of air conditioning. An air conditioner that cost $1,500 a year to operate imposed $7,000 in system-wide costs because of its impact on peak demand.[63] Demand management would have been a much cheaper alternative to infrastructure.

While the initial run-up in peak demand was real, it fell away quickly. The energy and peak demand forecasts set by the Australian Energy Market Operator (AEMO)[64] failed to take account of this new reality (see Figure 4). Basically, AEMO (and before that NEMMCo) took data collected by the networks[65] at face value, and the networks conveniently assumed that both energy demand and peak demand would rise at historical rates, without considering that energy efficiency programs, solar photovoltaics (PV) and steeply rising electricity prices might all contribute to lowering both peak and energy demand. 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.

A few other factors played a part. Reliability took primacy over the impact on customers' bills: some state governments raised the reliability standard, requiring networks to spend more to meet the tougher standards. And because the system gives network companies a licence to print money if they build more poles and wires, or expand the one they've already built, they didn't complain when all of the above conspired in their favour; in fact they pushed it further.[67]

It gets worse. As well as the spending splurge on physical poles and wires, network companies also charge their customers a much higher interest rate on their borrowing costs than they pay themselves. By demanding that regulators approve an unjustifiably high allowance for interest payments (known as the 'Weighted Average Cost of Capital'), the **network companies effectively award themselves billions of dollars in unearned income at the customer's expense.**[68]

The result of this is that we are left with expensive infrastructure, much of which we don't need, but which we the consumers are being forced to pay for whether we need it or not. Out of more than $45 billion in electricity grid upgrades in just the past five years, at least one third was avoidable.[69]

The last round of network infrastructure gold-plating was the equivalent of building a new four-lane bridge across the Sydney Harbour to be used only two days a year. We still have a big, dumb grid, but it is no longer cheap. In nominal terms, a typical NSW household paid $580 more for network charges in 2013-14 than in 2007-08.[70] Overall electricity prices have risen much faster than inflation, and are now higher than the OECD average.[71] One study suggests that Australian households pay among the highest prices in the developed world.[72]

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, Queensland and New South Wales).[73] 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.**

How we got into this mess: follow the money

Why were network companies 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 even 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.[74] 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 10 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 per cent over the 5 years to 2013.[74] 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

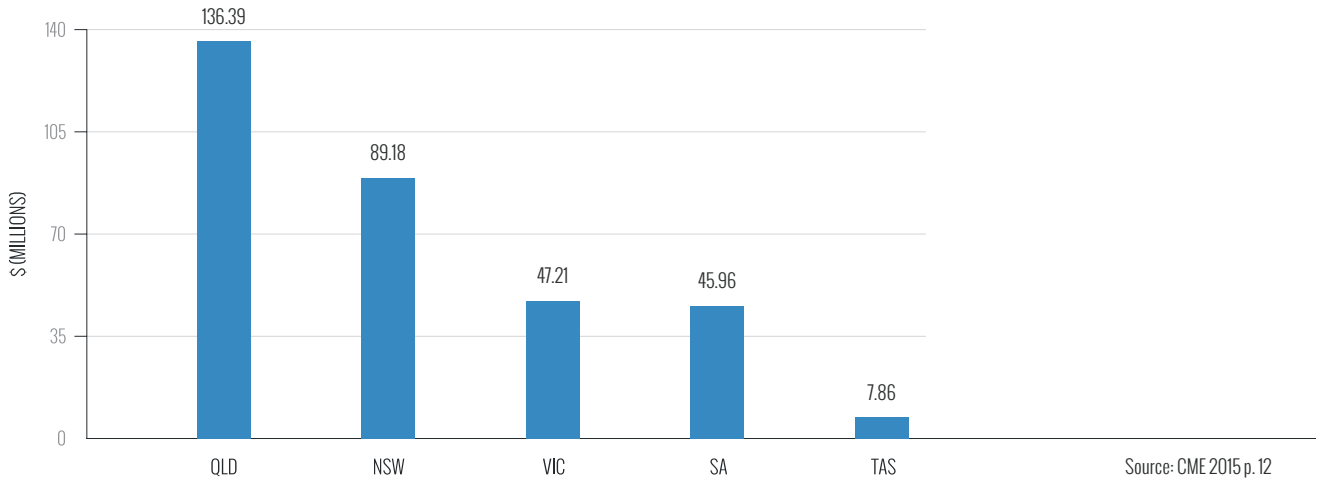
Times are changing

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 as a result 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%.[76] Demand remained flat in 2014-15;
- 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, Victoria and South Australia. (Queensland was a different story with a 7-day heatwave causing a new record peak);[77]
- 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;[78]
- Australia already has 1.5 million solar households, 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)[79] (see Figure 14 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 3, Section 5). This target is fundamentally incompatible with continued network gold-plating or missed opportunities for increasing energy efficiency; and
- 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.

Figure 5: Why networks really hate solar[80]

Reduction in network payments in 2014 attributable to households with rooftop PV



Source: CME 2015 p. 12

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 5, 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[81] 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.

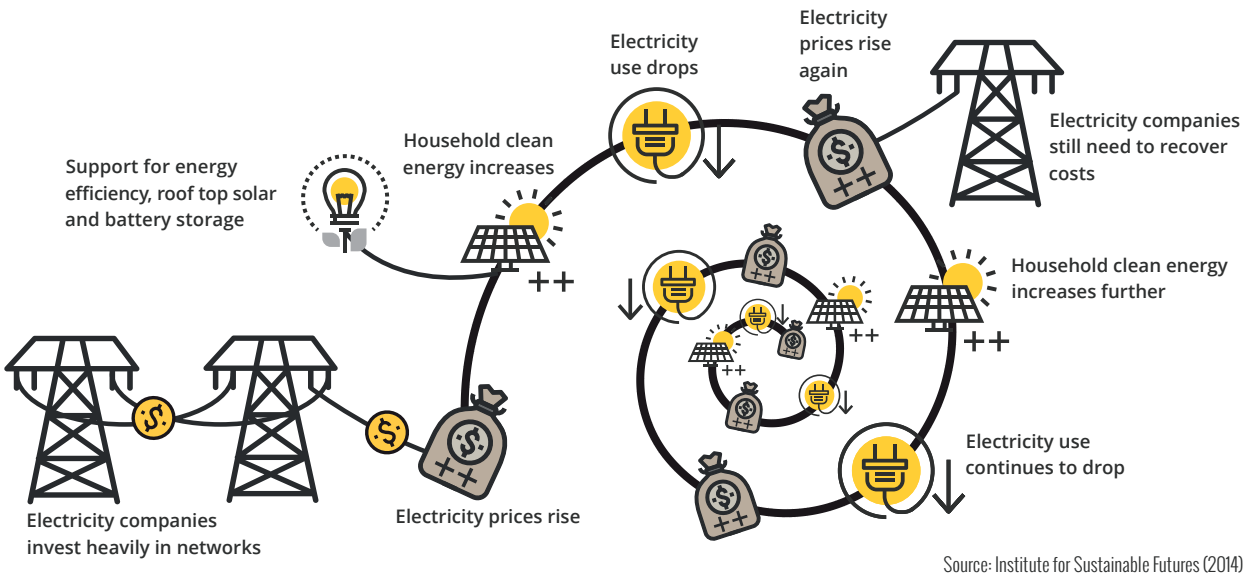
But the more consumers cut demand, the more networks try to recover that lost revenue by putting up their charges. This creates an even stronger incentive for consumers to reduce their demand. This cycle has been dubbed the 'death spiral' by the industry. While the label is alarmist, it's true that this costly feedback loop isn't much fun for most consumers or for the industry (see Figure 6).

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 6).

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 Victoria the retail component of a customer's electricity bill has more than doubled since 2008 when there were regulated reference tariffs.[83] There is also a trend for retailers not to offer standard discounts to solar customers.[84]

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

Figure 6: The spiral of rising prices and falling use[82]



Source: Institute for Sustainable Futures (2014)

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, 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, is know as the 'split incentive' problem, is discussed in Part 3, Section 5).
- 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. **But 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 Homegrown Power 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 Community Powerhouses (see Part 2, Section 4) show how we can support vulnerable energy consumers to access and benefit from the renewables boom. 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: it's how we manage it that matters for people, the planet and the economy;
- 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; and
- Some network companies are trying to do good things, yet they too are constrained by the existing rules.[85]

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 climate-safe energy;
- Stop network companies wasting their customers' money;
- Stop the old fossil-fuel dinosaurs from squashing their cleaner competitors;
- 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; and
- 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.[86] In order to meet our climate commitments we must transition to renewables.[87] 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 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.**

HOW TO **REBOOT THE SYSTEM**

1 Go the whole hog and completely redesign Australia's antiquated electricity system. This is what is needed to transition to 100% renewable power:

- Commit to a transition, as well as a target
- Rewrite the NEO, the one sentence that rules them all
- Make it someone's job to coordinate the transition
- Make the electricity network act more like the internet

2 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:

- Recognise that baseload is history and redesign the system to reflect the new technology
- Bring in new rules to require network companies to save their customers money
- Give citizens a real seat at the table on the decisions that affect us
- Create or coordinate a fair national feed-in tariff

12. Go the whole hog

To go the whole hog and redesign our energy system is, unsurprisingly, not a small task. It involves at least the following four steps:

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. Make the electricity network act more like the internet

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 fossil fuels, 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 2.2 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.[88]

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 – regulators, rule makers, market operators, retailers, network companies, and so on.

Governments in places leading the energy transition globally, such as New York[89], the UK[90], Denmark[91] and Germany,[92] have aligned their energy market objectives with their climate and social justice objectives and targets.

This is yet to happen in Australia. In fact, **the current 'National Electricity Objective' 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.[93]

While Australia's energy system is meant to operate in the long-term interests of consumers, 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.[94] 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".[95]

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 consumers 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.[96]

- 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.[97] **But the way the current NEO is written lends itself to such narrow interpretation. So we need to spell it out more clearly.**

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'); and
- 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.[98] 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." [99]

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.

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

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.[101] 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 essential.

"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 [100]

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 role of coordinating the transition should not be undertaken separately to the essential functions of governing Australia's energy system. As noted above, if those coordinating and governing the energy system are headed in a different direction to those driving the uptake of clean and renewable energy, the upshot is complexity, confusion, unnecessary expense and inefficiency, leading to bad outcomes for all involved, particularly consumers.

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; and

- 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".[102]

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.[103]

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 5 below), 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'[104] 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. Across the world there are exciting new businesses that are making this possible, like Vandebron in the Netherlands.[105]

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 an 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.[106]

In the state of New York (as Box 5 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.[107] (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

Box 5: 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." [107]
"The DSP fosters broad market activity that monetizes system and social values, by enabling active customer and third-party engagement that is aligned with the wholesale market and bulk power system." [108]

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.[109]

The market redesign process is complimented by a range of initiatives, including a solar schools program, a government energy efficiency program and the New York Prize (see Box 14).

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. However, there will be many 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. Western Australia, 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 network operator and retailer Ergon Energy in Queensland.

2

3. Kickstarting the transition

Turning the electricity market upside down is necessary, but it will take time.
There are at least four things we can do right now to kickstart the transition:

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 customers 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 energy innovation zones

3.1 Recognise that baseload is history

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

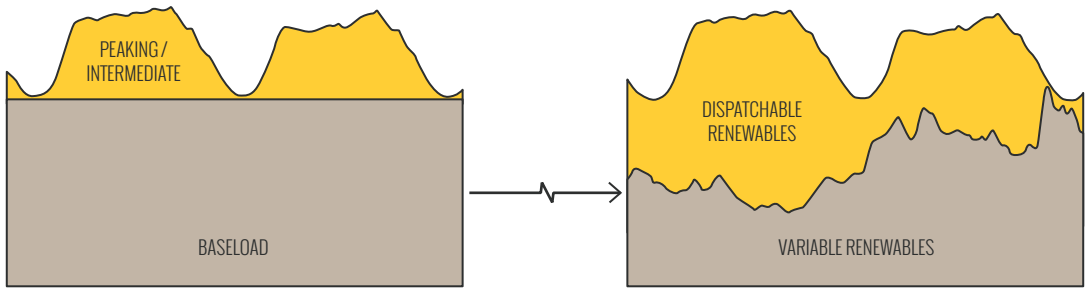
In addition to market reform at the distribution edge (creating local energy markets) we also need to reform our wholesale or bulk energy market to ensure system security and system flexibility as we transition towards higher penetrations of variable renewables.

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

- 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.[112]

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".[113]

Figure 7: A new power system paradigm[111]



Source: Riesz, J. et al, 2016

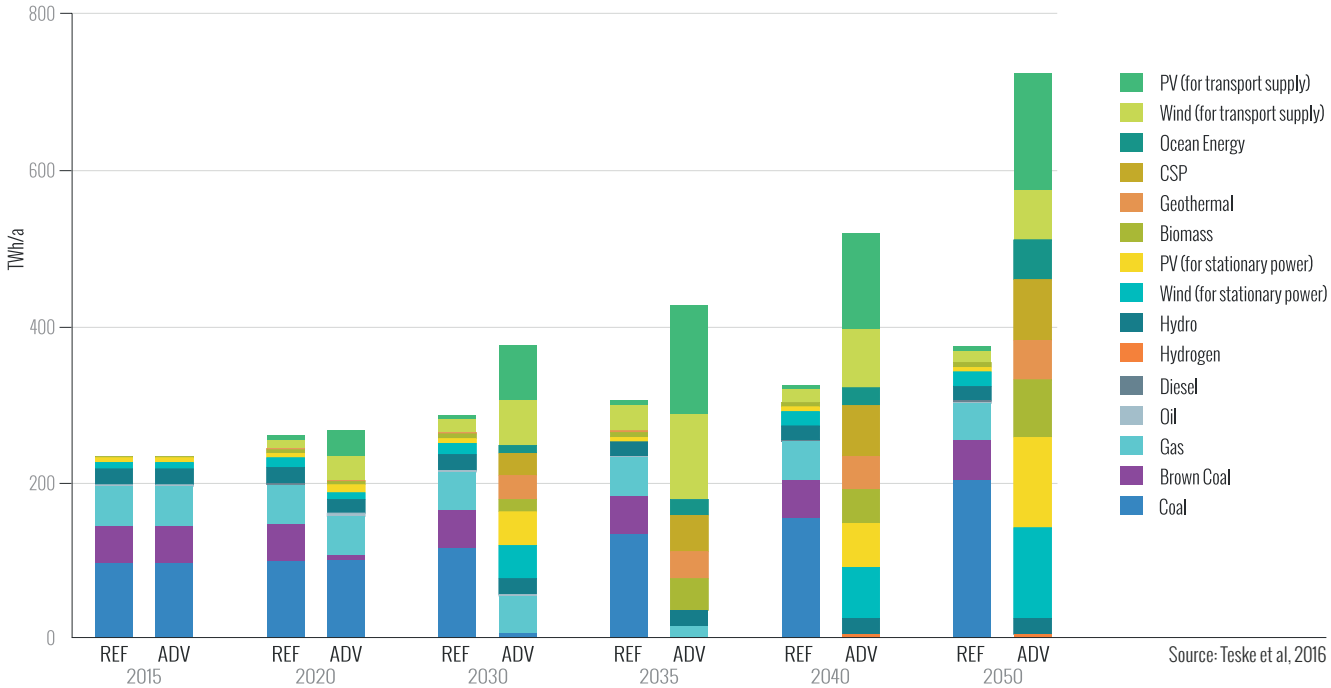
In the future, the base demand for energy will be supplied by variable but forecastable renewable energy such as solar PV and wind (see Figure 7) and supplemented by dispatchable renewables and storage such as bioenergy, conventional and run of the river hydro, concentrating solar thermal, geothermal and storage and batteries. More flexible demand will also play a part, from the traditional demand-shifting practiced by water and aluminium companies or encouraged by off-peak hot water prices, to new options opened up by appliances with smart switches.[114]

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 dispatchable 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 6-day basis. However very little of this is currently focused on how to better integrate dispatchable 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.

Figure 8: Development of electricity generation structure



- We need to adjust the system in line with the business case for dispatchable 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 2.1) with 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 Transition Agency 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).[115]
- A strategic reserve approach as is being adopted in Germany[116] and Denmark[117] 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 customers 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.[118] 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".[119]

Other rules were changed in 2014 to require network companies to change 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. The network companies keep sending their 44,000-page long ambit claims into the fray,[120] and the regulator keeps letting them get away with more of their customers' money than they deserve. In the latest round of debates on network pricing, only the Queensland Government told its state-owned network companies to accept the AER's ruling instead of fighting for more.

The result is that **the regulator is letting networks spend another $50 billion or so of their customers' money over the next 5 years.**[121]

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. We can do this by:

- Reducing 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;
- Reducing demand at peak times, the holy grail for keeping costs down. **Major peak demand events take up less than forty hours a year, but the spending needed to deal with them makes up around 25% of the average household's bill in NSW.** 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;
- Increasing 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.[122]

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 onto consumers they could cut bills by $120 to $500, every year.[123]

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 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.[124] Moreover, **the bulk of our savings have been achieved in one state: Queensland, where the State Government has actively supported the idea.**[125]

- 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 per cent and overall demand by 40 per cent.
- Another Queensland 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.[126]

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

Sadly, not much. 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, the report which acknowledged that effective demand management could deliver up to $12 billion in savings over ten years.[127] 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".[128]

The AEMC's response? First they dragged their feet for over a year on responding to the TEC's proposal. Now they have 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".[129] 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).[130] **Sorry consumers, no proper demand management incentives for another five years – it might save you too much money.**

The Total Environment Centre 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.[131]

COAG to the rescue?

The AEMC's decision to postpone a change that was so obviously in consumers' best interests is truly baffling. The case makes the need for a new National Electricity Objective and an Energy Transition Agency crystal clear. In the meantime, there are a few options. The COAG Energy Council could:

- Instruct the AEMC to review its decision and instruct the AER to implement a Demand Management Incentive Scheme, and to re-do the latest round of network price determinations while they're at it. This would deeply annoy all the industry lobbyists who've just spent the past few years negotiating what looks like another sweet deal at the customers' expense. The increased risk and uncertainty might come with costs attached, but it could be worth it if the potential savings are big enough;
- Instruct the AEMC to review its decision and tell the AER to implement an interim Demand Management Incentive Scheme without revisiting the latest round of network deter-minations. The AER has previously

acknowledged that, if the AEMC instructed them to do so, they would be perfectly capable of implementing an interim version of the scheme without having to go back and redo the five-year network pricing decisions from scratch;[132] and

- Submit a completely new demand management rule change request to the AEMC.
  - For example, the AEMC could change the rules so 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 that network companies avoid demand management, cultural inertia is also a big part of the story. Compulsory targets and reporting would help normalise demand management, as well as giving consumer advocates useful information on just how big the potential savings are.[133]
  - A stronger option would be to change the rules to require network companies 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.[134]

3.3 Give consumers a real seat at the table

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

The current system neglect the needs of consumers.

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 the Federal Government stop industry incumbents from fleecing consumers or introducing anti-solar tariffs (see Box 6). 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.

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; and
- The same process could also be used to set a fair national model for solar feed-in tariffs (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."[135]

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 net-works 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[136] 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; and*
- *proposals for undergrounding."* [137]

In February 2016, perhaps in response to the backlash against their anti-solar stance, (see Box 6) SA Power Networks 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.

Box 6: Who wants to block out the sun?

- The South Australian network company, SA Power Networks, 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.[138] 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 5 years.[139]
- 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.[140] 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.[141]
- Network fees have gone from being about one fifth of a typical Queenslanders bill in 2007 to nearly half the cost.[142] 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.[143]
- The Western Australian Government-owned network Synergy proposed introducing a 'solar tax', similar to SA Power Network's idea, which would have resulted in additional fees for solar households.[144] Following weeks of sustained pressure the WA Government has ruled out specific anti-solar fees for now.[145]
- Victorian networks wants to put households on demand tariffs that are really anti-solar tariffs in disguise (for example, in Victoria AGL Energy's 'peak' lasts all the way from 3pm-9pm, which isn't really peak demand).[146]

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.[147] 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 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.**[148] **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.[149]

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.[150] 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. In the words of Mark Henley, who conducted UnitingCare's tariff research:

"Using the idea of long run marginal costs as the guiding focus for tariff design is at best a philosophy or broadly defined principle...very different tariff structures and levels can be claimed to be consistent with long run marginal cost. It is neither an objective, verifiable nor precise standard."

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 6);
- 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;[151]
    - This means that solar households should *pay* the same for the electricity they *consume* as non-solar households with the same peak *demand*;[152]

- 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; and

- 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, social and cost 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 5 cents per kilowatt-hour, 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 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, 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.[153]

- 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[154] and that the electricity system provides 18 different benefits (Figure 9). 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 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 (<100kWs) or LGCs (100kW +).

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 approximately 5c/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 – 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 twenty 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 twenty 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 3 – 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 kilometers of the network they still have to pay for the whole system! Many councils are getting fed up with this and are starting to trench their own private wires. It's frustrating that Electricity System 1.0 forces them to do this, as duplicates existing infrastructure, which is extremely economically inefficient and wasteful.

Case 4 – 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:

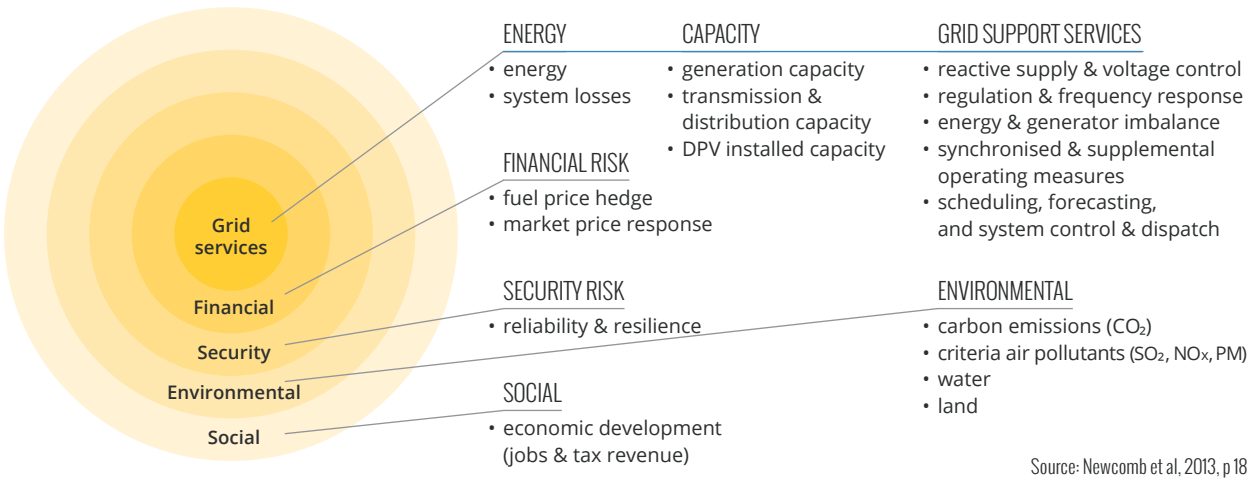
1. The customer owns (or leases) a share or a number of panels in the central solar array; and
2. The electricity generated by the customer's share or panels is credited on their electricity bill (see Figure 10).

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 at least 57 community solar programs spanning 22 states.[156] While this is still a relatively small sector, solar gardens in the US are predicted to increase in capacity seven-fold by 2020.[157]

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

Cases 2-4 are all examples of Local Energy Trading (see Box 7), which allows people and groups to generate and use energy locally in a small part of the grid, but not behind the meter. 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 9: Electricity System Value Chain[155]



Source: Newcomb et al, 2013, p 18

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 are currently reviewing the value of solar and other local generation technologies: Victoria, Queensland and Tasmania. However, there is no indication that these state reviews are going to come up with different results to the various previous state reviews that have concluded that local solar is only worth the value of the wholesale energy price and avoided energy losses from transporting electricity hundreds of kilometers: about 5c/kWh.

This is because regulators who set FITs generally only take into account the costs that can be avoided by retailers. No regulators take into account health and environmental benefits of distributed renewable energy in setting a FIT and few consider network benefits.

Another innovative approach is that being taken by Total Environment Centre, City of Sydney and the Property Council through their Local Generation Network Credit Rule Change to the AEMC (see Box 8). Unfortunately, it will take time for this rule change to work through AEMC's processes and then if it succeeds, time to implement.

Fast facts: the achievements of Feed-in Tariffs 1.0

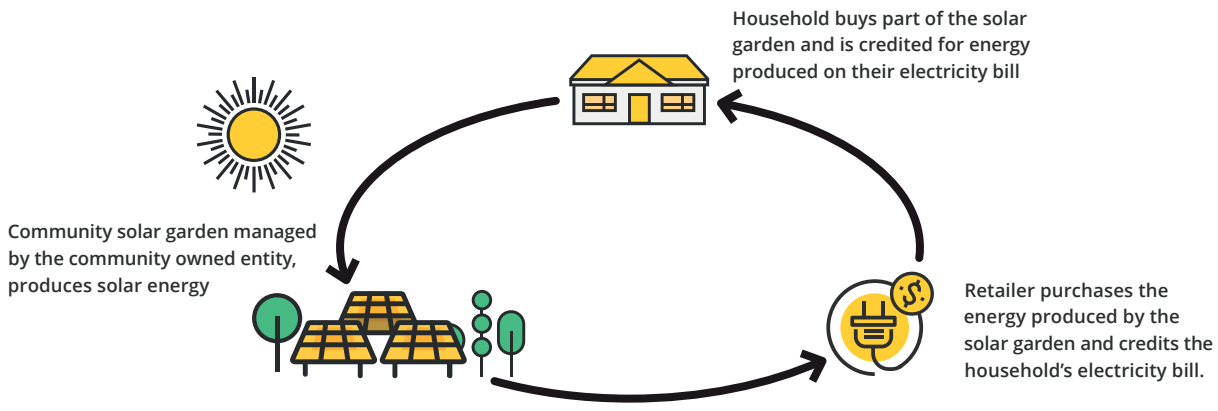
In Australia:

- There are now 1.5million homes and businesses with solar PV on their premises. This has empowered more than 4 million people to take control of their power bills during a time of steeply rising prices;
- Created a whole new sector and more than 13,000 solar jobs;[160]
- Helped increase electricity market competition by increasing the number of electricity products and services available to consumers;
- Decreased peak demand at a time when peak demand was rising sharply;
- 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; and
- Made Australia a leader in roof-top 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 companies, services and companies, with over 100,000 people in

Figure 10: How a Solar Garden works



Germany employed in the renewables export industry and an estimated annual export revenue of €10billion;[161]

- 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.[162] Many have already met or exceeded this target;
- Led to €14-18 billion in new investment annually,[163] by providing certainty to investors and thus unlocking the huge investment potential of renewables.

Feed-in Tariffs 2.0

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

As noted above, there is no market for local energy services. You can't sell solar to your neighbour, network companies don't value solar's contribution to reducing peak demand or any other grid support services, and you can't bid your energy into the spot market and capture the value when the market price is high (though we note that Reposit Power is trying to enable this). Electricity System 2.0 should fix this, 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 a while away. In the short-term we need a Fair Feed-in Tariff, that approximates the value of these different services and provides a guaranteed minimum price for solar and other local renewables.

Feed-in tariffs are often 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, the state is allowing incumbent companies to legally undervalue the product that millions of households are selling.

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

To this end, while the Homegrown Power Plan does not recommend a specific price for a Fair FIT, we anticipate that it will be significantly above the average wholesale electricity price (~5c/kWh although higher in some parts of the country) but below the average retail electricity price (which for households is >20c/kWh). This is because we recognise that for most consumers the grid and other services provided by the existing centralised energy system still has value. We note, however, that some consumers will choose to disconnect themselves entirely and go off-grid and in some locations it is more cost-effective for communities and households to be disconnected from the centralised energy system.

Box 7: 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; and
- Community retailers can aggregate exported electricity generation from generator-customers within a local area and resell it to local customers.[158]

As such, the Fair Feed-in Tariff (FIT 2.0) should be an interim measure, phased in as soon as possible and then phased out as 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." [164]

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 the establishment of a harmonised FIT across all Australian jurisdictions, the fundamental guiding principle should go further:

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. We recommend it include:

- 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.[165]

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. In the meantime, 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. 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.

Box 8: Local Generation Network Credit

The Local Generation Network Credit Rule Change is about establishing a mechanism – a credit or negative tariff that recognises the value of local generation in reducing future network costs. The credit would be paid to embedded generators by distribution networks, based on the long-term benefits local generators provide, minus any additional costs.

The rationale for a local network credit is to ensure that a local generator/consumer pair pays something closer to their fair share of overall grid costs; to unlock new local clean energy business models; reduce the incentive that disproportionately high network charges create for the wasteful duplication of infrastructure (private wires); and to make use of the existing electricity network.[159]

PART 2

REPOWER
THE COUNTRY

1. Introduction

As the world's sunniest continent,[166] Australia has a lot going for it in the race to power our homes and workplaces with clean, renewable energy. By turbo-charging existing renewables policies and adding a few missing pieces, we could repower our country with 100% renewable electricity by 2030 and 100% total energy by 2050.[167] We can also ensure that this transition is affordable and fair, stimulates Australia's economy and empowers all Australians to manage their electricity bills, no matter where they live or what they earn.

With the right policies in place, our renewable future looks sunny. In less than one generation 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 is now cheaper than building coal and gas, solar is cheaper for a household than grid electricity and this trend will continue. The transition to renewables 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 the renewables boom to the Australian economy and to all Australians.

We already have some of the key policy architecture we need. The Renewable Energy Target is helping to build big and small renewables. 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.

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:

- Get the right mix of renewable energy technologies installed, delivering a reliable and affordable energy system;
- Create a clear, trustworthy, long-term and thus bankable price signal for large renewables;[168]
- Ensure that local residents have an opportunity to benefit from investment in their neighbourhoods;
- Support innovation, R&D and drive renewable energy technologies further down the cost curve;
- Help households and organisations lead on renewables;
- Ensure vulnerable households are protected during the transition; and
- Build up the skills and experience needed to decarbonise the energy system in the long-term.

These policy outcomes are complementary to those set out in the Reboot the System and Remove the Roadblocks chapters. To unleash the renewables boom 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).

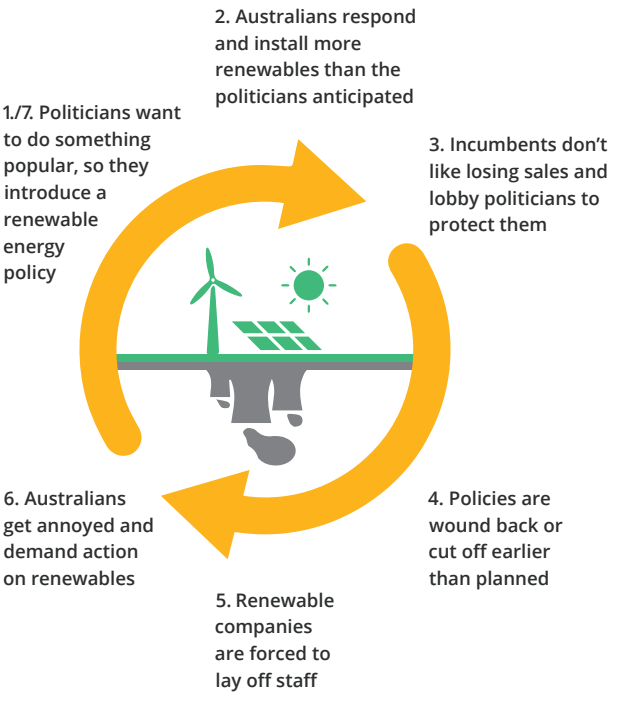
1.2 Renewable Energy in Australia - The Story So Far

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 resources in the world.[169] 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 (see Figure 11).

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. So in addition to the need for well thought-through, stable and ambitious policy (as introduced above and explained in the remainder of this Chapter), we also need cross-party political commitment that stays the course.

Figure 11: Boom and bust policy cycle



The RET: Doing the heavy lifting

The golden days of bipartisan support

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 at just 2.5 per cent of new renewable energy by 2010. 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 41,000GWh by 2020 or approximately 20 per cent 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 in the ACT.

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 per cent was in renewables and energy efficiency.[170] 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 boomtime year for the sector worldwide.[171] 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 41,000GWh to 33,000GWh 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 (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 and decreased the bankability of the RET for future projects.

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.[172] If retailers aren't signing them, finance is hard to find, which means no new large renewable projects.

The RET is now a more certain, if less ambitious policy, given the removal of the two-year review period. However, most retailers are still not signing PPAs. Retailers may be reluctant to take on the financial risk attached to PPAs, given that wholesale prices and consumer demand are unpredictable. But there could be another factor at work. Currently, the electricity market is oversupplied with polluting power from coal and gas, as noted in the Part 3: Remove the Roadblocks. 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.

Box 9: How the RET Works

The Renewable Energy Target 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; and
2. Establishing a market for renewable energy additional 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 100kWs and large generation certificates (LGCs) for projects bigger than 100kWs. These certificates represent 1MWh 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 33,000GWh 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 which is $93/LGC they are under by. 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.

Consequences for consumers

The anti-RET campaign and the PPA-shy gentailers have created significant price volatility in the renewable certificate market. During the period of uncertainty, the Large Generation Certificate (LGC) price was extremely low, making it difficult for renewable generators to recover their costs. Now that retailers are refusing to sign PPAs, there is greater demand for LGCs than supply, leading to very high LGC prices, which drives up the overall cost of the RET. This is bad for consumers, especially those who voluntarily do the right thing and purchase Greenpower.[177] Read on for ideas on how we can fix this mess.

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.[173] 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.[174] Even in cases where the private sector should be able to go it alone, another factor is at play. The relatively easy money to be made betting on the property market or selling off our mineral assets has caused Australian investors to turn up their noses at returns which investors in other developed countries would jump at.[175]

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. As noted in by ISF:

"In essence, financing a coal power plant or a wind farm is quite similar. In both cases a power purchase agreement, which ensures a relatively stable price for a specific quantity of electricity, is required to finance the project. Daily spot market prices for electricity and/or renewable energy or carbon are not sufficient for long-term investment decisions for power plants with technical lifetimes of 20 years or longer." [176]

While gigawatts of renewable energy have been installed by the private sector, only two coal fired power station has been built by the private sector since the NEM was introduced. One of these – Redbank only operated for 12 years, in significant part 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 renewables should do what coal cannot.

HOW TO **REPOWER AUSTRALIA**

1 Unleash big renewables:

- Build the right renewables in the right places with reverse auctions
- Put a long-term pro-renewable price signal in place beyond 2020
- Encourage large-scale renewable investors to give local communities a stake

2 Walk the talk on innovation:

- Turbo-charge ARENA and the CEFC
- Hold a Race to Renew competition for clean energy innovation
- Unlock equity crowdfunding in the clean energy sector
- Create a clean energy service agency to help the Federal Government cut its own energy waste and switch to renewables

3 Power to the people:

- Fund Community Powerhouses to scale up the community clean energy movement
- Fund a collaboratively-designed national Indigenous clean power program
- Work with willing states to set up PowerAccess, a public-interest retailer for people who need it most
- Ensure all Australians can access the training they need to get renewable jobs

12. Unleash big renewables

To transition Australia to 100% renewable energy we are going to need to build some big renewable power plants and storage in renewable energy hot spots: places that have the best renewable resources or are close to population centres. We already have a key policy in place that is helping us to build big renewables – the Renewable Energy Target – 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.

To build the right mix of large-scale renewables we need to put in place policies that create a clear, bankable price signal. We should also ensure that local residents can have their own slice of the boom in large-scale renewables which would be unleashed by these policies. To do this we need to:

- Undertake regular reverse auctions for important renewable energy services, funded by savings from capping the diesel fuel rebate at $20,000 (see Part 3);
- Implement a long-term price signal by extending the RET to 100% renewable stationary electricity by 2030 or 345 TWh (whatever is smaller), and extend the renewable energy certificate market to 2050; and
- Introduce accelerated depreciation tax incentives for big renewable projects with partial community ownership.

These policies, combined with the Coal Clean-up Auctions outlined in Part 3: Remove the Roadblocks, would send a clear message to the world's investors that Australia is once again open for renewable business.

2.1 Get the right mix of renewables

Hold regular clean energy reverse auctions to complement the RET

In addition to fixing the current hold-ups, it is also important to plan to get the right mix of renewables. A 100% renewable electricity system will require a portfolio of different technologies powered by different renewable energy resources. ISF's modelling,[178] along with that undertaken by AEMO,[179] UNSW[180] and others, shows that solar PV and wind, the cheapest renewable technologies available right now, will supply the majority of Australia's electricity under any 100% renewable scenario (and also 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 dispatchable renewables such as bioenergy and concentrating solar thermal with storage. 'Dispatchable' 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 South Australia show that it is possible to get to very high proportions of variable renewables without additional action.[181] But once a certain percentage is reached (a percentage that varies depending on location, the state of the grid, and so on) dispatchable renewables are needed to balance the load and ensure that supply is reliable around the clock.

Research from UNSW (illustrated in Figure 12) shows that a least-cost energy system powered by renewables includes a mixture of variable and dispatchable renewables. If the system is skewed towards mostly dispatchable renewables (left of the figure), this sees high generation costs as the technologies are more expensive. If the system is skewed towards 100% variable renewables (right of the figure) it requires much more capacity to be installed across larger areas and there are greater grid integration costs. The right mix of both dispatchable and variable renewables leads to a least-cost outcome across the system.

Currently, Australia's policy settings do not provide a clear price signal to stimulate the uptake of dispatchable renewables alongside solar PV and wind.

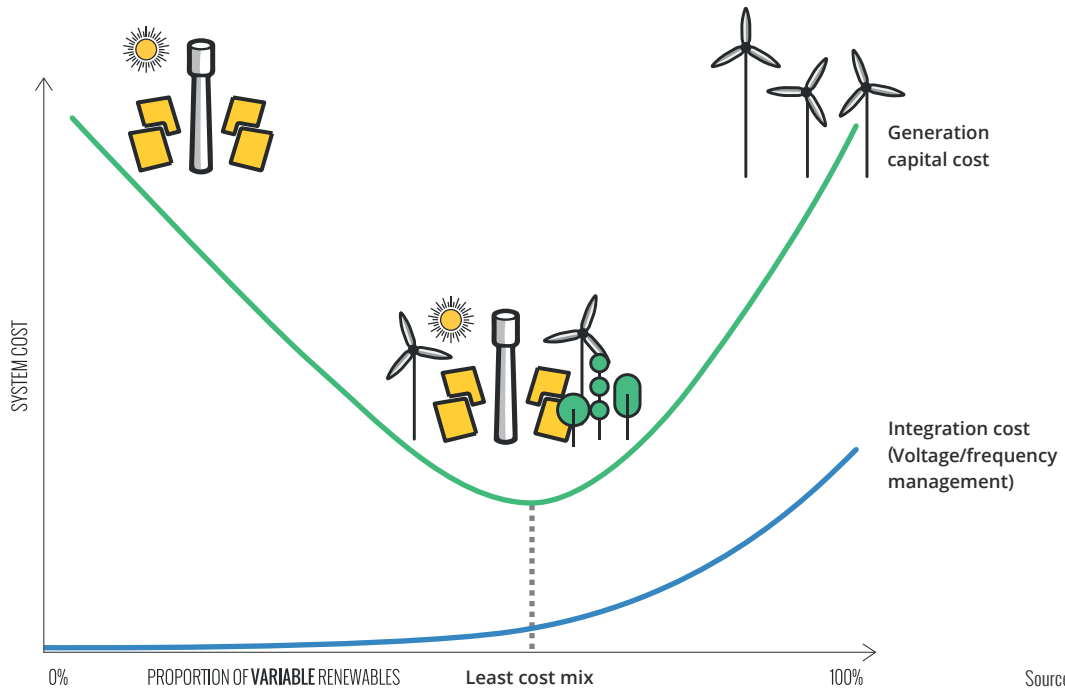
Box 11: What's the story with storage?

Household scale electro-chemical battery systems like the Tesla Powerwall are hitting the headlines at the moment. 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.

While household batteries represent a hugely exciting opportunity for households and organisations to have greater control over their electricity, the battery revolution isn't necessary to get to a 100% renewable system. Modelling has consistently shown that a reliable and affordable 100% renewable electricity system can be achieved without battery storage.[182] 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 currently cost less than batteries (see Part 1, Section 3.2 for more on flexible demand).

If battery costs continue to fall, however, and particularly if they go the way of solar PV in the last decade, it could make a lot of sense to install some grid-scale battery storage, particularly if this helps defer expensive network upgrades.[183] The CEO of network company Ergon has said that battery storage could cut grid upgrade costs by one third.[184] 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.

Figure 12: Optimising the generation mix



Source: Riesz, J. et al, 2016

Clean Energy Reverse Auctions

Reverse auctions are being used to deploy renewables from Brazil to Denmark, South Africa to Queensland. They are also the basis for the Coalition's Emission Reduction Fund, where the commodity tendered for is tonnes of greenhouse gas emissions saved rather than MWhs of electricity. (In case you're wondering, the reason they're called 'reverse' auctions is that 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).

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 2017 and they should be held regularly to 2030.

Why clean energy reverse auctions are needed

The existing RET is great way to deliver today's cheapest renewable technologies in the places where it's currently cheapest to build them. **To put us on the path to an integrated, high-quality, 100% renewable electricity system, we're also going to want some complementary technologies, in locations that lower the costs of the system as a whole.**

Also, while the Renewable Energy Target is a strong policy, the recent period of uncertainty has made investors question whether they can trust it to be around for the long haul. Reverse Auctions that run in tandem with, and are additional to, the RET, would go a long way towards reestablishing Australia as a great place to get innovative clean technology projects off the ground.

How clean energy reverse auctions would work

First, selection criteria for successful bids are chosen and published (including technical requirements identified by AEMO and any additional requirements identified by the coordinating agency). Tenders for a certain capacity (MWs) or volume (MWhs) of renewable generation or storage would then made by participating companies or organisations. 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 (see Box 12 on how ACT's auctions work). In this way reverse auctions provide the bankability and certainty needed to secure finance at competitive rates (one of the factors which keeps down the cost of the policy).

The power sale contract offered to the winning bids should be a 'contract for difference'. That is, the successful renewable energy project sells energy on the wholesale electricity market and the Federal Government agrees to top-up to the contract price offered by the winning bid. Where the wholesale price is greater than the contract price, the generator agrees to pay back the difference to the government.[186] Again, this approach has proved very successful at keeping down the costs of such policies.

The reverse auctions should be coordinated and delivered by the Energy Transition Agency (see Part 1, Section 2.3). The cost should be covered by the reallocation of funding from existing programs, for example by allocating at least half the savings from capping the diesel fuel rebate at $20,000 per claimant, which would deliver around $15 billion to the budget over the forward estimates (see Part 3, Section 3.1). If

Box 12: ACT leading the way on renewables

The ACT has committed to a 100% Renewable Energy Target for 2025. To deliver on this target, they have held a series of reverse auctions, where the ACT Government has tendered for a certain amount of renewable energy. Renewable energy developers then submit a proposal and the tenders are assessed according to selection criteria that includes affordability and whether they plan to share the benefits with the local community. So far the ACT has held a solar auction, two wind auctions, a next generation solar auction and a similar process for 1MW of community solar. Its second wind auction achieved a record low wind power cost of $77 per megawatt hour in December last year.[185]

The winning renewable energy projects then get paid the price they submitted in their proposal for the energy they generate for the tendered number of years. This cost is passed on to customers in the ACT through a small increase in the network charges levied by ActewAGL.

additional funds are needed, the clean energy reverse auctions could be set up as a joint project with interested state governments.

To complement the RET, these auctions should be designed to deliver renewable energy and storage technologies that provide important energy system support, such as flexibility or dispatchability, to the locations that need it. Examples could include:

- Solar with storage (either PV and electrical storage or concentrating solar thermal with thermal storage);
- Bioenergy from sustainable biomass (i.e. not from native forests) and, further down the track,[187] production of synthetic fuels using renewable energy; and
- Storage projects such as pumped hydro and flywheels, etc.[188]

AEMO should be given the task of identifying which energy system services are needed where. AEMO already writes the specifications for 'ancillary service markets', and they are currently revising them because of the emergence of new renewable and storage technologies. It should be possible to design the auctions to specify what outcomes are needed (dispatchability, voltage control and so on) without prescribing what technology delivers those outcomes.

The lowest-cost way to build tomorrow's technologies, today

Some of the dispatchable technologies needed to keep a renewable electricity system stable and affordable overall (see Figure 12) are not necessarily the least-cost technologies available today. They are therefore unlikely to be delivered through the technology-neutral RET. Reverse auctions are a great way to attain the lowest possible price for energy and storage projects and services that can keep our energy system reliable, sustainable and affordable over the long term.

One crucial piece of the policy puzzle

Because auctions do not create a market for renewables independent from government coordination it is important that the reverse auctions continue to work alongside the RET or another policy mechanism that provides a price signal to non-government actors to coordinate the delivery of renewables projects. That is, we need both renewable energy policies that rely on the initiative of governments, and others that rely on the initiative of the private sector.

It should be noted that auctions and similar mechanisms can be employed by a range of actors, from state governments to large energy consumers, as the City of Melbourne is currently proposing. **Auctions can also be used to facilitate the uptake of a range of different renewable energy outcomes, for example community renewable energy projects and projects in communities transitioning away from fossil fuels.** The criteria for winning bids in the Clean Energy Reverse Auctions should be designed to require good community engagement and partial (say 10 per cent minimum) local community ownership (see Section 2.3 below).

2.2 Set an expanded 2030 RET

Establish a long-term price signal for renewables and an ongoing accountability mechanism.

Without an ambitious, long-term target, the price signal for renewables is neither strong nor certain enough to unleash the rapid investment currently underway in other countries.

Out to 2020, we have the existing RET, but beyond 2020 Australia doesn't yet have a plan for stimulating the renewable investment we need. If we are to go 100% renewable (or even 50%) that will have to change, fast.

There are two main options: extend and expand the Renewable Energy Target, or introduce a carbon price. Both of these options would help level the playing field between renewable and fossil fuel generators, recognising that a free permit to pollute represents a massive subsidy to coal and gas-burning power stations (see Remove the Roadblocks for more on this).

If a carbon price is adopted, it should be designed to deliver on the pledge to work towards a 1.5 degree target made by Australia at the Paris Climate conference, and it should be based on the carbon pollution reduction timeline recommended by the Climate Change Authority. It should also draw on the latest experience from the dozens of carbon pricing schemes that have already been set up around the world. We note the growing global recognition, including from the International Monetary Fund, that fixed carbon prices are proving much harder to 'game' than emissions trading schemes.[189]

Much has been written about carbon pricing, and much less on what an extended or expanded RET may look like. In the Homegrown Power Plan, we therefore focus on the latter.

The need for an expanded 2030 RET

Expand the Renewable Energy Target to 100% by 2030 and extend the certificate market to 2050

The RET is an extremely successful policy. The existing 2020 RET is expected to unleash $40.4 billion worth of investment and over 15,200 jobs between 2015 and 2030.[190] An assessment of 1,000 carbon pollution reduction policies by the Productivity Commission found that policies such as the RET, which encourage new large-scale renewable electricity projects, are the second most cost-effective option after carbon pricing.[191] While the RET review was underway, modelling showed that due to the merit order effect[192] the average household would have to pay over $50 more a year for electricity in 2020 if it were removed (and over $100 a year more beyond 2020).[193] The same report indicated that an expanded 2030 RET of 30 per cent would reduce bills by two to three percent a year by 2030.[194] The RET is also highly popular: **73 per cent of Australians support lifting the renewable energy target to 50 per cent or higher.**[195]

One of the best policy options for increasing the uptake of renewables is to extend and expand the RET. The Renewable Energy Target, backed by certificate trading, is a market mechanism which stimulates least-cost renewable investment. It works well alongside the existing electricity market's functions. It also acts as a compliance mechanism, ensuring that our energy system keeps moving towards an agreed destination. The RET should be extended to a 100% renewable electricity target: based on Institute for Sustainable Futures modelling this equates to 345 Terawatt Hours by 2030.[196]

The following role and structure should be adopted for the RET between 2020 and 2030, to get us to 100% renewable electricity.

How an expanded 2030 RET would work

Step 1: Set the RET at the total target of stationary electricity from renewables by 2030: 345 TWh or 100% renewable electricity, whichever is lower. The 345 TWh target is drawn from Institute for Sustainable Futures modelling of a scenario in which electricity demand grows rapidly due to the electrification of transport. If this additional demand doesn't eventuate, then a target of 100% renewable electricity by 2030 is well within reach.

Step 2: If or when the target is set to 100% renewable electricity, that target should include whatever other support mechanisms (e.g. auctions) are put in place by the Federal Government or state governments. As such the target would be a catch-all or total target. In this way, states could still decide to reach 100% earlier than 2030 via additional (non-certificate market) mechanisms, and this would have the effect of reducing the target elsewhere.

Step 3: LGCs/STCs should be created under all renewable policy mechanisms, however federal auctions (and ideally state auctions and any other similar schemes, such as those run by local councils) should require that these LGCs and STCs be surrendered by anyone who participates in them. This would prevent double dipping. That is, a project wouldn't benefit from both the REC market and an auction, BUT the surrendered LGCs would still count towards the overall target.[197]

Step 4: The market also needs to be extended. Currently the market is only legislated until 2030, which means that in upcoming years new renewable energy projects will have access to LGC revenue for a shorter proportion of their lifespan. A solar farm built in 2016 will have 14 years to participate in the REC market, while a solar farm built in 2020 will only have 10 years to participate in the REC market. This has significant impact on the financial viability of renewable energy projects, an impact that increases as time goes by. By the time the 2020s come around we want Australia's renewable investment boom to be in full swing, not stalling yet again! Therefore as well as extending the RET to 2030, the REC market should also be legislated to continue to 2050, providing a long-term market for renewable energy for projects installed in 2030, as well as projects built in 2016.

Keeping us on the straight and narrow

As explained in Box 9, the RET legislation sets out the amount of large-scale[198] renewable electricity that must be generated each year (in the future this amount could be either a GWh target or a percentage). As we head towards a high-penetration renewable electricity system, the expanded RET proposed here would primarily become an accountability mechanism and a signal to all market actors that the orderly transition to a 100% renewable system is expected to continue. It would do this by requiring retailers to continue to purchase an increasing amount of LGCs each year, helping to ensure that the transition to renewables doesn't stall.

As we get towards a higher penetration of renewables, the value of a REC (LGC or STC) would diminish, as most of the value would be recovered through the wholesale electricity spot market. As the system draws nearer to a 100% renewable target, an LGC may only be worth a few dollars or even a few cents per MWh. This is because the REC market works in tandem with the wholesale market. The total price a large new renewable power plant needs to cover its costs (capital and operational) can be

recovered from both the wholesale market and the REC market. Estimates of future average wholesale prices expect them to rise in the medium term for a number of reasons, including rising gas costs.[199] However, many are not yet factoring in the fact that Australia's ageing written-off generators will need replacing, and regardless of whether they are replaced with renewables or fossil fuels, the price will be higher than current written-off assets. As wholesale prices rise, the price of RECs can fall while still providing a sufficiently strong business case for renewable investments.

For example, if in 2015 the levelised cost of energy (LCOE) for a new wind project in Australia is approximately $80-$90/MWh and the average wholesale market is approximately $40/MWh, this means a wind developer needs to be getting an LGC price of between $40-$50/MWh to cover their costs.[200] Currently, the wholesale market costs are low because most of the generation is coming from written-off coal generators that no longer need to recover their initial capital investment. By 2030 this is unlikely to be the case.

By 2030, when most of the electricity generated in Australia comes from renewable energy, the wholesale market will be doing most of the heavy lifting. For example if the LCOE of a solar farm in 2030 is $80/MWh, the majority of this would likely be delivered through the spot market average of, say, $70/MWh, with the remaining $10/MWh coming from the LGC market.[201]

If the price of the REC would be so low – why keep the RET? The RET is currently important both as a target which tells the players in the market where we're heading, and a market which creates an income stream for renewable generators. Over time the most important role of a 100% 2030 RET would shift from market to target.

If a 100% 2030 RET were implemented, a review should be conducted by the Energy Transition Agency in 2025 (but not beforehand) to ensure that the assumptions and targets set out in the legislation, as well as the mechanism itself, are still fit-for-purpose on the path to 100% renewable electricity.

Photo: Jarra Hicks

2.3 Share the benefits of large-scale renewables

Tax incentives for large renewable projects with partial community ownership.

Renewable energy is an excellent way to stimulate local and regional economic development. Research from the United States shows that **mechanisms that allow members of the community to have a partial ownership stake in large renewable projects in their area increases the local economic benefits of such projects by 1.5-3.5 times.**[202]

Incentivising partial community ownership in larger, typically developer-led, renewable projects also has the benefit of activating local engagement and support. We know Australians love renewables, and it comes with many benefits. Wind 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.

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 the renewables boom more widely. It also comes with an added bonus: communities which have been properly consulted and which 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. Australia's renewable energy sector operates in a highly competitive market, and has had to overcome a lot of resistance from well-funded vested interests, not to mention the institutional inertia described in Reboot the System. Community ownership, which goes hand-in-hand with higher levels of community engagement, is likely to be seen as a bit of a hassle and not core business by many renewable energy developers.

To address this industry culture, activate latent community support and increase local economic benefits, a number of countries,including Denmark and the UK, have required renewable energy developers to open up a certain percentage of a project's ownership to the local community. 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.[203] 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 the renewables boom 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 per cent.

2

3. Renewable Innovation Package

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. The right business model can 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.

All major parties federally are embracing the importance of innovation. Prime Minister Turnbull's first major policy announcement was the National Science and Innovation Agenda, supported by a $1 billion funding package and 24 priority initiatives, to "help create the modern, dynamic, 21st-century economy Australia needs".[204] This is important, because to perform the ambitious and achievable task of transitioning to 100% renewables will require taking risks, 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 put in place policies that can help change the culture of our energy system.

A modern, dynamic economy requires a modern, dynamic, 21st-century energy system, and support for clean energy innovation is crucial.

Two of the major institutions driving innovation in Australia's energy system are the Australian Renewable Energy Agency (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). However, the same good news cannot be said of ARENA, the Turnbull Government has committed to keep ARENA in name only, with plans to abolish its main function – providing grants.

The Renewable Innovation Package of the Homegrown Power Plan sets out three main policy priorities:

1. Expanding **all** initiatives in the Turnbull Government's National Science and Innovation Package to explicitly encompass clean energy, with a specific focus on:
   a. Government leading by example;
   b. Additional equity crowd-funding reforms;
   c. Putting social innovation on the agenda; and
   d. Pursuing clean energy innovation in agriculture and regional areas;
2. Turbo-charging ARENA, CEFC and the new Clean Energy Innovation Fund; and
3. Holding a Race to Renew, a clean energy innovation competition.

3.1. Expand the National Innovation Agenda to Clean Energy

Government leading by example

In the National Science and Innovation Agenda the Federal Government commits to "lead by example by embracing innovation and agility in the way we do business." [205] To avoid "falling behind by example" instead, the Government must embrace renewable energy innovation in the way it does business.

In 2011-12 (the last time they reported) the Federal Government used 1738 Gigawatt hours (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.[206] While the Federal Government does purchase Greenpower, it only covers 8 per cent 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[207] (see Part 3, Section 5 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,[208] as well as a Sustainable Government Team, and has just called for tenders to power the new North-West rail link with 100% renewable energy.[209] The South Australian government has issued a Low Carbon Electricity Supply and Services Expression of Interest[210] to service up to 100% of government's electricity needs (or 481 GWh a year) through innovative low carbon supply and demand management measures. The key criterion is that the technologies deployed must meet a carbon emission target of less than 400kg carbon dioxide equivalent per megawatt hour of electricity generated. The Victorian government is also holding a tender for Large-scale Generation Certificates to ensure that between 100MW and 170MW of large scale renewables is built in its own state.

The Federal Government should:

1. Establish a Commonwealth 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 South Australia; and
   - Handling all other electricity and gas contracts for government operations.
2. Meet all its own electricity needs with 100% renewable energy by 2020.

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 4.3).

Equity Crowdfunding reforms

Bigger is not always better. While the transition to 100% renewables will involve building large renewable energy projects, it will also involve lots of small ones. Across the world micro-businesses are flourishing, enabled in part by equity crowdfunding, and the clean energy sector is no different. Indeed, modular technologies make small business and clean energy a perfect fit.

Equity crowdfunding allows many small investors to invest in start-up businesses. Unfortunately, our corporate regulations have not kept up with the innovations in small and micro-business financing. People and organisations wanting to do this kind of crowdfunding face many regulatory barriers. This issue has been progressed by the current Federal Government as outlined in the National Science and Innovation Agenda. Some of the barriers to equity crowdfunding, such as cost-prohibitive reporting requirements (at

least for the first five years) would be removed if recent reforms by the Federal Government were to pass the Senate, but more needs to be done.

There is huge potential for 'micro' or project-based clean energy businesses to open up clean energy investment to everyday Australians. Unlocking equity crowdfunding in the clean energy sector, and particularly in the community energy sector, could allow thousands of people to invest in and benefit from renewable energy projects in their community's backyard. Key additional changes required to do this include:

- Reducing compliance costs for community crowdfunding projects as well as the existing changes to reporting exemptions for Public Companies; and
- Applying equity crowdfunding changes to Private Companies, specifically by capping the total equity crowdfunding amount rather than the number of investors.[211]

Getting granular on renewable innovation

There are a number of other ways the National Innovation Agenda can support the transition to 100% renewable power. These include:

- Expanding the remit of the Innovation Agenda to social innovation; and
- Pursuing clean energy innovation in agriculture and regional areas.

An innovation agenda encompassing social enterprise

The greatest challenges facing Australian society are complex, and it will take our best collective thinking to face them with confidence, skill and ambition. Adapting our economy to a rapidly changing world; rising to the challenge of action on climate change and addressing energy affordability: these all require more than just a 'business as usual' approach.

We are finding that systems, regulations and regimes implemented even just a few years ago are no longer capable of meeting our needs in the face of fast-paced developments in technology. These challenges and opportunities however, are not just economic and technical in nature; they are social and environmental challenges as well. It is essential that **Australia's innovation agenda also incorporates and supports much-needed innovation in our social and environmental sectors, particularly social enterprises and not-for-profits.**

The challenge of transitioning to 100% renewable energy comes with economic, social and environmental challenges and opportunities. We need innovation policy that allows different types of organisations – for-profit, profit-for-purpose and not-for-profit to participate in, benefit from and address the obstacles to a 100% renewable transition.

Box 13: Why we need equity crowdfunding reforms

Imagine your local sports centre and swimming pool wants to save on power bills by installing a 200 kW solar array and doing an energy efficiency upgrade. They need to raise the capital and would like to do so from the local community. They would like to enable the people that use the sport centre to invest and own the new solar array, as something pool users can be proud of taking part in, and potentially gain a financial return from as well. Ideally, the sport centre would like to have 200 people from the community 'buy' (or invest by owning) 1kW each and they especially want to target a market that's ripe; the owners and tenants of a couple of nearby apartment blocks.

Unfortunately, if they tried to set up a structure to do this today, they would hit a brick wall. If they want to set up a public company, the cost of complying with ASIC regulations would break the business case for the project, even with the recent equity crowdfunding changes introduced by the Turnbull Government. If they go with the alternative, a Private Company or Trust, they would have to limit the number of community investors to 20 in each year and not more than 50 total, which would lock out 'Mum and Dad' investors.

Clean energy innovation in regional areas

Clean energy is a regional development opportunity. Around the world, farmers and regional communities are maximising the benefits from clean energy resources that are abundant in regional areas. Regional Australia has similar opportunities. Investing in the prosperity and resilience of regional Australia is essential for Australia's future. The National Science and Innovation Agenda includes seed funding for collaborative workshops.[212] A specific focus on clean energy opportunities should be added to the agenda, with a focus for farmers on how they can innovate and integrate clean energy into agriculture. These workshops should be prioritised for:

- Communities and regions that are facing significant changes due to the shutdown of fossil fuel infrastructure; and
- Regions where there is significant untapped renewable energy resource potential.

3.2 Turbo-charge the Clean Energy Finance Corporation

Give the CEFC more choice about what it invests in, by lowering its target rate of return

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. It has had difficulty in the past two years getting finance out the door due to the industry uncertainty sparked by the attacks on the Renewable Energy Target (as discussed in Section 2). This uncertainty was compounded by the commitment by the Abbott Government to abolishing the CEFC.

The Turnbull Government has thankfully seen the light and scrapped plans for its abolition. Given that the CEFC is making a profit, 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 and to date has exceeded this.[213] In fact, this target return is set too high, effectively constraining it to act much like any other investment bank.[214]

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 Investment 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 Investment Fund?

The Clean Energy Investment 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 put into the shiny new CEIF, which will at least function differently, and better, than its parent fund. This is mainly because they've lowered the target rate of return of the CEIF to 1 per cent 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 given 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 target to the rate that now applies to the Clean Energy Investment Fund (the bond rate plus 1 per cent). A difference of 3 per cent 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 the fact that:

1. Many renewable projects are decentralised and small in both physical scale and the level of financing required. They are therefore below the threshold for commercial project finance; and
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 per cent 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.

3.3 Turbo-charge ARENA

Increase ARENA's funding to put Australia back in the global clean-tech race

ARENA plays an essential role in clean energy innovation and Australia would be even further behind in the global renewables race 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".[215] It has a strong track-record of identifying the most important steps needed to unleash the renewables boom and it designs its funding programs around the needs it identifies. For example, ARENA is currently undertaking a competitive grant round to support the deployment of large-scale solar PV projects, helping to bring 'big solar' down the cost curve. It also has a Research and Development program for new renewable energy technologies and an Advancing Renewables program that helps remove barriers to uptake.

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.[216] The Abbott Government also tried unsuccessfully to completely abolish ARENA, but was knocked back by the Senate. While the Turnbull Government has withdrawn the ARENA repeal bill, it remains intent on defunding it.

At the same time as announcing that CEFC is safe, the Turnbull Government reconfirmed its commitment to stripping $1.3 billion in funding from ARENA. This is funding that ARENA has not yet spent, but which has been allocated to it for 2016-2022. In fact the exact amounts that ARENA is supposed to receive each year are set out in the ARENA legislation.

Essentially, the Federal Government has told ARENA to finish what it's doing and go help CEFC with its loan and investments instead (because ARENA will have a small role in the new CEIF and be allowed to invest in projects). It is also being allowed to manage the grants it has already made and finish the current grant rounds that are open. But after that, no more grant making.[217] The combination of defunding ARENA and removing its grant-making function amounts to abolishing it in all but name.

This is a problem. 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 no-where, fully developed and ready to deliver great returns from day one.**

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

- Renewable technology R&D, like funding research into printable solar panels
- Early-stage commercialisation of renewables technologies, like the Carnegie Wave energy pilot project in Perth,[218] and

Table 4: Suggested priorities for additional ARENA funding

Program or focus area	Funding 2016-2022
Driving dispatchable renewables such as CST and bioenergy down the cost curve (complementing Clean Energy Auctions – Section 2.1)	$200m
Race to Renew Prize (Section 3.4)	$35m
Remote Indigenous Clean Energy Program (Section 4.1)	$100m
Community Powerhouses (Section 4.2)	$250m
R&D priorities drawn from the modelling of 100% renewable energy systems by the Institute of Sustainable Futures and others, such as renewable fuel sources for transport and industrial processes, including sustainable synthetic fuel production.	$115m
Total	**$700m**

- Doing other important research and capacity building that fills data and knowledge gaps, such as the Australian Renewable Energy Mapping project[219] which shows where the best wind and solar resources are in comparison to where the grid is.

Australia needs more grant funding for renewables, 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 increase ARENA's 2016-2022 budget allocation from $1.3billion to at least $2billion.** This additional $700m in funding would cover additional priorities and programs outlined in Table 4.

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 its funding remit.[220]

3.4 Establish the Race to Renew prize

Hold a competition for innovative renewable business models

Advances in renewable energy technologies and storage combined with the digital revolution are democratising our energy system. There are so many potential ways that individuals and organisations can participate in and benefit from clean energy. To turn much of this potential into reality, we need business models that stack up. The Race to Renew would be a prize to support the development of innovative new clean energy business models, that stack up financially, drive significant renewable uptake and address a chosen market failure or barrier to renewables.

The Race to Renew would have three stages:

- **Stage 1:** Energy business model design and feasibility testing. In this stage 30 teams are awarded $150,000 each to develop a new business model concept, test it through a virtual (desktop) trial and identify a pilot site/s.
- **Stage 2:** Energy business model piloting. In this stage, 15 teams are given up to $1.5 million each to implement a pilot of the new business model. Matching funding would be expected.
- **Stage 3:** Energy business model refinement and scale up. The most successful business model team wins an additional $1.5 million to scale up their business model. Four runner-up teams each win $500,000 to scale up their business model. A further 5 teams win $100,000 to scale up their business.

Based on this design, an additional $35 million should be provided to ARENA to deliver the Race to Renew.

The Race to Renew is modelled on the Sunshot Prize, which aims to speed up solar deployment times, and on the New York Prize (part of the New York REV – see Box 14 below and Box 5 in Part 1), which aims to increase the resilience of their grid.

The beauty of both the New York Prize and the Race to Renew is that it allows for failure – the very nature of innovation is that ideas don't always work. The Race to Renew will support this innovation processes, with the aim of ultimately seeing at least 10 new business models scale up.

Box 14: New York Prize[221]

"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."[222]

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 is currently underway, with 83 feasibility studies across New York State, each funded to the tune of $100,000. During the Stage 2 Design Stage, it is expected that up to $1 million in funding will be approved per project proposal for approximately 10 detailed designs. For Stage 3, $5 million per project is expected to be awarded for approximately seven projects for build-out and construction.

3

4. Power to the People Package

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 which saw some of the most polluting electricity in the world and a 70 per cent hike in electricity prices over five years due to network gold plating.[223] A new energy future is afoot, and this time it's powered by people.

People + clean energy + the digital revolution
= an empowered, democratic and climate-safe energy system.

All Australians, no matter what they earn or where they live, deserve access to affordable clean energy. Unfortunately some parts of our community still face barriers that block them from benefiting from the renewable energy revolution. 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. In Germany, just under half of all renewable energy is owned by citizens and communities. All Australians should have the chance to follow in their footsteps.

Renewable energy is extremely popular. Policy makers have frequently found themselves in deep water after underestimating how popular a renewable policy might become, contributing to the boom-bust cycles discussed in Part 1. The following policy package aims to harness this popularity and extend clean energy access to those who would like to participate but can't because of market or structural barriers.

Australia has the highest per capita installations of rooftop solar PV,[224] with just under 1.5 million solar roofs.[225] That means there are at least 4 million Australians living in solar-powered buildings. It was both communities and state and federal policy that helped drive this solar rooftop revolution, at the same time creating 13,300 jobs,[226] establishing a solar industry and driving down the cost of installing solar for all of us.

The chart below (Figure 13) 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, what the chart also shows is that the lowest income suburbs have been the most excluded from solar access.

Barriers to clean energy access exist not only for low-income households but also renters, apartment dwellers and homeowners without solar access or 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 per cent of households and 48 per cent of businesses are unable to host their own Solar PV systems.[228] Low-income households are more likely to be renters, and therefore face the dual challenges of financial constraints and unmotivated landlords (the 'split incentives' problem). Addressing this situation will require both government support and greater innovation by community enterprises.[229]

The Power to the People Package of the Homegrown Power Plan sets out three main policy priorities:

1. The Indigenous Communities Clean Power Program;
2. Community Powerhouses; and
3. PowerAccess.

4.1 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 fossil fuel extraction 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,[230] many off-grid projects are looking to renewables as an alternative power supply.[231]

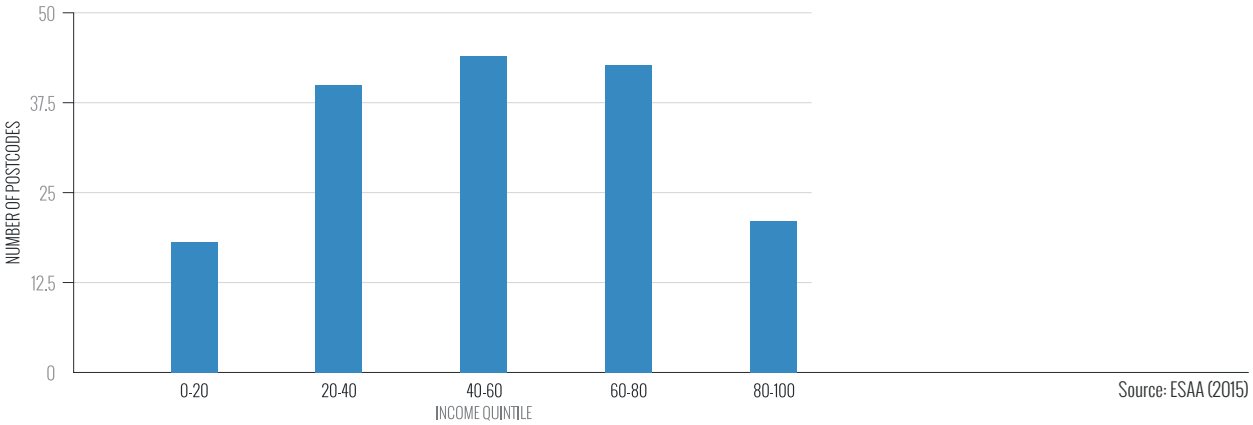
Many Indigenous communities are calling for support to switch from expensive, polluting diesel generators or overpriced grid connections to renewable energy and storage. Past programs along these lines have had some success and were abandoned without any compelling reasons. Among other benefits, they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

As renewable costs fall and as diesel costs become more apparent, momentum is growing 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, by establishing a national, 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.**

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;

Figure 13: Queensland postcodes with over 30% solar penetration, by income[227]



Source: ESAA (2015)

- 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; and
- 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 Queensland and Northern Territory through Ergon Energy and NT Power and Water Corporation (NTPWC) respectively. Through this Ergon Energy is expected to achieve up to 100% solar penetration, with their 1MW expansion of Doomadgee Solar Farm that displaces an expected 528,000 litres of diesel per year.[232] 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 Queensland 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 the $150,000 rebate applies to domestic installations. Similar programs exist in WA, NT and SA.

Where to now

Despite existing support programs for the uptake of renewables in Aboriginal communities, some projects are not working as well for communities as they could or should. There are also a range of opportunities that exist today, that didn't just a few years ago. Factors that mean the time is now to rethink and expand support for Indigenous renewables include:

- A continued focus from funding bodies and utilities on technological fixes, which is still ingrained in much of the planning and rhetoric around 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;
- A history of colonisation that lives on today through much of the 'community consultation' being conducted with Indigenous communities;
  - Historically, diesel power supply systems leading not only to high costs for communities and polluting forms of 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;[233]
- The rise of a multitude of 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, coming down the cost curve, and battery storage following fast;
- Diesel prices likely to rise over the medium term;[234]
- Increasing international attention to Australia's poor treatment of its first peoples; and
- Strong growth of the community energy sector in Australia, with a strong network of communities sharing and learning together and some successful examples in Aboriginal communities (see Box 15 for an example).

A much more systemic and empowering approach to the energy supply of Aboriginal and Torres Strait Islander Communities is urgently needed. An approach along

the lines of 'Empowered Communities'[235] would put 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-carbon energy services so that solutions are appropriate to local situations, with the community having ownership over the outcomes.[237]

A community-scale approach can be far more transformative, enabling citizen participation, building on local knowledge and networks and developing locally appropriate solutions.[238] 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 Community Powerhouses Network – see Section 4.2).

How it could work

All Indigenous communities deserve access to affordable clean energy. The suggestions that follow outline what a program tailored to remote Indigenous communities might look like. A Remote Indigenous Community Clean Energy Program should be designed in collaboration with leaders of Aboriginal communities who will be involved. 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 have good social and economic and technical outcomes.

Box 15: Case Study - Remote Aboriginal Community Solar in NSW[236]

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 (see Box 16) 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!"

Box 16: Case Study - AllGrid Energy - the Indigenous-owned energy company lighting up remote communities

AllGrid Energy aim to use the renewable energy boom 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 5 years more than 1 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."[241]

- **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 these pilots. 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 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 fulfill 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 and 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.[239]

The states and territories with the most remote Indigenous Communities – WA, NT and Queensland 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.[240] 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 and CEFC funding 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.

4.2 Establish Community Powerhouses

Supporting households, communities and local businesses to lead on clean energy.

Australians love local renewables

Across Australia, well over 4 million people live under solar roofs and already over 80 innovative community energy groups have sprung up across the nation. There are thousands of Australians willing and able to get local renewable energy projects going in their communities, particularly in rural and regional areas. And we're not alone: in Germany, 47 per cent of all renewable energy capacity is owned by individuals and communities.

From helping spark the solar rooftop revolution through many successful bulk-buy programs, to creating plans to go 100% renewable and pioneering new collective ownership models of renewable energy, communities have and will continue to play an integral role in the clean energy revolution. Community energy projects bring with them a range of environmental, social, monetary, technical and political benefits.

Example of community energy enterprises include:

- Hepburn Wind, Australia's first renewable energy cooperative;
- Repower Shoalhaven, Australia's first community-owned solar project;
- Enova, Australia's first community energy retailer; and
- CORENA, which funds solar and energy efficiency upgrades for charities across Australia.

Communities leading where the market is failing
While renewable uptake is highest amongst low and middle-income households, there are some people and organisations who cannot currently access the benefits of renewables like rooftop solar PV. Access and affordability of renewables are issues for renters, apartment-dwellers, low-income households and homeowners without solar access or who have inappropriate roofs. These customer segments face a range of market barriers, such as split incentives and higher transaction costs.

Community energy groups across Australia are taking up the challenge and are at the leading edge of renewable energy business model innovation to overcome these market failures. Examples include:

- Piloting community solar projects with social housing providers;
- Developing solar gardens (owning a few panels in a nearby shared solar facility instead of on your own roof) and pushing for a rule change with the AEMC that would make them possible; and
- Rates financing for low-income pensioners (see Box 17 for an example of this model developed by Darebin Council and Moreland Energy Foundation).

Why do we need Community Powerhouses?
While community energy groups have enthusiasm, time and commitment, 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 cutting greenhouse gas emissions. Some people are missing out on the clean energy boom altogether.

Companies driven primarily by profit have few incentives to make clean energy more affordable for low-income households or to ensure that hard-to-reach customer segments can benefit from clean energy. We need not-for profits and social enterprises that have a duty of care to the vulnerable energy customers they are supporting. That's why we need Community Powerhouses.

Community Powerhouses would leverage the efforts of existing volunteers, willing contributions from the private sector and community enthusiasm for renewables, to support all Australians to access innovative and emerging energy technologies such as solar + battery storage.

They would unlock the organisational resources – including time, money, land/roof space of thousands (if not millions) of new actors in deploying renewables.

What are Community Powerhouses?
Community Powerhouses would draw from the best examples of local clean energy organisations springing up across the world. The program is modeled on funded volunteer coordination services provided through the

Box 17: Best practice community energy - Moreland Energy Foundation

There are many community energy enterprises implementing innovative community energy projects and programs, but Moreland Energy Foundation is the longest running and a model many communities are trying to emulate.

Moreland Energy Foundation (MEFL) was founded as an independent non-profit 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.

National Landcare Program (see Box 18). It would include 50 Community Powerhouses, supporting hundreds if not thousands of volunteer groups, supported by a Community Powerhouse Fund and Network.

Community Powerhouses would 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;

Imagine if there were clean energy organisations across Australia at the scale of Landcare with the energy skills of MEFL. With an investment of $149 million in federal funding over the forward estimates period (a total of $460 million dollars over 10 years),[245] 50 Community Powerhouses would help ensure that all Australians, no matter how much they earn or where they live, are able to take control of their power bills and access affordable, clean and renewable electricity.

Modeling undertaken by Marsden Jacobs and Associates found that, given time, community energy

Table 5: How Community Powerhouses would work

Structured similarly to the National Landcare Program, the 10-year Community Powerhouse Program would work as follows:

Aim	To scale up the existing grassroots movement to increase local clean energy access, affordability and innovation.
Organisations	Establish 50 Community Powerhouses – not-for-profit organisations or social enterprises in 50 regions (urban, regional and remote locations) across Australia.[244] Start-up funding for 2 years and ongoing ⅓ matched operational funding. These Community Powerhouses would support many local volunteer community groups in their regions.
Programs and Funding	A Community Power Fund would provide funding for community clean energy organisations (both those with and without start-up funding) to: • Develop local renewable community plans • Develop, pilot and scale-up new models of community clean energy, that enable community members, renters, low-income Australians, farmers, small businesses and more to participate in and benefit from clean energy
Capacity Building Network	A Community Power Network would ensure that the models, business plans, implementation strategies developed are shared across the 50 Community Powerhouses, 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 trainings and a bi-annual conference.
Making it easy: Deductible Gift Recipient Status	Add the provision of, information or education about, and the implementation of community clean energy projects to the Environmental Register criteria. Alternatively, create a new pathway under the ACNC for community clean energy groups to get tax-deductible status.

projects could leverage $17 of community funding for every $1 of government funding.[246]

Community clean energy – the new frontier

Clean energy is the new frontier, not only for local environmental conservation but also economic development and community empowerment. It's popular: 63% of Australians would be more likely to vote for party with a policy to ensure solar is installed on every home that is suitable and on buildings like hospitals and schools. It's affordable: average installed solar PV prices have fallen 30% since 2012. It's spreading fast: 27% of the voting public now live under a solar roof. And it could spread even faster with just a little help from Community Powerhouses.

Box 18: 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." [242]

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 Programme provides three funding streams:

- Regional funding stream – this is investing "over $450 million throughout Australia's 56 natural resource management (NRM) organisations over four years. This funding recognises the crucial role the 56 regional NRM organisations play in delivering NRM at a local and regional level." [243]
- 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.

Box 19: 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% renewables. 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.[247]

Uralla is just one of many communities that are leading the way and creating 100% renewable community plans. 'Totally Renewable Yackandandah' in North-East Victoria 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,[248] which will involve transitioning to 100% renewable electricity.

4.3 Make clean power affordable for all

Establish PowerAccess, a public-interest retailer for those who need it most

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

Australian households are still paying off the electricity network companies' latest five-year spending spree. Some have been able to take steps to manage this increase and reduce its impact on the household coffers (see Figure 14).

However, many have been unable to access or afford energy efficiency upgrades or household solar, leaving them exposed to soaring bills. While in some states electricity prices are declining slightly, for Australia's lowest income and most vulnerable customers, paying their electricity bill continues to be a struggle. As the Australian Council Of Social Services puts it "for the estimated 12.8% of the Australian public who are living in poverty, energy affordability is a growing, and sometimes crushing problem".[250]

The AER publishes figures for households covered by the National Electricity Market. These figures show that low income households spend between 3 and 7.7 per cent of their disposable income on electricity.[251] Unsurprisingly the highest burden was in Tasmania, the state with the lowest incomes and the coldest climate.

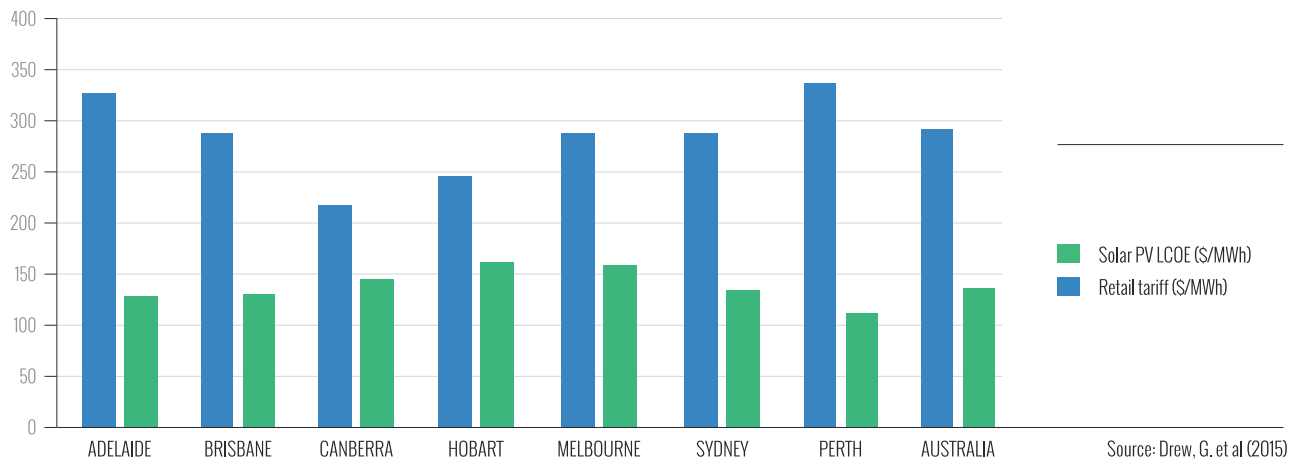
Disconnections, on account of a failure to pay bills, have been a growing problem. In Victoria in 2013-14, 34,000 people had their electricity cut off because of an inability to pay their bills, and more people have been seeking bill relief from retailers.[252] In NSW, disconnections doubled in the five years to 2014.[253]

Low-income households tend to use less energy than high-income households, and a higher proportion of their energy consumption is impossible to avoid. This is particularly true of the unemployed, people with disabilities, families with young children and people who need specialist medical equipment that run on electricity. According to ACOSS the groups most impacted and likely to seek crisis or emergency assistance for payment of bills include "single parents, couples with children, and households that rely on government benefits."[254] These are also the groups of people who are more likely to be home during the day and would thus most benefit from and use rooftop solar electricity. However, due to the fact that many low-income households rent, some may have credit rating issues and many live in apartments, there are barriers to both the affordability and accessibility of clean energy as a way to manage rising electricity bills. It is unlikely that innovative social finance alone can overcome these barriers.

There is a need to directly improve energy affordability for low-income households, and to extend access to clean energy as part of that.

Figure 14: Retail tariffs and rooftop solar compared[249]

What rooftop PV means for household bills



Source: Drew, G. et al (2015)

As noted in Reboot the System, whether we like it or not our energy system is changing. The so-called 'death-spiral' with its increasing fixed charges is likely to have the greatest impact on the lowest income households. 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.

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 and required under the National Energy Customer Framework. However, 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 $459 per year in Tasmania, to $165 per year in South Australia. 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.

We need an innovative approach to supporting low-income energy consumers, just like we need an innovative approach to stimulating the transition to 100% renewables.

To this end we propose that the Federal Government, in partnership with the states, look at setting up 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. Households eligible for existing government energy assistance schemes (to be identified by the Transition Agency in collaboration with state governments) would be offered the opportunity to opt in to become a customer of PowerAccess. It could also, with the cooperation of participating states, be set up as the default retailer for public housing tenants.

A similar model to PowerAccess exists in Scotland, called 'Our Power'. Social housing providers have banded together to set up an energy supply company that meets the needs of the residents they serve:

"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, but 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." [255]

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. PowerAccess would be free to undertake a wide range of innovative measures to achieve these outcomes for its customers.

Establishing PowerAccess would deliver several benefits at once. As an organisation PowerAccess would have lower 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. As a public agency or not-for-profit, any surplus would be reinvested back into providing benefits to customers.

PowerAccess could potentially be combined with, or developed by, the energy services agency for federal government buildings proposed in the Clean Energy Innovation Package (Section 3.1), to increase the purchasing power of both. Low-income households, because of hardship programs and disconnections, are some of the most costly to service for current commercial retailers. PowerAccess could reduce the cost burden to these private retailers, which could in turn lead to lower bills for all energy consumers. Measures such as the national benchmark tariff process proposed in Reboot the System (Part 1) would need to be in place, however, to ensure that this did not simply lead to higher retail margins. PowerAccess could in part be paid for by states pooling funding from their current energy hardship budgets: customers would either choose to retain their existing energy concessions or become a customer of PowerAccess – they wouldn't benefit from both. There is good reason to believe that low-income customers would 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 the big three profit-orientated gentailers.

How PowerAccess would be established and its costs would need to be scoped in more detail. For example, the Federal Government could set-up a new government owned entity as a joint venture with states, or it could tender for a non-profit provider.

Giving consumer advocates and community groups a real seat at the table when setting fair national bench-

mark electricity tariffs, as recommended in Reboot the System (Part 1), could go a long way towards protecting low-income households during the transition from Electricity 1.0 to Electricity 2.0. But benchmark tariffs can only go so far, particularly for households with limited capacity to take the actions needed to gain full control over their electricity consumption and bills. By consolidating existing energy hardship programs into one national public-interest retailer, PowerAccess would provide low-income households with the certainty they need to face the coming energy transition with confidence.

5. Training for the Next Boom

Invest in a well-trained clean energy workforce

Jobs and the renewable transition

Solar panels don't install themselves. Nor do double-glazed windows, wind turbines or solar farms. The International Renewable Energy Agency has counted 7.7 million renewable energy workers worldwide so far, and the sector is growing fast.

In 2014, more than 12,000 Australians worked in rooftop solar installation,[256] larger by far than the coal-fired power station workforce.[257] This should not surprise us. 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.[258]

Australia is in urgent need of more sustainable, skilled job opportunities, especially outside the capital cities. As major employers in manufacturing and other industries shift jobs offshore and as mining companies sack staff now that the investment boom has bust, Australian workers with significant skills and experience are seeking employment. **There is no need for their energy and skills to be wasted: the coming boom in renewable energy generation and energy efficiency will create sustainable employment,** both for skilled workers and for young Australians entering the workforce.

These jobs will be in several fields, including but not limited to:

- Rooftop solar installation, growing fast already and likely to see significant further increases with the installation of batteries;
- Building and installing large-scale renewables like the new wind, solar power generation plants, as well as other technologies in the future;
- A wide range of knowledge work, including energy efficiency assessments, renewable business case analysis, and so on;
- Retrofitting offices and buildings to cut energy consumption;
- Maintenance of new renewable technology installations, particularly for wind turbines and solar arrays.

Many of these skills will already be present in abundance in today's workforce. In other cases, however, people will need to start training today for the jobs of tomorrow.

The boom in rooftop solar could be mirrored by a boom in the large-scale renewable power generation industry, if Australia embraces the transition and adopts the recommendations made in the Homegrown Power Plan. And because the right places to locate large-scale renewables tend to be outside cities, this could generate a lot of much-needed regional employment.

But there's a challenge. The boom-bust cycle in renewable policy has affected far more than the level of renewable investment. It has also affected the stability and skill development of Australia's renewable workforce.

There has been a resultant impact on apprenticeships. 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. Currently, apprentices in electrotechnology prefer to be trained as licensed electricians, a licence which allows them to work on houses and other buildings, because they have been given no reason to believe there will be sustained employment in the renewable energy sector. The Renewable Energy Electrician Australian Apprenticeship is offered only in Victoria, South Australia and the Northern Territory and had no commencements at March 2015.

This is further compounded by the fact that **most training packages include qualifications with competencies related to renewables as electives and not as core.[259] This issue was noted in a report undertaken by Regional Development Australia Northern Rivers.[260] It sends a clear message to apprentices that renewables are second-tier skills and not essential to their future employment prospects. This problem could be fixed immediately at almost no cost.**

5.1 Maximise the benefits of the renewables boom

With the right policies, Australian workers could not only gain sustainable jobs here but also have portable skills which would allow them to seek employment around the globe. But so far, Australia has been lagging behind in our efforts to ensure that the most highly-skilled renewable occupations can be filled by local candidates. In the case of wind farms, power companies are sometimes sold maintenance packages which include access to technical assistance, along with the infrastructure. In the absence of local alternatives, Australian-based workers undertake much of the maintenance and repairs but, when they encounter more serious problems with the equipment, are instructed to contact an international technician. These technicians then either undertake the maintenance and repair work from a distance; or provide advice and instruction to the Australian-based worker.

Another highly skilled trade is in switch farms, where low-level voltage gets transformed to high voltage. This is a dangerous occupation, requiring a high level of skill. As large-scale solar expands, this occupation is expected to grow, providing employment opportunities, particularly in regional areas.

Australia must ensure its workforce has access to these high-skilled employment opportunities as the industry grows, and the training needed to perform these occupations safely and well. Training for Australian workers is a critical requirement for a rapidly growing industry. Australia has the opportunity to be a global leader, not just in renewable energy but in renewable energy skills, if the right steps are taken to prepare our future workforce now.

To support this employment growth, there are simple and cost-effective approaches which should be implemented immediately.

5.1A Include renewable competencies in all relevant qualifications

First, and most simply, every qualification in every training package for power generation, utilities, electrotechnology and building and construction should include competencies (skills) in renewable energy and these competencies should be core and not electives.[261] This would, of course, include qualifications for licensed electricians, where competencies in the installation and maintenance of solar PV become core.

5.1B Align apprenticeships to areas delivering the transition

Second, apprenticeships should be focused on the areas of the economy which will boom 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. These could include:

- An apprenticeship in solar power generation maintenance, to accompany the existing wind generation apprenticeship;
- Incentives to attract young people to these apprenticeships in renewable energy generation, such as guaranteed work following the completion of the apprenticeship for a specified period of time;
- An apprenticeship in renewable energy generation power plant across wind, large scale solar, marine, geothermal and hydro, including aspects of both mechanics and electrotechnology (with a limited licence to allow the technician to undertake specific electrical work);
- A building and construction apprenticeship which includes skills for new renewable infrastructure; and
- An apprenticeship at Certificate IV or Diploma level in high level technical skills for switchyard operation in renewable energy plants, and a post-trade qualification for licensed electricians

There should be an equally strong focus on developing high-level skills in energy efficiency (based on the AS/NZS 3598 series developed by Standards Australia).

5.1C Establish renewable energy Group Training Organisations

Third, until the expansion of the renewables industry makes it clear that jobs growth is sustainable and secure, and the industry attracts more young people without this support, renewable energy Group Training Organisations (GTOs) should be established. These GTOs would hire apprentices and trainees and provide them with opportunities to work across a range of renewable generation technologies and include the standard skills and qualification for a licensed electrician. In this way, apprentices can develop a wide range of skills, greatly enhancing their employability.

5.1D Focus Apprenticeship Centres on the next generation of jobs

Fourth, Apprenticeship Centres should focus their efforts in matching the next generation of workers to the next generation of jobs and cease support for employment in old technologies.

Challenges to a Successful Transition

Australia has seen on a number of occasions that booms have the potential to attract unscrupulous operators. Vocational education and training must provide the skills and qualifications that industry, individual workers and employers can rely on and which allow people to gain and, importantly, maintain employment. It is not sufficient to provide workers with tick-a-box, short-term training for today. Training needs to provide workers with current skills, underpinning knowledge and future adaptability.

TAFEs are sometimes criticised for being more expensive than other providers, a spurious comparison which does not take into account the fact that TAFE is a tertiary education institution, offering training that is different in kind from that of the majority of private vocational providers.[262] TAFEs also provide workers with sustainable skills, adaptability and internationally recognised qualifications.[263]

The opportunities for employment, training and retraining created by the coming renewables boom also provide an opportunity for governments and power generation companies to re-engage with high quality training providers with demonstrated expertise. By partnering with TAFEs across the country to build the skills needed for a clean-energy economy, governments could recognise the value of this long-neglected lynchpin of Australia's education sector.

The ACT government has led the way, announcing a new national trades training centre at the Canberra Institute of Technology, Bruce, to provide vocational training with qualifications in renewables skills including "wind, solar, sustainability, and a range of associated programs including construction and contract management, workplace safety, conservation and land management, and project management."[264] Named the Renewable Energy Skills Centre of Excellence, the centre is expected to attract 30 to 40 new students to the ACT every year.[265]

Photo: Westmill Coop

PART 3

REMOVE **THE ROADBLOCKS**

1. Introduction

It might seem obvious, but given the disproportionate influence of big fossil fuel companies over Australian politics, we need to spell it out: fossil fuels have no place in a 100% renewable future. To fully unleash the renewables boom, 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.[266] Because governments and corporations have encumbered today's Australia's energy system with the legacy of yesterday's terrible decisions, we also need them to remove the roadblocks holding back the renewable boom, by:

- stepping in to help manage the orderly phase-out of coal-fired power over the next 15 years;
- supporting the transition to a flourishing future for post-coal communities;
- passing air pollution laws strong enough to protect our health;
- cutting the fossil fuel subsidies that push energy spending in the wrong direction;
- doubling Australia's energy productivity by 2030, with strong energy efficiency policies that bring our energy consumption under control; 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.

The benefits of climate-safe economic policies

Australia is in a strong position to thrive as global investment shifts towards renewables. 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.[267] Just 0.1 per cent of this radiation, converted into electricity, would be enough to power the nation.[268] We also have 120 million hectares of very affordable land suitable for large-scale installations,[269] a strong research base in solar technology and design, and we're close to major export markets.[270]

As the world makes the transition to renewables, Australia could transform these strengths into competitive advantages – building low-cost renewable energy into exports, and selling our solar expertise to a world hungry for renewable power.

The economy has not been kind to people in Port Augusta or Elizabeth in South Australia or in the Latrobe Valley or Geelong in Victoria. 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 what the Future Business Council describes as 'the next boom':

"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."[271]

The key ingredients of good industrial policy

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. Negative gearing skews finance towards property speculation rather than other investments. 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 to 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).

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 lightbulbs 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.[272]

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." [273]

2. The path to a post-coal future

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 the renewables boom, deliver major health and environmental benefits, and ensure that workers and 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 Hazelwood in Victoria is inevitable, many politicians are not willing to confront the issue directly, even when energy companies are actively calling for intervention. By 2020, 45 per cent of Australia's power stations will be over 40 years old.[274] 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."** [275] As of March last year, almost half of the coal-fired power plants over 35 years old had already been mothballed.[276] 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, mercury and particle pollution** (particulate matter or 'PM') than other forms of power generation.[277] If regulations were passed requiring their owners to bring these toxic emissions 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.[278]

The most polluting plants also tend to be the ones that waste the most water.[279] The insatiable thirst of sub-critical coal-fired power plants 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 taxpayers will be left to eventually foot the bill 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.[280]
- We have already seen the sudden closure of the Anglesea and Port Augusta power stations in Victoria and South Australia with no plan for a just transition. 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.**[281]

It was the responsibility of the owners of existing plants to have seen this coming – they don't deserve our help. 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." [282] Their workers do deserve support, however, and so do the communities in which they operate. **A plan to phase out coal which is predictable, affordable, and which looks after workers and their communities is a much better option than leaving it to the whims of a volatile energy market.**

South Australia will be coal-free after the closure of the Port Augusta plants. Victoria is conducting a root-and-branch review of its brown coal industry. Over in the United Kingdom, the government has announced that it will close all 'unabated' coal-fired power stations within 10 years.[283] **The Federal Government 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 in the next term of government.**

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 [284]

"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 [285]

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),[286] Origin Energy[287] and AGL have announced that they will not be replacing their old coal-fired generators with new ones.[288] **This isn't surprising given that wind power is already cheaper than new-build coal or gas and large-scale solar PV is on track to catch up by 2020.**[289]

Why haven't the most polluting plants been decommissioned already?

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 – 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.

Secondly, when it comes to quitting coal, **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 are playing a game of chicken, hoping the other guys will swerve first.**[290] **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.**

Finally, **safely decommissioning and cleaning up coal power plants and their associated mines costs money** – quite a lot of money.[291] Unfortunately, past governments have been lax landlords. They have failed to require power plant and mine owners to pay upfront bonds sufficient to cover the full costs of cleanup if they go broke. As a result, taxpayers and local communities are 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 decommissioning and rehabilitation can be very serious.

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 carbon price or emissions standards to speed the exit of old, dirty, coal-fired power stations. The effectiveness of policies like the Renewable Energy Target is being held back by unfair competition from coal, which receives direct subsidies in the form of cheap water and other government handouts, and indirect subsidies in the form of unpriced pollution and health impacts. At this point **Australia's power sector is like an overgrown tree. We need to prune out the dead wood for the new shoots to grow.**

Renewables are popular and affordable enough that their growth is nigh unstoppable in the medium term (although anti-renewable policies can still do a lot of damage in the short term). Right now though, additional renewable investment faces many hurdles. Renewables 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.[292]

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.** 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 carbon pollution

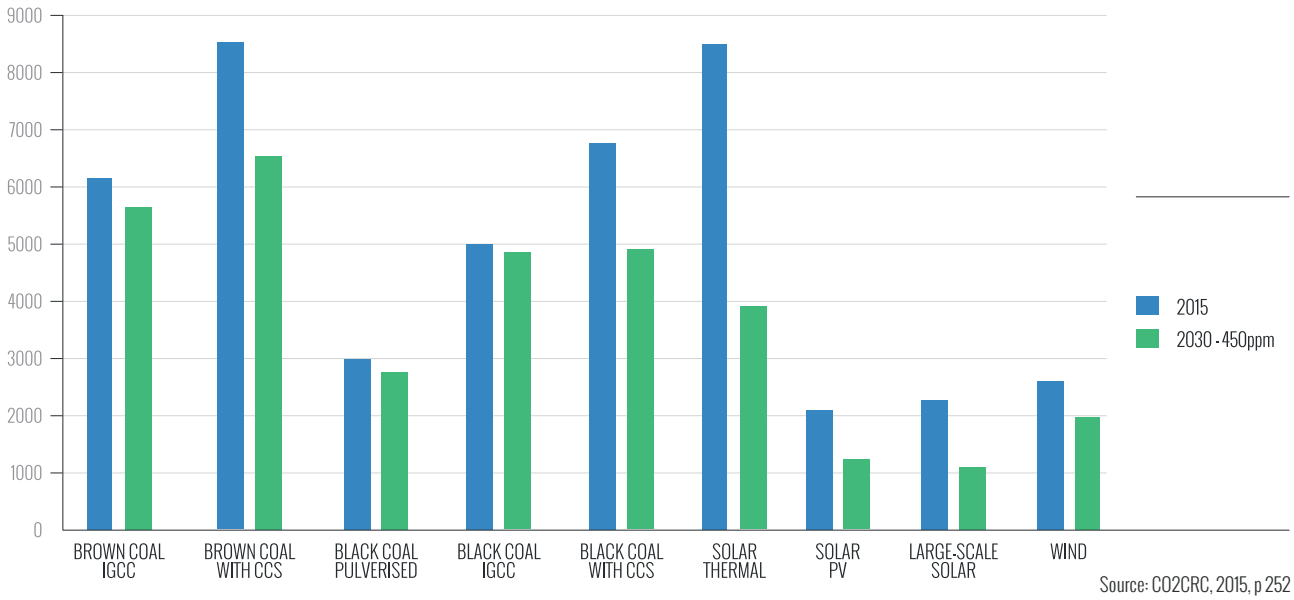
Coal-fired power closure is necessary to get Australia in line with the global effort to slow down and reverse dangerous climate change. To limit global emissions to a level consistent with a 2°C warmer future,[293] the world needs to shut down at least a quarter, or 290 gigawatts, of 'subcritical' coal-fired power by 2020 (the equivalent of around 300 very large plants).[294]

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.[295] 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 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.[296]
- 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 climate-safe economy. 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 last year's Paris climate conference, they have left it far too late to get on board. 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 (see Figure 15, which shows that coal, with or without CCS, is out of the picture on capital costs alone, without taking fuel costs into account).[298]

Figure 15: Generation capital costs 2015 and 2030[299]

Summary of capital costs, inflation adjusted (A$/kW)



Source: CO2CRC, 2015, p 252

2.1 Kick-start the coal power clean-up

Run Coal Clean-Up Auctions to ease the exit of the oldest and dirtiest coal-fired power stations, starting in the next term of government

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. Each option has different strengths and weaknesses but in the current context one idea stands out: **a way for the closure and rehabilitation of the most polluting plants to be paid for by other polluters, out of the windfall gains they receive when their competitors shut down. Let's call them Coal Clean-Up Auctions.**

How it would work

- The Australian Energy Market Operator (AEMO) identifies the amount of generating capacity in each state which can be closed down without risking security of supply. This is likely to include at least one old coal-fired power plant in Queensland, Victoria and New South Wales.[300] (Note that we are not recommending that auctions for this level of capacity be held all at once, but consecutively.)
- Coal-fired generators across the National Electricity Market (NEM) are invited to bid in a reverse auction for partial funding to decommission their power plant, rehabilitate any associated mines, and top up their existing obligations to employees with an additional retraining, retrenchment and redeployment package.
- The remaining generators are levied to pay for the winning bids, in proportion to their emissions intensity.
- A reverse auction is held each year until the level of capacity identified by AEMO has been decommissioned. If an adequate carbon price has not yet been adopted by this point, the policy could then be adapted to link additional outgoing coal capacity to the level of new renewable capacity coming online via the RET and clean energy auctions (see Part 2, Section 2).

Advantages of Coal Clean-Up Auctions

As noted in Part 2, blind reverse auctions, in which each bidder is aware of the criteria for success but unaware of what their competitors will bid, are useful tools for getting the best bang for your buck in a situation where the participants have more of the relevant information at their fingertips than governments. The mechanism for this policy is already in place through the Coalition's Emission Reduction Fund. Coal Clean-Up Auctions could in fact be viewed as an extension of the 'Direct Action' policy, designed to address one of its major omissions –

Table 6: Coal Clean-up Auctions: the benefits

Addresses capacity & network constraints?	Yes. AEMO decides how much coal can be retired in each state without risking supply.
Shuts the highest-emitting plants first?	Yes. Incentivises the closure of the most emissions-intensive generator in each state, by levying the remaining generators in line with their emissions intensity.
Distributes windfall gains fairly?	Yes. Windfall gains from each closure are captured via the levy and used to ensure a fully-funded rehabilitation, retraining and transition package.
Incentives for low-cost exit?	Yes. The reverse auction combined with the levy encourages low bids. This could be combined with the addition of emissions standards to the National Clean Air Act to further incentivise low-cost bids.
Who pays for rehabilitation and worker retraining/ transition packages?	The owners of the closing generator, supplemented by the other generator owners, in proportion to their emissions intensity. (In a full coal phase-out there will also be a role for governments to help fund a just transition package, outlined below.)

electricity generation.

The auctions can be designed in a way to incentivise the power plant owners to bid low, while also protecting community interests by specifying, for example, that successful bids must include the costs of any training needed for workers to safely dismantle existing plants, and that existing employees and local residents should be given the first shot at decommissioning and rehabilitation jobs. (For more options to ensure a just transition, see Section 2.2 below)

Levying the remaining generators in line with their emissions intensity achieves three things:

- It usefully and fairly distributes the windfall gains which the remaining generators receive (from higher prices and market share) when their dirtier, cheaper competitors exit the market;
- It adds to the incentive for the most polluting plants to bid low in an effort to win the auction and avoid having to pay the levy; and
- It creates a small incentive for the remaining generators to reduce their emissions in order to reduce the cost of the levy.

This option combines elements of a number of similar proposals, including a model outlined by Dr Frank Jotzo and Salim Mazouz,[301] a different mechanism proposed by Dr Richard Denniss and Rod Campbell from The Australia Institute,[302] 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.[303]

The costs are reasonable

No company deserves to be bailed out for its failure to plan for a climate-safe economy. As citizens, we are under no obligation to pay power companies for clean air or a stable climate. We are proposing Coal Clean-Up Auctions not because owners deserve our help but because we want to ensure that the safe, timely decommissioning and rehabilitation of coal-fired power stations, as well as transition packages for workers, are adequately supported by industry.

Some power companies will, of course, criticise anything that adds to their costs. But letting power generators off the hook for the costs of the coal clean-up will not make those costs disappear. If no-one pays, then it's communities that wear the costs, by enduring the health and environmental impacts of power plants that are operating long past their use by date. It could also mean that taxpayers end up footing the bill for rehabilitation costs that big power companies haven't set aside enough money to pay for. For example, the inquiry into the 2014 fire at Hazelwood found that it would cost around $100 million to rehabilitate the mine alone, whereas the bond posted by the owners is just $15 million.[304] In Victoria there are only bonds for mines, and none at all for the power stations themselves. 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.[305]

It is important to note that funding from the coal clean-up auctions should complement not replace a company's existing obligations to its workers and the community, and the criteria for successful bids should be designed to ensure such obligations are met. Site rehabilitation that meets community needs is a basic right, so no company should be let off the hook when it comes to this requirement.

Initial cost estimates of proposals along these lines indicate that this scheme should be quite affordable:

- The ANU's Frank Jotzo proposed a model under which the most polluting plants would bid for payment for foregone profits as well as for decommissioning and a worker and community assistance package. He found that the closure of just one plant under this model would deliver CO2 emissions reductions at a fraction of the cost of the existing Emissions Reduction Fund (ERF) – $3 to $7 per tonne vs $14 per tonne under the ERF, and that it might add perhaps 1 per cent to power bills for one year only.[306]
- Oxford University researchers estimated that a series of auctions resulting in the phase-out of all coal-fired power over 15 years would cost at most $8.4 billion total, or $560 million a year, but that the actual figure was likely to be much lower.[307]
- By way of comparison, the Australian Energy Regulator recently made a decision to add 1 per cent a year for five years to South Australians' bills, when it (partially) gave in to South Australian Power Networks proposal that they be allowed to spend more of their customers' money.[308]

A number of factors could keep costs lower than these estimates, especially in the early stages. For one thing, several coal-fired power plants have already announced their closure without any rehabilitation assistance. Many of those that remain and are financially marginal will be deterred from closing only by the rehabilitation costs outlined above. **A process that allows these owners**

to get out earlier, for less than the full value of the decommissioning costs for which they are already liable, is a bargain and should attract low bids in a well-managed competitive auction.

Because wholesale electricity costs make up only one fifth of an average customer's bill (see Part 1, Section 1.2), the impact on households of any such scheme is likely to be quite modest – certainly less than the potential savings delivered by other elements of the Homegrown Power Plan.[309] For example, consumers will pay less on their power bills if policies promote more energy-efficient homes, or if governments act to prevent overspending and unjustifiably high fees and charges by network companies (whose costs make up almost half of an average bill). And this will be added to savings on petrol costs from improved vehicle efficiency, leaving households better off overall.

Photo: SolarReserve

Box 20: Case Study - Repowering Port Augusta

The fight for a just transition in Port Augusta has reached a critical point. For five years the South Australian community have been campaigning for the town's emissions intensive coal fired power stations to be replaced with a concentrated solar thermal plant. It's a campaign that has become more urgent due to the surprise announcement that the Northern and Playford B power plants will be closing this year.

"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 currently working at Alinta's power station. The early closure will leave hundreds of workers unemployed and struggling to find new jobs as there is currently no transition plan in place. The job losses highlight the urgent need for policies that will ensure a fair and orderly transition from fossil fuels to renewable energy.

The lack of a transition plan for Port Augusta should serve as a reminder for other companies and the government to be prepared for the inevitable closure of more coal fired power stations. A just transition in Port Augusta would benefit everyone, not just the people about to lose their jobs. The entire community has suffered the impacts of coal burning on the outskirts of their town, which has historically had some of the highest rates of lung cancer in South Australia, and above average rates of respiratory diseases like asthma. Replacing coal with solar energy would mean jobs as well as a healthy environment for everyone and the Port Augusta community are keen to make this happen.

Gary Rowbottom is also chairperson for the Repower Port Augusta community group which has been leading the solar campaign charge. He read about the group in the local paper when Beyond Zero Emissions (BZE) released their report on the potential for solar plants to replace the coal stations.

"It really caught my imagination and interest. Quite a few of these power stations had been built already – they'd been proven to work, and the BZE report showed that it's quite affordable, though now other funding options are considered more attractive."

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 opposed to gas. As Gary says "we recognised a good idea when we saw it."

"To me it's relatively obvious, you know. I accept the world needs to transition away from fossil fuels, that's not a hard concept to grasp. Therefore we need to replace it with something else. This is a form of renewables that had something new to bring to the table in terms of storage. And Port Augusta is a pretty good place to put one of these things – so it's also a chance to do something good for the town."

It's estimated that a solar thermal plant would create at least 1,000 jobs during the construction phase and 50 permanent jobs going forward. It would be a big boost for a community reeling from the unexpected power plant closures.

The Nevada project by SolarReserve is a great example of how beneficial a solar thermal power plant in Port Augusta could be. Benefits of solar in Nevada include:

- No requirements for oil back up or natural gas, the plant supplies completely emissions-free power
- Storage provides a firm, reliable electricity supply on-demand, day and night.
- Significantly reduces the use of water for cooling by using an efficient, low-water hybrid cooling system
- 75,000 homes powered during peak use periods

Gary is hopeful that the solar vision for his community could have a domino effect across Australia, sparking off other similar renewable energy projects. "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."

2.2 Secure a just transition to a post-coal future

Put the foundations of a post-coal future in place now, starting by bringing stakeholders together to plan the transition

In addition to the coal closure auctions proposed above, there will also be a role for governments to step in directly to help communities transition.

Australia has a history of doing structural adjustment badly. We often wait until a company, or an entire sector, goes under before offering training or financial assistance to redundant 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.[310] 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 20) illustrates the inadequacy of an unplanned transition away from coal-fired power.

People in areas with high unemployment, including regional towns with coal-fired power plants, have been neglected 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 5 years, 15 years, 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.**

A nation-wide just transition

At a national level, one key ingredient for a fair and successful phase-out of all coal-fired power is the establishment of a national tripartite (government, industry and union) group tasked with coordinating the redeployment, retraining and early retirement of coal power workers. This group could sit within the Energy Transition Agency. The group should:

- Be tasked with coordinating the local, region-wide and industry-wide redeployment of workers;
- Ensure that retraining is offered to workers well before a plant closes;
- Coordinate early offers of voluntary redundancies to free up positions to be made available to workers from neighbouring plants as and when they close; and
- Mobilise funding to assist with worker redeployment, retraining and early retirement, along with the implementation of community-driven economic renewal plans.

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 education. A lack of long-term public investment in essential infrastructure is a major barrier to good community economic development: any attempt to stimulate local businesses in post-coal communities will be much harder in places where the internet is unreliable or the trains run only once a day. Likewise, the regional TAFE network is one of our best tools for delivering timely, tailored high-quality retraining packages, and governments should restore its funding and role at the heart of vocational education and training.

Communities and workers deciding their future

At a local level, each community will have its own challenges and strengths in responding to job losses from the closure of coal-fired power stations and their associated mines. Anglesea, where Alcoa's power station and mine shut down, had reasonably low unemployment and a small workforce of 80 in the final years of the station's operation. Environment Victoria estimated the cost of rehabilitating the site at between $16 and $30 million, which would create 30 to 60 jobs over 10 years.[311] The Latrobe Valley has bigger challenges: a larger coal-fired power workforce, higher unemployment and a high-needs population of public housing residents.

For this reason, 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.

When providing structural assistance to communities, the aim should be to diversify economic and employment opportunities in the area rather than paying inflated dowries to lure big businesses into a relationship with a community that they have no real commitment to supporting. The national tripartite transition group (or state or local governments) could help set up local advisory councils to bring all the stakeholders together. These local advisory councils – including local state and federal governments, local businesses, unions,

power station and mine owners, and community resident 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 existing regional development programs. There are already moves afoot to set up something along these lines in the Upper Hunter Valley to help the Hunter diversify its economy away from coal.[312]

Renewable economic renewal

The example of Repower Port Augusta 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. Researchers at the Melbourne Energy Institute have flagged the idea of converting old mine pits in the Latrobe Valley into reservoirs for pumped hydro storage,[313] making use of the prime grid connection as the coal-fired power plants shut down. In other locations, newer plants could perhaps be suitable for conversion into turbine-only 'synchronous condensers' to help stabilise the grid.[314]

To ensure that those affected by the phase-out of coal-fired power also stand to benefit from the scale-up of renewable power, other policies could also be designed so that coal-affected communities are among the first to benefit from energy efficiency programs and the renewables boom. 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.

Ensuring each worker gets the assistance they need

Just like communities, individual workers will also benefit from tailored assistance rather than a cookie-cutter approach. In each coal-fired power station, there will be a cohort who are nearing retirement, and for whom a decent redundancy package may result in an earlier and better-funded retirement than they might have enjoyed otherwise. There will be some more recent hires who are happy to move where the jobs are, and who should be assisted to do so. There is potential to provide job placements in other power stations through an industry-wide collaboration, along the lines implemented in Germany. There will also be a cohort, such as those who have children in local schools – who won't be in a good position to move, and who will need to be offered retraining opportunities and job placement assistance well before the doors are shut.

Retraining options should also be individually tailored to ensure that they provide relevant, useful and transferable skills. A number of existing government bodies already support retraining and upskilling programs in communities undergoing major structural reform. To ensure the quality and effectiveness of such programs, TAFEs should be funded to deliver them.

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 infra-structure and machinery repair and maintenance;
- Training in mine site rehabilitation, as one possible way to ensure that the existing workforce is able to benefit from the jobs that come with de-commissioning 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.);
- For those with relevant trade skills setting up a small business may be an option, in which case training in business skills and access to loans may be more relevant.

The era of coal-generated power is ending, and the transition to a renewable future is a shared responsibility between companies and government. To provide for a just transition and to ensure the long-term viability of both companies and communities, CEOs and boards must step up to plate, with a combination of support for the current workforce and training for the future workforce.

Any company that currently owns coal-fired power plants and wants to prove its commitment to a renewable future should not only commit to a timetable for early closure and full rehabilitation, but should begin work now on plans to retrain and redeploy its existing workforce from coal-fired power to renewable generation.

2.3 Pass a National Air Pollution Control Act with teeth

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 the fact remains that, without stronger pollution regulations, all fossil-fuel companies are free-riding on the community by asking the rest of us to pay for the consequences of their emissions. One of the most straightforward ways to deal with this, and to address other major pollution problems at the same time, would be to implement Environmental Justice Australia's proposal for stronger national air pollution laws.[315]

More than 3,000 people die from urban air pollution in Australia every year according to one estimate,[316] all the more shocking as these deaths are preventable. A stronger and more coordinated approach to pollution reduction is clearly overdue. 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.[317] Another 2011 review concluded that Australia's existing pollution regulations "are not meeting the requirement for adequate protection of human health" [318] 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." [319]

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, 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.[320]

Fast facts: Coal is part of Australia's air pollution problem

Coal-fired power plants are among the worst sources of air pollution in Australia:

- Electricity generation is the single largest source of PM2.5 particles (particulate matter), known to be particularly hazardous to human health;[321]
- The Centre for Air Quality and Health Research and Evaluation includes people who live near industrial pollution sources, such as coal mines and coal-fired power stations, as among those most at risk from the health impacts of air pollution;[322]

Box 21: The lasting harm of the Hazelwood mine fire

Kiery-Anne lost her partner Craig to the Hazelwood mine fire. This is her story.

"When the Hazelwood coal mine caught fire, my home town of Morwell was blanketed in toxic smoke for 45 days.

The air was filthy and disgusting, the noxious smoke made us gag and vomit, the headaches and nose haemorrhages were excruciating. The putrid fumes got in our homes. The smell permeated our clothes, got through our bedding. And they told us it was safe.

After three days, there wasn't a bird left. Smart birds, I wish we followed them. If we did, my husband wouldn't have died. It was clear the birds couldn't handle these poisonous particles, but we never considered it could kill one of us within months.

My partner of 30 years, the love of my life, and my very best friend Craig (Harry) McCormack suffered an aneurism on what I thought was a normal Sunday morning, at 10.38am. I performed CPR until the ambulance and paramedics arrived. He fought for his life for six days, but the poison he breathed from that fire killed him.

He died in my arms.

Since the fire our community has been cursed with birth defects and miscarriages. People are getting lung disease and respiratory illness. People are getting cancers. The fire has finally stopped, but we are still burying our friends and family.

Air pollution kills."

- Some of Australia's major pollution hotspots include:
  - Morwell, Victoria, 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.[323]
  - Port Augusta, South Australia, where Alinta's coal-fired power stations are closing down, has twice the average lung cancer rates in the state and the highest childhood asthma rates in the state.[324]
  - The Hunter Valley, where burning coal has been estimated to result in $600 million worth of health costs a year.[325]

In other words, Australia's air quality laws are clearly not strong enough to safeguard our health.

The current process for regulating air pollution is held back by poor monitoring and enforcement, and the lack of targets for exposure. Previously, Environment Minister Greg Hunt flagged his support for strong action on air pollution, saying, "This is a critical national issue and I would like it to be a signature objective of my watch." 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. It probably didn't help that state governments are the ultimate owners of several of Australia's coal-fired power stations. The Commonwealth Government is also culpable, having helped to kill off the COAG Council responsible for driving the reform process in 2014.[326]

Unlike the current agreement, a National Air Pollution Control Act that truly protects our health and environment must:

- Be indexed to world's best practice and World Health Organisation guidelines on maximum permitted concentrations of each of the major pollutants;
- Include an exposure reduction framework to ensure that pollution levels continue to improve over time below the standards;
- Include a phased introduction of emissions standards linked to the level achieved by the world's best available technologies in power generation and vehicle transport (the latter could also be achieved through separate vehicle emissions standards – see Section 5.1);
- Include a strong compliance and enforcement mechanism with sufficient penalties;
- Allocate sufficient funding for monitoring in urban and rural areas, and guarantee timely access to monitoring data; and
- Protect citizens' rights to enforce the laws by allowing communities to take polluters to court.

A National Air Pollution Control Act with teeth could work in tandem with Coal-Clean Up Auctions to deliver a predictable, affordable and fair phase-out of coal-fired power.

3. Stop propping up polluters with public money

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.[328]

Here in Australia, GetUp! estimated that the top twelve 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.[329] 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 economy, environment, health and security.[330] 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 lions' 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'.[331] 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.[332]

> ***"Fossil fuel subsidies are public enemy number one for green energy."***
>
> ***Fatih Birol, International Energy Agency Chief Economist in 2013*** [327]

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.[333]

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 New South Wales Government 'assistance package' paid to coal companies in 2009, as well as free or discounted infrastructure, like the Queensland Government's $1 billion discount on rail services to the coal industry from 2012-13 to 2013-14.[334] 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.[335]

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)." [336]

3.1 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.**[337] Australia's fuel taxes are already among the lowest in the 'developed' world.[338] There is no need to make them even lower for coal mining companies and other large diesel-guzzling businesses;[339]
- **End accelerated depreciation for fossil fuel companies** and extend it to renewable energy projects with at least 10 per cent community ownership (see Part 2, Section 2.3). 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;**[340]
- **Eliminate exploration and prospecting deductions for fossil fuel companies.** Around $650 million dollars[341] 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 per cent of the reserves we already know about have to stay in the ground if we are to head off dangerous climate change.[342] Yet Australia still provides substantial tax assistance for oil, gas and coal exploration.[343] 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. As if this weren't enough, in 2014 the Abbott Govern-ment introduced a new Exploration Development Incentive which partly reopened the loophole closed by the Gillard Government in the previous year![344] The Exploration Development Incentive is capped at $100 million and the final **$40 million is due to be claimed in the 2016-17 budget;**
- **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 per cent. 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 per cent on top, just because. Whacking an arbitrary 15 per cent 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,**[345] 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 per cent, and results in around the same cost to the budget;
- **Remove or redirect the aircraft fuel excise discount.** The airline industry gets to take home an extra **$1.24 billion this year** because of a federal government discount on its rate of fuel excise.[346] In line with the move towards doubling Australia's energy productivity by 2030 (see Section 5), this discount should be eliminated, saving around $6 billion over the next four years[347] 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 Beyond Zero Emissions 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;[348] 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);

- **Reform the Fringe Benefit Tax so that it covers personal use of company cars.** The current treatment of the Fringe Benefit Tax on company cars effectively subsidises the personal driving of (mostly middle and high-income) employees. It's pretty clear that if people claim long distance calls to their mum or a family holiday to Bali as a work-related deduction, they're committing tax fraud. But for some reason this kind of behaviour is perfectly legal for 'salary packaged' cars provided by employers, even if they're never used for work. Up to **$810 million a year** could be saved by moving from the 'statutory formula' to the alternative model proposed by the former Labor Government;[349]
- **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 Queensland, or on infrastructure that is primarily intended to assist such projects; and
- **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.[350] The World Bank set a positive precedent in 2013 by moving away from financing coal projects.[351] Australia should follow suit.

4. Grid Access: Connecting communities to power

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 dozens of wind or solar farms. They quite literally didn't know how to do it and have had to learn rapidly in the last 10 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 also 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 in 2013-14, the Clean Energy Council found that:

"65 per cent 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 per cent stated that they did not believe the connection process meets their requirements in a fair and certain manner and as quickly as reasonably possible." [352]

This situation is further compounded by both culture and skills gaps. As a result, pioneering renewables 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 100MW wind farm is different to a 4MW wind or solar farm, and is different again to a 150kW commercial solar array or a 3kW 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[353] 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 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. The most recent 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.[354] This is a much quicker turnaround than in Australia.

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

- For small scale generators, the AER regulates network connection fees; and
- For medium scale generators (<5MW) 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 La Trobe 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 renewables 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.[355] 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; and
- 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.[356] 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. However, this one example on its own is 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.

4.1 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."[357] 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 Part 1, 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, it will mean supporting network companies to identify locations where are best disconnected from the grid and serviced by local renewables and storage instead. This planning role requires integrated technical and economic expertise.

If the independent grid planning authority recommends major transmission infrastructure projects to improve access to renewable energy zones or hot-spots, these projects should be referred to Infrastructure Australia and considered for funding via the Building Australia Fund.[358]

4.2 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. Many actions are needed to make this happen. However, in the short term the following five actions are recommended as significant steps in the right direction.[359]

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 100kW;
2. Direct the AER to undertake **compliance audits of network companies for 10 per cent 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 5MW. 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,** 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 the standards. There is no reason why solar installers can't do the assessment and connection process for small solar arrays (<100kW). 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.

5. The cleanest energy of all

So far we've talked about how to clean up the sources of energy we're using to power our homes, offices and factories by switching to renewable sources. **But what if we needed less energy in the first place?** A well-designed or cleverly retrofitted home can cut its energy needs down to the point where being self-sufficient in electricity is both easy and affordable.[361] That's the option that energy efficiency opens up to all of us, whether as individuals, communities or as an entire country.

The pathway to an energy-efficient Australia is known and most of the main steps have been advocated for a long time. The bad news is that Australia is appallingly inefficient in the way we use energy and getting to a 100% renewable future will be much harder than it needs to be if we go on wasting energy like we do today. A study by the Australian Alliance to Save Energy found that Australia's energy productivity (the ratio of primary energy use to GDP) is low compared to other countries, and we're also not improving as fast.[362] Australia ranked 85th out of 133 countries for Energy Productivity in 2012, just behind Senegal and just ahead of the United States and Saudi Arabia. China increased its energy productivity at twice the rate of Australia between 1992 and 2012.[363]

The good news is that there are countless, cost-effective opportunities to save money and save energy at the same time. And because the opportunities for cutting energy waste are ubiquitous throughout the economy, **a strong push to deliver on that potential could also deliver thousands of jobs, doing everything from installing more efficient lighting and equipment to retrofitting homes to redesigning manufacturing processes to cut down on waste.** Environment Victoria estimates that building upgrades in Victoria alone could generate 13,000 jobs over 10 years.[364] According to the American Alliance to Save Energy, America's commitment to double energy productivity by 2030 will generate 1.3 million jobs and save $327 billion across industry, transport and buildings.

Energy efficiency policies don't make for scintillating soundbites, which might explain why they have been further down the priority list for many politicians. But they are among the most important tools for speeding the transition to a 100% renewable system. As research from the UTS Institute for Sustainable Futures and others has shown, the smartest way to make the energy we use for transport, heating and industry clean and efficient is to begin by making it electric. This will involve a big expansion in electricity demand, and a big improvement in energy efficiency will make that expansion a lot more manageable.[365]

> ***"The cleanest megawatt hour [is] the one we never need, and the most secure barrel of oil the one we never burn. It is also often the cheapest, and the easiest to achieve..."***
>
> ***Maria van der Hoeven, Executive Director, International Energy Agency***[360]

Energy efficiency improves living standards while cutting consumption

Most of the measures that cut energy waste also make life nicer, such as more comfortable and healthy homes, more natural light in offices, cleaner air in cities, more accessible public transport and less time spent in traffic.

"An efficient clothes washing machine or dishwasher... uses less power and saves water, too... a well-insulated house will feel warmer in the winter, cooler in the summer and be healthier to live in. An efficient refrigerator is quieter, has no frost inside or condensation outside, and will probably last longer. Efficient lighting offers more light where you need it. Efficiency is thus really better described as 'more with less'."[366]

For the 77 per cent of Australians who live in cities, urban planning is a crucial part of the efficiency picture. Sustainable urban planning and infrastructure could transform our cities into more pleasant and affordable places to live.[367] While specific urban planning recommendations are beyond the scope of this report, it's important to note that investing in better urban planning could avoid the predicted doubling in the cost of congestion to $20 billion per year by 2020[368] and narrow the growing inequality of access to public services and public space between the inner and outer suburbs. As well as reducing greenhouse gas emissions and improving health, policies to encourage a shift to more sustainable transport options (such as electric vehicles, improved public transport, cycling and walking) could be designed to deliver better and fairer access to services and more efficient use of land and infrastructure.[369]

With the release of the Tesla 3,[370] the enthusiasm for

electric vehicles has never been greater. Electrifying our transport system is a crucial step in shifting to 100% renewable energy (not just electricity) in Australia. Local energy management that goes hand-in-hand with local energy trading will make it vastly easier to manage millions of electric cars on our electricity network. Stimulating the uptake of electric vehicles, both through local energy trading and other policies (which are outside the scope of the Homegrown Power Plan) will have the added benefit of getting some more use out of our gold-plated network infrastructure and lowering the overall cost of energy for all of us.

The health implications are also significant. Some of the main causes of energy waste have serious side-effects. For example, **there are more deaths associated with cold weather in Australia than in Sweden, a fact which can be attributed to our national habit of building homes with the thermal performance of a leaky tent.**[371]

Energy efficiency is key to an affordable transition

There's no shortage of evidence that using energy more productively is good for the economy, especially now that network gold-plating has put an end to Australia's low power prices. The Australian Alliance to Save Energy points out that doubling our energy productivity would save energy consumers $30 billion a year by 2030, while increasing growth and reducing carbon emissions by 25 per cent compared to business as usual.[372] Researchers at ClimateWorks have also crunched the numbers on what energy efficiency could mean for the costs of getting to 100% renewable energy by 2050. What they found is that if we can halve average household electricity use (and all the evidence suggests that, excluding electric vehicles, this is an achievable goal) then even if retail prices rose by 40 per cent, our bills in 2050 would **still** be 30 per cent lower than they are today.[373]

Australian consumers have saved approximately $10 billion on their energy bills so far this century thanks to a simple policy measure: the Greenhouse and Energy Minimum Standards program.[374] Yet Australia still has a long way to go to be in line with international best practice and pre-vent the dumping of inefficient equipment in Australia.

Australia is among the worst in the OECD for passenger transport fuel consumption, according to the Global Fuel Efficiency Initiative.[375] Studies by ClimateWorks Australia and the Climate Change Authority show that tougher vehicle efficiency standards could deliver savings of $830 a year per car by 2025, or $7.9 billion in fuel savings across our national fleet.[376]

The International Energy Agency has shown that the co-benefits of energy efficiency, such as health improvements and productivity gains from working in better buildings, can deliver up to 2.5 times the value of the energy savings themselves.[377] A review of one Australian energy efficiency program came to a similar conclusion: that the productivity benefits were likely to be around two times the value of the energy savings, that is $167 million compared to $72 million.[378]

5.1 Get serious about cutting energy waste

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 per cent by 2030.[379] 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.[380] 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 still 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 per cent compared to the next most popular option ('time-of-use' pricing) with net support of just 24 per cent.[381]

There's no shortage of evidence that Australia can go further than is proposed in the National Energy Productivity Plan. ClimateWorks, for example, has demonstrated the potential for Australia to double its energy productivity by 2030.[382] 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.**

To begin with, federal and state governments should lead the way on the changes outlined in Table 7.

Table 7: 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 the 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.[383]
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 and revive one of Australia's best-performing and lowest-cost carbon reduction policies.[384]
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. Require mandatory disclosure of the energy efficiency of homes at the point of sale.	To prevent landlords from offloading sub-standard properties that waste electricity and drive up their tenants' bills. 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.[385]
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.	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.[386]
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 6 years, according to the NSW Farmers Federation.[387]
Economy-wide	
Support and strengthen existing state based energy efficiency funds and schemes and encourage expansion to other states, or potentially harmonisation into a nation-wide program, and ensure that 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, Victoria, ACT and South Australia also have 'retailer energy efficiency obligations'. Harmonising these schemes would create a consistent, clear, economy and nation-wide incentive to cut energy waste.

ENDNOTES

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Part 3: Remove the Roadblocks

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