

GIGA-WHAT? AB R TARGE

The Climate Council is an independent, crowd-funded organisation providing quality information on climate change to the Australian public.

CLIMATECOUNCIL.ORG.AU

Authorship: Petra Stock

Published by the Climate Council of Australia Limited

ISBN: 978-0-9942453-4-2 (web)

© Climate Council of Australia Ltd 2015

This work is copyright the Climate Council of Australia Ltd. All material contained in this work is copyright the Climate Council of Australia Ltd except where a third party source is indicated.

Climate Council of Australia Ltd copyright material is licensed under the Creative Commons Attribution 3.0 Australia License. To view a copy of this license visit http://creativecommons.org.au

You are free to copy, communicate and adapt the Climate Council of Australia Ltd copyright material so long as you attribute the Climate Council of Australia Ltd and the authors in the following manner:

Giga-What? A guide to the Renewable Energy Target by Petra Stock (Climate Council of Australia).



© Climate Council of Australia Limited 2015.

Permission to use third party copyright content in this publication can be sought from the relevant third party copyright owner/s.

This report is printed on 100% recycled paper.



mall

Petra Stock

Key Findings

1. Renewable energy is a crucial way to reduce carbon emissions from electricity supply and combat climate change.

- > Burning fossil fuels for electricity production is the largest source of greenhouse gas emissions driving climate change.
- Australia's renewable energy resources are capable of producing 500 times the amount of electricity we currently use.
- A Productivity Commission review of more than 1,000 emissions reduction policies found that policies encouraging additional large-scale renewable electricity power plants were the secondmost cost-effective set of policies after emissions trading schemes.
- 2. While renewable energy is booming globally, policy uncertainty around the Renewable Energy Target means investment has fallen in Australia.
 - Investment in large-scale renewable energy projects fell 88 percent in Australia in 2014, while global investment in renewable energy grew.

3. The Renewable Energy Target has reduced greenhouse gas emissions in Australia.

- To date, the Renewable Energy Target has reduced greenhouse gas emissions by 22.5 million tonnes carbon dioxide- equivalent to 10 per cent of Australia's annual electricity emissions.
- In future, if the current policy continues, the RET will reduce emissions by 58 million tonnes carbon dioxide (2015–2020) – equivalent to annual emissions from all of Australia's passenger cars and light commercial vehicles.

1. Introduction

Over the past year, there has been plenty of wrangling over the future of Australia's renewable energy target (RET). The RET debate tends to get caught up in technical terms and specialised arguments – like how many gigawatthours (GWh) the target should be – making it difficult for anyone not in the renewable energy industry to follow.

Renewable energy is an important solution to climate change given the energy sector is responsible for both the largest proportion and biggest growth of greenhouse gas emissions created by people (IPCC 2014). The Climate Council is consistently asked questions from the public and the media about renewable energy and the RET. This report aims to provide a simple guide to how this policy works, explaining key terms and concepts, and answering common misconceptions.

Given the majority – over 70% - of Australians support retaining or increasing the RET (Climate Institute 2014), it's important for all of us to understand what changes, if any, are proposed following the recent Warburton (Commonwealth of Australia 2014) and Climate Change Authority (2014) reviews. We hope this report helps you to unscramble the technical jargon and get to the bottom of any announcements, reports or proposals on the RET.

2. Back to basics: What is a renewable energy target?

A renewable energy target is a policy to encourage more renewable energy, that is energy produced from naturally replenished sources such as sunlight, wind, rain, tides and heat from the Earth (ARENA 2014).

There are many reasons countries, like Australia, adopt renewable energy targets: action on climate change; an abundant and free fuel source with limited reliance on scarce resources like water; health and environmental benefits; energy access and security; and to provide an economic boost to regional economies (Box 1).

Australia's renewable energy resources are capable of providing 500 times the amount of electricity we currently use.

IN DETAIL 1

Box 1: Reasons for having a renewable energy target

ACTION ON CLIMATE CHANGE

Renewable energy targets aim to reduce emissions in the electricity sector, which is "pivotal" for limiting global warming to no more than 2°C (Climate Change Authority 2014). This is because globally and in Australia, electricity produced using fossil fuels is the largest source of greenhouse gas emissions (Department of the Environment 2014; IPCC 2014). In Australia, around 90% of electricity is generated by fossil fuels, with 75% coming from coal (Australian Energy Market Operator 2013a). Australia's coal fired power stations are highly polluting, ageing units using less efficient technology (Climate Council 2014a).

AN ABUNDANT AND FREE FUEL SOURCE

Renewable energy resources are readily available and free once capital is invested to harvest them. In Australia, our renewable energy resources are among the best in the world; potentially capable of providing 500 times the amount of electricity we currently use (Geoscience Australia and ABARE 2010; AEMO 2013b). On the other hand, fossil fuels are never free, and most, like oil, gas and black coal, are now priced through international trading mechanisms.

LIMITED RELIANCE ON SCARCE RESOURCES, LIKE WATER

Renewable energy technologies (other than hydroelectricity) do not require large quantities of water for cooling unlike coal and nuclear (US Environmental Protection Agency 2014).

HEALTH AND ENVIRONMENTAL BENEFITS

In operation, renewable electricity emits little or no toxic waste. In contrast, each part of coal's lifecycle emits toxic and carcinogenic substances with severe health impacts for miners, workers and local communities (Climate Council 2014b). In China, reducing air pollution is a major driver behind its renewable energy targets (Climate Council 2014c).

ENERGY ACCESS AND SECURITY

Renewable energy can provide an affordable and reliable source of energy within country borders, thereby limiting reliance on imported fuels such as oil and gas (IEA 2007).

AN ECONOMIC BOOST TO REGIONAL ECONOMIES

Renewable energy can attract investment and create jobs in regional areas. Farmers and landowners in regional areas can benefit from annual lease payments "drought-proofing" farms by providing a reliable, alternative source of income (Climate Council 2014d; REN21 2014).

3. Renewable energy targets around the world

Australia was one of the first countries in the world to introduce a national renewable energy target (Clean Energy Regulator 2013). Now, renewable energy targets are common worldwide. At the beginning of 2014, 144 countries (as well as thousands of states, cities and towns) had renewable energy targets in place (REN21 2014; Figure 1).

Figure 1: The number of countries with renewable energy targets is growing



Area	Target
Denmark	50% renewable electricity by 2020
	100% by 2050
Indonesia	26% renewable electricity by 2025
New Zealand	90% renewable electricity by 2025
California	50% renewable electricity by 2030
Australia	41,000 GWh large-scale renewable electricity annually by 2020 plus uncapped support for eligible small-scale solar and wind
South Australia	50% renewable electricity by 2025
Targets for all energy consume	d (includes electricity, transport, heating)
European Union (28 countries)	20% renewables of all energy consumed by 2020
Targets for heating and cooling	1
United Kingdom	12% renewables in total heating and cooling supply by 2020
Targets for transport	
Germany	20% renewables of transport energy consumed by 2020
Targets for installing specific re	enewable energy technologies (capacity targets)
China	Overall target of 20% zero emissions energy for all energy by 2030
	Technology specific targets:
	420 GW hydropower by 2020
	200 GW wind power by 2020
	50 GW solar photovoltaic power by 2020
	200 GW concentrating solar power by 2020
	30 GW biomass power by 2020
India	Overall target of 15% renewable electricity (not including hydroelectricity) by 2020
	Capacity targets:
	100 GW solar power by 2022
	60 GW wind power by 2022

Table 1: Renewable energy target examples around the world

Note: To gain a sense of the scale of capacity targets – the capacity of Australia's total electricity supply is 56 GW, and installed renewable electricity capacity is 15.7 GW

Sources: REN21 2014; RenewEconomy 2014a and b; Governor of the State of California 2015; Institute for Energy Economics and Financial Analysis 2015 China aims to increase wind power by 200 GW in the next 5 years, that's more than three times Australia's entire electricity supply.

IN DETAIL 2

Box 2: What's a watt? Key technical terms explained.

Gigawatts (GW) and megawatts (MW) are measures of capacity. Capacity is the maximum amount of electricity that a power station, or multiple power stations are capable of producing (Climate Council 2014a).

For example, a typical wind turbine has a capacity of between 1.5 - 3 MW, and the total capacity of Australia's electricity supply was 56 GW (or 56,000 MW) in 2012–13 (BREE 2014b).

Gigawatthour (GWh) is a measure of electricity generated by a power station/s over a period of time. For example, the total amount of electricity generated in Australia in 2012–13 was 249,000 GWh (BREE 2014b).

Renewable energy certificates are a kind of tradable currency representing renewable electricity generation (one certificate = one MWh). Renewable energy certificates are created by large-scale renewable energy power plants or small-scale (household) renewable energy systems. Certificates can be bought and sold, before they are eventually handed in to the Clean Energy Regulator, a Commonwealth Government department (Clean Energy Regulator 2014a).

4. About Australia's Renewable Energy Target

The RET aims to:

- a) encourage additional renewable electricity
- b) reduce emissions of greenhouse gases in the electricity sector
- c) ensure that renewable energy sources are ecologically sustainable.

The RET target is made up of:

- A Large-scale Renewable Energy Target (41,000 GWh annually by 2020)

 a capped target to encourage new major renewable energy power plants, like wind farms, large solar plants and hydroelectric power stations (Figure 2a).
- A Small-scale Renewable Energy Scheme – an uncapped scheme to encourage small-scale renewables, such as household solar photovoltaic panels and solar hot water heating (Figure 2b).

In 2009, the RET was expanded with the aim to generate at least 20 percent of Australia's electricity from renewable sources by 2020 (Climate Change Authority 2012).

The Large-Scale Renewable Energy Target steadily increases up to a 2020 target of 41,000 GWh, requiring electricity retailers to source more and more renewable electricity every year (Clean Energy Regulator 2014a and 2014b).

To meet the increasing targets, new renewable power stations need to be built. And, to finance these power stations, renewable power generators usually need long-term contracts with electricity retailers (sometimes called off-take agreements) to sell their electricity and renewable energy certificates (ESAA 2014).



Figure 2: (from top to bottom) (a) Large-scale renewable energy and (b) Small-scale renewable energy



Sources: Department of the Prime Minister and Cabinet 1997; Climate Change Authority 2012; BREE 2014b and 2014c*; Parliament of Australia 2014; Pitt6Sherry 2014 and 2015**

Table 2: RET Report Card

How is the RET performing against its objectives?

Objective	Comments
Encourage additional renewable electricity	Large-scale renewables
	 More than 400 additional large-scale renewable power stations built (Climate Change Authority 2014).
	 Increased renewable electricity from 8% (2001) to 13.1% (2013) (BREE 2014c).
	Small-scale renewables
	 Nearly 1.4 million rooftop solar photovoltaic systems installed (Clean Energy Regulator 2015)
Reduce greenhouse gas emissions in the electricity sector	Australia's RET was originally designed as a policy response to climate change (Department of Prime Minister and Cabinet 1997).
	To date the RET has reduced greenhouse gas emissions by:
	 > 22.5 million tonnes carbon dioxide (2001–2014) – equivalent to 10% of Australia's annual electricity emissions
	In future the RET will reduce emissions by:
	 58 million tonnes carbon dioxide (2015–2020) – equivalent to annual emissions from all of Australia's passenger cars and light commercial vehicles
	 299 million tonnes carbon dioxide (2015–2030) – equivalent to half of Australia's current total annual emissions (Climate Change Authority 2014).
Ensure renewable energy sources are ecologically sustainable	All renewable power stations accredited under the Act comply with all federal, state and local planning and environmental laws (Commonwealth of Australia 2014).

MYTHBUSTING GUIDE ON THE RENEWABLE ENERGY TARGET (RET)

MYTH: THE RET IS DRIVING UP ELECTRICITY PRICES.

FACT: HOUSEHOLD ELECTRICITY PRICES WOULD INCREASE IF THE RET WAS REMOVED.

Economic modeling by ACIL Allen Consulting found the RET had only a small impact on electricity prices and electricity prices for an average Australian household would actually increase if the RET was removed.

MYTH: THE RET WAS ONLY EVER MEANT TO BE 20 PERCENT OF ELECTRICITY DEMAND.

FACT: THE RET HAS ALWAYS BEEN AIMING FOR A GWH TARGET, AND WITH GOOD REASON.

When the RET was expanded in 2009, the Act was designed to deliver "at least" 20 percent renewable electricity by 2020. However, the Act has always specified a 45,000 GWh target for renewable electricity by 2020 rather than a percentage figure. A fixed GWh target creates greater certainty for investors than a

floating percentage target by avoiding continual revisions of the Act as electricity demand changes.

While forecasts of future demand and supply vary, projections indicate the RET will deliver at least 20 percent renewable electricity by 2020, if implemented effectively. However, continuing policy uncertainty could make it harder for Australia to meet this target.

5 MYTH: THERE ARE BETTER POLICY MEASURES FOR MEETING AUSTRALIA'S EMISSIONS TARGET.

FACT: RENEWABLE ENERGY TARGETS ARE AMONG THE MOST COST EFFECTIVE EMISSIONS REDUCTION POLICIES.

Lowering Australia's emissions from electricity generation is critical in responding to climate change. Australia's electricity sector accounts for 33 percent of our total greenhouse gas emissions – the single biggest source of emissions.

The RET is making a reasonably cost-effective contribution to emissions reduction in a strategically important sector – both out to 2020 and beyond, when steeper reductions will be required. A Productivity Commission review of more than 1,000 emissions reduction policies found that policies encouraging additional large-scale renewable electricity power plants were the second-most cost-effective set of policies after emissions trading schemes.

Sources: Productivity Commission 2011; Climate Change Authority 2012; ACIL Allen Consulting 2014; BREE 2014a; Climate Change Authority 2014; Department of the Environment 2014; Parliament of Australia 2014: The Conversation 2014

MYTH: ALL RENEWABLE ENERGY SHOULD BE INCLUDED IN THE RET.

FACT: THE RET HAS ALWAYS BEEN ABOUT ENCOURAGING NEW RENEWABLE ENERGY.

Since it was introduced in 2001, the purpose of the renewable energy target was and continues to be encouraging additional renewable electricity generation above the 1997 baseline. Some older power stations, like hydroelectric plants can still benefit from the RET if they produce extra renewable energy above the baseline level. If hydroelectricity from before 1997 was included in the RET this would mean less new renewable energy would be added.

4

MYTH: THERE IS AN OVERSUPPLY OF ELECTRICITY, SO THE RET SHOULD BE ADJUSTED DOWN ACCORDINGLY.

FACT: THE OBJECTIVE OF THE RET IS TO ENCOURAGE NEW RENEWABLE ELECTRICITY SUPPLY WHICH IS ESSENTIAL IF AUSTRALIA IS TO TRANSITION TO A LOW-EMISSIONS ECONOMY.

It is not the role of the RET to balance supply and demand of electricity; rather that is the specific purpose of the Australian Energy Market Operator. Ideally, when there is oversupply, an efficient energy market would see the least profitable electricity generators (inefficient and ageing coal plants) closing in order to rebalance supply and demand.

Even very old coal fired power plants might not be closing because:

- as the power plants are already built most will continue operating as long they make some profit;
- generators that retire later are better off than plants closing earlier as reduced electricity supply increases wholesale electricity prices;
- site remediation costs have not been adequately planned for;
- there is uncertainty about the future policy environment, in particular the possibility that generators could be paid to retire.

5. How policy uncertainty affects investment

To invest in renewable energy projects, financiers, like banks, need certainty in government policy and legislation to be able to forecast future electricity prices and revenue (ESAA 2014).

When governments change existing policies and laws, or create concern about possible future changes, this heightens the sense of risk for investors. This risk is called "sovereign risk" and is one of the most damaging sorts of risks to investors as it undermines the legal basis on which past investments have been made, and increases perceptions of future investment risk.

International investors tend to look for countries with low sovereign risk in which to invest. Uncertainty about government policy raises the cost of capital, and damages investment, jobs and growth (Global Commission on the Economy and Climate 2014).

The Climate Change Authority (2012, 2014) argues frequent reviews of the RET are contributing to uncertainty and discouraging investment. There have been six reviews of the RET since 2001, two of which were in 2014 (Clean Energy Council 2014; ESAA 2014; Infographic – 'Short History of the RET'). In Australia, policy uncertainty caused by two reviews of the RET together with the repeal of the Carbon Price has effectively frozen new investment in renewable energy since late 2013 (ESAA 2014; Sydney Morning Herald 2014).

"Banks stated that in the period from 2002 to 2013, there was growing interest in renewables and strong lending liquidity... In 2014, however there have been very few (if any) renewable energy transactions" (ESAA 2014)

Bloomberg New Energy Finance reported an 88% drop in large-scale renewable energy investment in Australia compared with 2013 – the lowest investment in large-scale renewables since 2002 (Sydney Morning Herald 2015).

All renewable energy investment in Australia fell 35 percent in 2014 to \$3.7 billion even though globally, investment in renewables grew by 16 percent. Bloomberg New Energy Finance (2015) reported renewable energy investment increased to \$310 billion worldwide in 2014, led by China, investing \$89.5 billion, and Japan \$41.3 billion. Policy uncertainty also led to a "hiatus" in mergers and acquisitions in renewable energy assets in Australia last year, despite the global value of such deals in renewables rising 13 percent (PwC 2015).

"A reduction in renewable targets is likely to adversely affect the industry, given investments already made in achieving the existing targets. It is difficult to foresee any pick-up in Australian renewables deal flow until there is a more positive and certain policy outlook for renewable power projects." (PwC 2015)

Even if a political deal is reached on the future of the RET, the key challenge will be to shift the sense of uncertainty and return investor confidence to ensure the targets set out in the Act can be met.

Investment in large-scale renewable energy projects fell 88 percent in Australia in 2014, as global investment in renewable energy grew.

Conclusion

Renewable energy targets are a "pivotal" policy tool for reducing carbon emissions from electricity supply. After emissions trading schemes, policies like the RET which encourage large-scale renewable energy are the next most cost-effective way to reduce carbon emissions. Globally, the number of countries with renewable energy targets is increasing over time, as are the targets themselves. Australia is blessed with abundant renewable energy resources, more than 500 times our current electricity needs. Meanwhile our power plants are ageing and will need to be closed or replaced in coming decades.

Over more than a decade, the RET has increased the supply of renewable energy thereby reducing greenhouse gas emissions from electricity generation.

References

ACIL Allen Consulting (2014) *RET Review Modelling. Market Modelling of Various RET Policy Options,* Report to RET Review Expert Panel. Accessed at https://retreview.dpmc.gov.au/sites/ default/files/files/ACIL_Report.pdf.

AEMO (Australian Energy Market Operator) (2013a) NEM Historical Market Information Report. Accessed at http://www.aemo.com.au/Electricity/ Planning/Related-Information/Historical-Market-Information-Report.

AEMO (2013b) 100 per cent renewables study modeling outcomes. Accessed at http://www. climatechange.gov.au/sites/climatechange/files/ documents/08_2013/100-percentrenewablesstudy-modelling-outcomesreport.pdf.

ARENA (Australian Renewable Energy Agency) (2014) What is renewable energy? Accessed at http:// arena.gov.au/about-renewable-energy/.

Bloomberg New Energy Finance (2015) Clean Energy Investment Jumps 16%, Shaking Off Oil's Drop. Accessed at http://www.bloomberg.com/ news/2015-01-09/clean-energy-investmentjumps-16-on-china-s-support-for-solar.html.

BREE (Bureau of Resources and Energy Economics) (2014a) *Australian Energy Projections to 2049-50*. Accessed at http://www.bree.gov.au/files/files// publications/aep/aep-2014-v2.pdf.

BREE (2014b) *Energy in Australia 2014*. Accessed at http://www.bree.gov.au/publications/energy-australia.

BREE (2014c), 2014 Australian energy statistics, Canberra, July, Table O Australian electricity generation, by state, by fuel type, physical units.

Clean Energy Council (2014) Lost opportunity and big costs: The impact of an unresolved RET review.

Clean Energy Regulator (2013) *Renewable Energy Target: Focus on Solar.*

Clean Energy Regulator (2014a) *Renewable Energy Target: How the Renewable Energy Target works.* Accessed at http://ret.cleanenergyregulator.gov.au/ About-the-scheme/How-the-RET-works.

Clean Energy Regulator (2014b) Renewable Energy Target: The Large-scale Renewable Energy Target. Accessed at http://ret.cleanenergyregulator.gov.au/ About-the-Schemes/Iret.

Clean Energy Regulator (2015) *Small-scale installations by postcode* (data current at 6 January 2015). Accessed at http://ret.cleanenergyregulator. gov.au/REC-Registry/Data-reports. Climate Change Authority (2012) Renewable Energy Target Review Final Report. Accessed at http://www.climatechangeauthority.gov.au/ files/20121210%20Renewable%20Energy%20 Target%20Review_MASTER.pdf.

Climate Change Authority (2014) *Renewable energy target review report*. Accessed at http://www. climatechangeauthority.gov.au/files/files/reviews/ ret/2014/review.pdf.

Climate Council (2014a) Australia's Electricity Sector: Ageing, Inefficient and Unprepared. Accessed at http://www.climatecouncil.org.au/ uploads/f9ba30356f697f238d0ae54e913b3faf.pdf.

Climate Council (2014b) Joint Statement on the Health Effects of Coal in Australia. Accessed at http://www.climatecouncil.org.au/uploads/800f051 ad0cb47d1554179635d9f4070.pdf.

Climate Council (2014c) Lagging behind: Australia and the Global Response to Climate Change. Accessed at http://www.climatecouncil.org.au/uplo ads/211ea746451b3038edfb70b49aee9b6f.pdf.

Climate Council (2014d) The Australian Renewable Energy Race: Which States are Winning or Losing? Accessed at http://www.climatecouncil.org.au/ uploads/ade2bc2c7b54bc88421c5c4945874581.pdf.

Climate Institute (2014) Australian views on the renewable energy target and the ideal energy mix. Accessed at http://www.climateinstitute.org. au/verve/_resources/CoN_RenewableEnergy_ Factsheet_2014_FINAL.pdf.

Commonwealth of Australia (2014) *Renewable* Energy Target Scheme Report of the Expert Panel.

Commonwealth Renewable Energy Electricity Act 2000.

Department of the Environment (2014) *Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2014,* Australia's National Greenhouse Accounts. Accessed at http:// www.environment.gov.au/system/files/ resources/2bd59b0d-cf8f-4bdf-8e23-5250e4361c24/files/nggi-quarterly-updatejune-2014_0.pdf.

ESAA (Energy Supply Association of Australia) (2014) *State of the Debt Markets for the Energy Supply Industry,* prepared by PricewaterhouseCoopers Australia. Geoscience Australia and ABARE (2010) Australian Energy Resource Assessment, Canberra. Accessed at http://arena.gov.au/files/2013/08/Australian-EnergyResource-Assessment.pdf.

Global Commission on the Economy and Climate (2014) *The New Climate Economy*. Accessed at http://newclimateeconomy.report/.

Governor of the State of California (2015) *Governor Brown Sworn In, Delivers Inaugural Address.* Accessed at http://gov.ca.gov/news.php?id=18828.

Department of the Prime Minister and Cabinet (1997) PM Transcripts Statement by the Hon John Howard MP Safeguarding the Future: Australia's Response to Climate Change Australian Government Media Release 20 November 1997. Accessed at http://pmtranscripts.dpmc.gov.au/ browse.php?did=10595.

IEA (International Energy Agency) (2007) Contribution of Renewables to Energy Security, IEA Information Paper. Accessed at http://www. deres.org.uy/practicas_pdf/cambio_climatico/ Contribution_of_renewables_to_energy_security. pdf.

Institute for Energy Economics and Financial Analysis (2015) *Briefing Note: Global Energy Markets in Transition*. Accessed at http://ieefa.org/ wp-content/uploads/2015/01/IEEFA-BRIEFING-NOTE-Global-Energy-Markets-in-Transition_ Final_15Jan2015.pdf.

IPCC (Intergovernmental Panel on Climate Change) (2014) *Summary for Policymakers, In: Climate Change 2014, Mitigation of Climate Change.* Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Parliament of Australia (2014) *The Renewable Energy Target: A quick guide*. Accessed at http://www.aph.gov.au/About_Parliament/ Parliamentary_Departments/Parliamentary_ Library/pubs/rp/rp1314/QG/RenewableEnergy. Pitt&Sherry (2014) Electricity emissions update - data to 31 December 2013, Carbon Emissions Index cedex. Accessed at http://www. pittsh.com.au/assets/files/Cedex/CEDEX%20 Electricity%20Update%20January%202014.pdf.

Pitt&Sherry (2015) Electricity emissions update - data to 31 December 2014, Carbon Emissions Index cedex. Accessed at http://www. pittsh.com.au/assets/files/Cedex/CEDEX%20 Electricity%20Update%20January%202015%20 Rev01.pdf.

Productivity Commission (2011) *Carbon emissions policies in key economies, Research report,* Canberra.

PwC (PricewaterhouseCoopers) (2015) Power and Renewables Deals 2015 outlook and 2014 review. Accessed at http://www.pwc.com/en_GX/ gx/utilities/publications/assets/pwc-powerrenewables-deals-2015.pdf.

REN21 (2014) *Renewables 2014 Global Status Report.* Accessed at http://www.ren21.net/ren21activities/ globalstatusreport.aspx.

RenewEconomy (2014a) *India's energy future: Australian coal or renewable revolution*? Accessed at http://reneweconomy.com.au/2014/indiasenergy-future-australian-coal-renewablerevolution-97615.

RenewEconomy (2014b) South Australia sets 50% renewable energy target for 2025. Accessed at http://reneweconomy.com.au/2014/south-australia-sets-50-renewable-energy-target-for-2025-2020.

Sydney Morning Herald (2015) *Australia's large-scale renewable investment dives in 2014*. Accessed at http://www.smh.com.au/environment/climate-change/australias-largescale-renewable-investment-dives-in-2014-20150112-12mbis.html.

The Conversation (2014) *FactCheck: does Australia have too much electricity?* Accessed at http:// theconversation.com/factcheck-does-australia-have-too-much-electricity-31505.

US Environmental Protection Agency (2014) Nonhydroelectric Renewable Energy. Accessed at http:// www.epa.gov/cleanenergy/energy-and-you/affect/ non-hydro.html.

Image Credits

Cover photo: "Brown Hill Range wind turbines at sunrise" by Flickr user David Clarke licensed under CC BY-NC-ND 2.0

Page 9: Figure 2a Large Scale Renewables: "Albany Wind Farm" by Flickr user Bentley Smith licensed under CC by –NC-ND 2.0, accessed at https://www. flickr.com/photos/superciliousness/29624786

Page 9: Figure 2b Small Scale Renewables: "Solar panels on old home" by Flickr user Michael Coghlan licensed under CC by -NC-ND 2.0, accessed at https://www.flickr.com/photos/ mikecogh/9223731920

