

THE AUSTRALIAN RENEWABLE ENERGY RACE: WHICH STATES ARE WINNING OR LOSING?

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

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The Australian Renewable Energy Race: Which States Are Winning or Losing? by The Climate Council of Australia



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Key findings

1. Australia's states and territories have an important leadership role to play in tackling climate change and growing Australia's renewable energy industry.

- › In the US, state-based actions have been highly effective. The US is second in the world for installed renewable energy capacity due to the majority of US states implementing targets and incentives for renewable energy.
- › In Australia, the states have historically led the way on emissions and renewable energy policy, influencing national action. In 2003, New South Wales introduced the world's first mandatory emissions trading scheme. In 2004 and 2006, South Australia and Victoria introduced state based renewable energy targets in response to a low 2% federal target.
- › With the Federal government seeking to weaken the Renewable Energy Target and having abolished carbon pricing, Australian states and territories have an opportunity to provide stable investment environments for renewable energy and revitalise energy efficiency initiatives.

2. South Australia is striding forward leading the Australian states on renewable energy.

- › Due to the policy environment, South Australia is the most desirable market in Australia for investment. Since 2003, there has been \$5.5 billion invested in renewable energy in South Australia, with nearly half occurring in regional areas.
- › South Australia sources over 36% of its electricity from renewable sources and ¼ of SA homes have solar PV panels. South Australia has installed more large-scale renewable capacity since 2001 than any other state.
- › With effective renewable energy policies South Australia moved from having little renewable energy a decade ago to installing the most renewable energy since 2001 on a total and per capita basis. Having already met its 2020 renewable energy target of 33%, South Australia has now set a 50% 2025 target.
- › The ACT is also punching above its weight with effective emissions reduction targets and a target of 90% renewable energy by 2020.
- › Other than South Australia, no other Australian state has a current target to increase renewable energy.

3. Victoria and NSW have moved from leaders to laggards in Australia's renewable energy race.

- › In the past NSW had been a leader introducing the first emissions trading scheme, and Victoria was an early implementer of energy efficiency measures.
- › Neither state now has targets to reduce emissions or increase renewable energy.
- › Victoria has excellent wind and solar resources, however, the restrictive policy environment makes it the least favourable investment environment of any Australian state for renewable energy. Victoria has moved to actively discourage renewable energy, so, in contrast to South Australia, investment in renewable energy has dried up. Victoria's restrictive policy environment has cost the state an estimated \$4 billion in lost investment and 3,000 jobs.
- › Despite having 57% of the population Victoria and NSW only have 40% of renewable energy jobs.
- › Victoria's electricity comprises only 12% of Australia's new renewable energy capacity and NSW 7%. NSW is last among the states for new per capita investment in renewable energy.
- › The recent NSW Government Renewable Energy Action Plan includes 24 actions and 3 goals designed to encourage renewable energy in NSW. This may indicate a welcome shift in NSW's approach.

4. Australia has substantial opportunities for renewable energy. A lack of clear federal policy has led to a drop in renewable energy investment.

- › Australia is the sunniest country in the world and one of the windiest. Australia's potential for renewable energy generation is 500 times greater than current power generation capacity.
- › Twenty one thousand Australians are already employed in the renewable energy industry and this could increase to 32,000 in 15 years with a strong and consistent policy environment.
- › The Federal government is seeking to weaken the Renewable Energy Target. Consequently investment in renewable energy in 2014 has dropped by 70 percent compared with the previous year.

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Introduction

This year, much of the focus on Australia's climate change and renewable energy policy has been directed at the federal level – given the review of the national Renewable Energy Target (RET), repeal of the Carbon Pricing Mechanism, and release of a new Energy Green Paper. However, while national action is vital, the roles and opportunities for Australian states and territories to contribute to reducing greenhouse gas emissions and expanding renewable energy should not be underestimated.

Internationally, the energy sector accounts for the largest proportion of greenhouse gas emissions, which are the main drivers of climate change. Tackling climate change requires large scale changes in the electricity sector and a tripling of low-carbon energy by 2050.

Australia's electricity is largely generated from coal. Our fleet is ageing and inefficient, which means that most of Australia's coal stations are much more emissions intensive than other countries, including the USA and China. Within the decade, around half of Australia's coal fuelled generation fleet will be over 40 years old. Australia will need to plan and install new electricity generation to replace ageing generators.

The Climate Council's recent report *Australia's Electricity Sector: Ageing, Inefficient and Unprepared* found that rapid deployment of renewable power, like wind and solar, is one of the most effective ways to reduce electricity sector emissions.

This report provides a snapshot of current targets and policies on emissions and renewable energy in each of Australia's states and territories, and also measures their performance in terms of emissions, renewable energy capacity and generation.

Previous state targets have been removed after federal nationwide carbon pricing and energy efficiency measures were legislated. With these federal measures now abolished, industry, commerce and households in most states are left with no measures to reduce emissions or improve energy efficiency to lower costs. The efficacy of the Emissions Reduction Fund is yet to be established. Furthermore, uncertainty in the RET has caused investment in renewable energy to drop by as much as 70 percent over the past year. Yet, South Australia and the ACT have set ambitious targets to cut emissions and increase renewable energy uptake. Positive policy settings in South Australia and the ACT will help these regions benefit from the global transition to cleaner energy, leaving the other states and territory lagging behind. Experience from overseas also illustrates how it is possible for state-based actions to stimulate highly effective policy measures.

The importance of sub-national action: an international perspective

Worldwide, state-based actions often lead to the development of national policies and can be highly effective measures in their own right (Box 1).

'Sub-national' actions taken by state and local governments often influence the development of national policies:

National governments often observe sub-national level actions and consider using successful programmes as blueprints for national policies. China, for example, is experimenting with carbon trading mechanisms on the local level before potentially launching a nationwide scheme.

(REN21 2014, Page 86)

BOX 1: CHINESE AND US SUB-NATIONAL CLIMATE ACTION

Sub-national actions can also be highly effective on their own, even in the absence of national legislation or policies. The Climate Council's 'Lagging Behind: Australia and the global response to climate change' (2014a) highlighted the significance of sub-national action in China and the United States (US):

- › China is now home to the second largest carbon market in the world - covering a quarter of a billion people – due to pilot emissions trading schemes operating in two provinces and five cities.
- › Chinese cities Beijing and Hebei have introduced local clean air action plans to reduce coal consumption, building on a new National Action Plan for Air Pollution Prevention and Control.
- › The US remains second in the world for installed renewable energy capacity - despite lacking a national target - largely due to the majority of US states implementing targets and incentives for renewable energy.
- › California – one of the world's largest economies – aims to reduce its greenhouse gas emissions to 1990 levels by 2020. To achieve this goal, the state has set a 33 percent renewable energy target for all energy consumed by 2020 and put a price on carbon to drive down emissions.
- › Texas has constructed extensive new transmission lines connecting high wind resource areas to consumers in Dallas-Fort Worth, Austin and Houston, a move which has attracted 7,000 MW of new wind energy projects and over 8,000 jobs to the state.
- › While there is no national price on carbon in the US, ten US states already operate their own carbon pricing schemes.

Australia's renewable energy potential

Australia has some of the best renewable energy resources in the world, particularly in wind and solar (Geoscience Australia and ABARE 2010).

In fact, according to the Australian Energy Market Operator (AEMO 2013) Australia has more than enough

renewable energy resources to power all our electricity needs. AEMO (2013) modeled scenarios for providing 100 percent of Australia's electricity from renewable energy, and found potential renewable generation to be about 500 times greater than demand in the National Electricity Market (NEM) (Table 1).

Australia has more than enough renewable energy resources to power all our electricity needs

Table 1: Total renewable energy resource by technology

Resource	Maximum installable generation capacity (GW)	Maximum recoverable electricity (TWh/yr)*
Wind – onshore	880	3100
Wind – offshore	660	3100
Solar – concentrating solar thermal/ photovoltaic	18,500/ 24,100	41,600/71,700
Geothermal	5,140	36,040
Biomass	16	108
Wave	133	275
Total**	25,700/31,300	86,800/116,900
Current NEM (actual installed capacity and annual generation, all technologies)	50	200

Notes:

* TWh/yr relates to generation (capacity over time). Table 1 shows that Australia currently uses 200 TWh/yr in the NEM, but the potential (in renewables) is more than 86,000 TWh/yr.

** Current NEM installed capacity is 50 GW, but the potential (in renewables) is more than 25,000 GW (that is, more than 500 times the current capacity).

Source: AEMO 2013

However despite having world-class renewable energy resources, particularly in wind and solar, Australia has a low share of renewable electricity generation – seventh lowest among 28 member countries of the International Energy Agency (Australian Energy Regulator 2012). According to Bloomberg New Energy Finance, uncertainty over the RET in Australia has resulted in a 70% slump in investment in renewable energy over the past year (The Guardian 2014).

Renewable energy benefits

As well as providing low or no emissions energy, renewables attract investment and create jobs, particularly in regional Australia. Twenty one thousand people

are already employed in the renewable energy industry in Australia (Clean Energy Council 2014a) and modeling by the Climate Institute (2011) estimated that nearly 32,000 renewable energy jobs (including over 6,800 new permanent jobs) could be created in Australia by 2030 with strong and consistent climate policies.

Farmers and landowners in regional areas who lease their land for wind turbines also benefit through annual lease payments which provide a reliable, alternative source of income and help to “drought-proof” farms (Chapman 2013). Around \$16.4 million is paid annually in lease payments for hosting wind turbines (Epuron 2014; Clean Energy Council 2014a).



Figure 1: Australian wind farm and agriculture, Western Australia

Solar and wind provide clean energy and consequently also have additional benefits of reducing the pollution from other energy sources. Coal, the dominant fuel for electricity in Australia produces pollutants that damage human health through mining, transportation, combustion and the disposal of waste (Epstein et al 2011). In Australia, it is estimated that the adverse impacts from pollutants produced from coal-fired electricity generation costs A\$ 2.6 billion annually (ATSE 2009).

The least expensive zero emission option available at scale for deployment today in Australia is wind, closely followed by field scale solar PV (Climate Council 2014b). Over each full year, renewables are reducing wholesale electricity prices, not only in Australian states where wind and solar PV penetration is high, but in many overseas markets (e.g. Denmark, Texas and Germany) (Sinclair Knight Merz 2013). A University of New South Wales study analysed wind generation, electricity demand and price data in the NEM between 2011 and 2013 and found wind reduced the average wholesale electricity price by 5 to 8 percent. However the

study found these cost savings had not been passed on to households and small business due to exemptions for energy intensive industries, the market power of the large retailers, and the regulation of electricity tariffs in some states (Cludius et al 2014).

Electricity from coal is likely to be more expensive than renewables, if the cost of retrofitting Carbon Capture and Storage (CCS) technology is factored in, or if new fossil fuelled stations with CCS are built. Furthermore, even new gas fuelled power plants in Australia without CCS may become more expensive than new renewables now that gas prices are increasing, as gas producers can choose to export that gas at much higher LNG export prices (Elliston et al 2014).

When demand for electricity is high (e.g. during heatwaves) renewable energy generation has helped keep electricity prices down. For example, in South Australia and Victoria, during the summer heatwaves in 2014, electricity prices were at least 40 percent lower than they would have been otherwise without the contribution of wind energy (Sinclair Knight Merz 2014).

BOX 2 – ECONOMIC BENEFITS OF A 50 MW WIND FARM

Case Study: Economic Benefits of a Wind Farm to the Local Economy

- › Construction of a 50 MW wind farm provides a gross value added of some \$50 million to a state and contributes up to 0.21 percent to gross state product depending on the size of the state economy.
- › Construction of a 50 MW wind farm is estimated to contribute up to 2.6 per cent to gross regional product depending on the size of the regional economy.
- › Construction could lead to potential local personal expenditure of \$25,000 per person per annum. If, for example, a wind farm had an average construction workforce of some 35 over a two-year construction period then the expenditure in the region would be some \$875,000 in total per annum on accommodation, food and other services.
- › The same wind farm could employ between five and six full-time-equivalent staff for operations and maintenance with a potential ongoing expenditure of \$125,000–150,000 per annum.
- › In addition, a 50 MW wind farm project is likely to provide up to \$250,000 in payments to farmers and an ongoing community contribution that could be some \$80,000 per annum for the life of the project.
- › This expenditure is likely to be a minimum as wind farm developers' policies of sourcing suppliers and services locally as far as possible also mean that transport, plant hire and materials such as crushed rock, cement, sand and gravel are likely to be provided from local sources.

Extract from Commissioner for Environmental Sustainability Victoria (2013)
Science Policy People Victoria: State of the Environment

Policies and Targets: How do the states and territories compare?

Emissions

Climate change is driven by the emission of greenhouse gases, from fossil fuels and deforestation, which trap heat at the Earth's surface heating the oceans, air and land surfaces (IPCC 2014). It is clear that greenhouse gases must be reduced dramatically to effectively tackle climate change (Climate Commission 2013).

It is no surprise that states with larger populations generally have greater total emissions (Table 2). For example, New South Wales has the largest population and highest total greenhouse gas

emissions (149 Mt CO₂-e) (Department of the Environment 2014).

A fairer basis for comparing state and territory emissions is on a per capita basis (Table 3). Tasmania and South Australia have the lowest per capita emissions of the states (15.2 and 18.1 Mt CO₂-e per person respectively) partly reflecting the higher proportion of renewables in their electricity supply (ABS 2012; Department of the Environment 2014). The mining states of Queensland and WA have the highest emissions of the states.

Table 2: Total emissions (Mt CO₂-e)

Australia's emissions = 543.6 Mt CO₂-e (in 2012)

Highest							Lowest
NSW	QLD	VIC	WA	SA	NT	TAS	ACT
149	135	129	76	30	15	8	1

Note: The most up to date data on state and territory emissions is for 2012

Source: Department of the Environment 2014

Table 3: Emissions per person (t CO₂-e/cap)

Australian average (2012) = 23.96 t CO₂-e

OECD average (2012) = 12.47 t CO₂-e

Highest							Lowest
NT	WA	QLD	VIC	NSW	SA	TAS	ACT
63	31.2	29.5	23.0	20.4	18.1	15.2	3.5

Note: 2012 population statistics are used to accord with the emissions data

Source: ABS 2012; Department of the Environment 2014; OECD StatExtracts 2014

Emissions reduction targets

Up until recently, all Australian states and territories had targets for reducing emissions.

South Australia and the ACT have retained their targets and continue to work towards reducing emissions:

- › South Australia aims to reduce emissions to 60 percent below 1990 levels by 2050.
- › The ACT aims to reduce emissions to 80 percent below 1990 levels by 2050 (with an interim target of 40 percent by 2020).

Meanwhile, the other states and territory have shelved targets and policies for reducing emissions (partly in response to the introduction of a federal emissions target):

- › Victoria, Queensland, Western Australia and the Northern Territory currently have no emissions reduction targets or policies in place.
- › Tasmania has abandoned its 2020 emissions reduction goal and abolished the state's Climate Action Council, but retains the state's 2050 target (set in legislation).

Renewable energy

New South Wales (5,681 MW), Tasmania (2,695 MW) and Victoria (2,432 MW) have greater total renewable energy capacity

than other states and territories, but this is largely due to hydroelectric schemes built in the 1950s and 60s (Clean Energy Council 2014a; Commonwealth of Australia 2014; Table 4).

Once these "old" renewables are taken out of the equation, South Australia clearly leads the country in installed "new" renewable energy capacity with 1,478 MW of mainly wind power installed since 2001. On this measure, Victoria is second (1,285 MW) and New South Wales and Tasmania fall back to fifth and sixth place respectively (Commonwealth of Australia 2014).

These numbers highlight the significance of renewable energy targets and policy in South Australia. A little over a decade ago, South Australia had very little renewable energy capacity to speak of, but is now a leader in renewables after a decade of increasing targets for renewables and supporting policies.

Whereas, Victoria, once a leader in renewable energy has lagged behind. Victoria's restrictive planning rules that actively discourage new wind farm developments make the state the worst policy environment for renewable energy growth. Consequently, investment in renewable energy in Victoria has dried up, while South Australia has ramped up renewable energy uptake.

The ACT aims to reduce emissions to 80 percent below 1990 levels by 2050

A little over a decade ago, South Australia had very little renewable energy capacity to speak of, but is now a leader in renewables after a decade of increasing targets for renewables and supporting policies

Table 4: Total installed renewable energy capacity (MW)

Australian total = 15,762 MW

Highest							Lowest
NSW	TAS	VIC	QLD	SA	WA	ACT	NT
5,681	2,695	2,432	2,219	1,735	936	47	16

Source: Clean Energy Council 2014a

Table 5: Large-scale renewable capacity installed since 2001 (MW)

Australian total = 5,062 MW

Highest							Lowest
SA	VIC	QLD	WA	NSW	TAS	ACT	NT
1,478	1,285	682	642	599	344	26	5

Note: The large-scale renewable capacity data includes wind projects in NSW and Victoria currently under construction but not yet commissioned and excludes NSW solar PV field scale project under construction. There appears to be a discrepancy between these figures and Australian Energy Market Operator figures for Queensland, with significantly more landfill gas capacity being reported in the RET review. The above table includes 509 MW of landfill gas for Queensland – more than fifteen times NSW's 33 MW, the next highest amount (AEMO 2014).

Source: Commonwealth of Australia 2014, based on data provided by the Clean Energy Regulator current at 16 July 2014

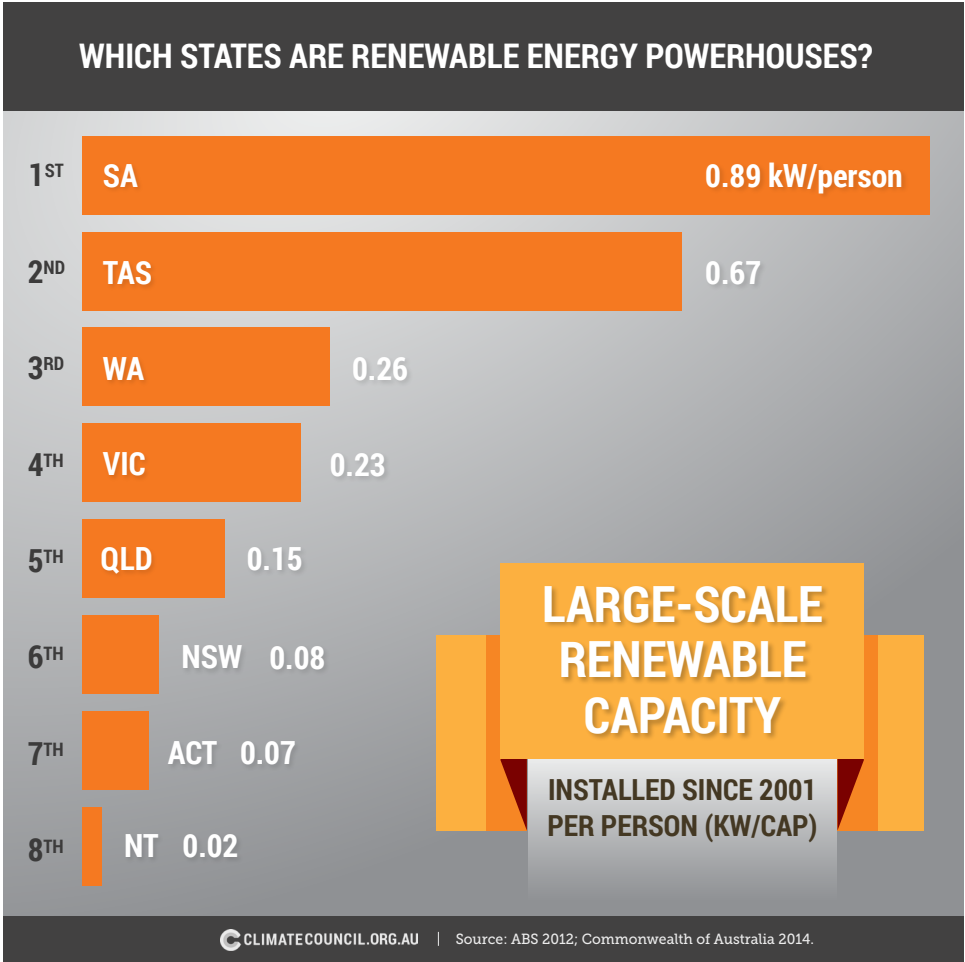


Figure 2: Large-scale renewable energy capacity installed since 2001 per person (kW/cap)

South Australia’s lead over the other states and territories becomes more striking when renewable capacity additions are considered on a per person basis (Figure 2).

Another measure for comparing the states is the percentage of renewable

energy in electricity generation (Table 6 and Figure 3). On this measure Tasmania is clearly in the lead with 93 percent renewables in its electricity supply. South Australia follows on 36 percent with the other states at 12 percent or lower (Clean Energy Council 2014a).

Table 6: Electricity generation from renewables %

Highest			Lowest		
TAS	SA	VIC	WA	NSW	QLD
93%	36%	12%	11%	7%	6%

Note: Equivalent data on the percentage of renewable energy in ACT or Northern Territory electricity supply was not available.
Source: Clean Energy Council 2014a

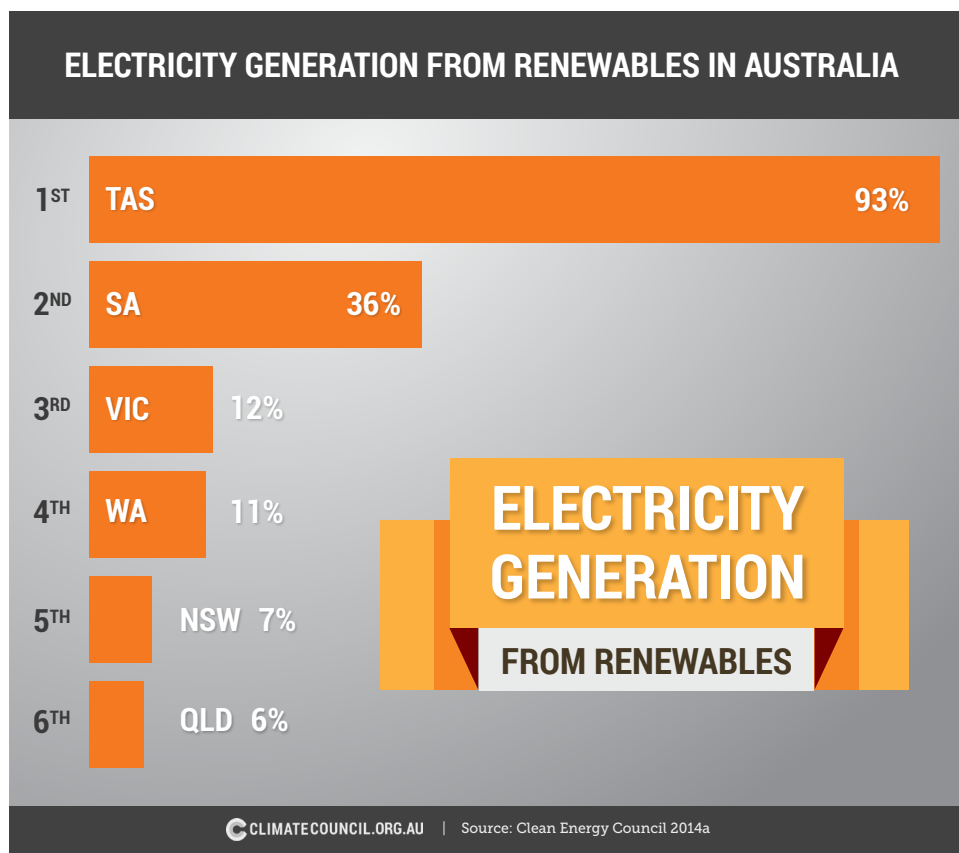


Figure 3: Percentage of renewable energy generation in electricity

South Australia leads in terms of the percentage of households with solar PV – 26 percent - more than one in four dwellings (Table 7). The Northern Territory performs worst on this measure, with solar PV on only

5.1 percent of households, which is surprising given the high cost of retail electricity, good solar insolation, and often remote high cost alternative electricity supply options.

Table 7: Percentage of dwellings with solar PV

Highest							Lowest
SA	QLD	WA	NSW	ACT	VIC	TAS	NT
26.1%	24.9%	18.4%	11.8%	11.7%	11.4%	10.4%	5.1%

Source: Australian PV Institute 2014

Renewable energy targets

South Australia and the ACT both actively encourage renewable energy development.

Since 2004, South Australia has consistently ramped up its targets for renewable energy:

- › initially aiming for renewable energy to make up 15 percent of electricity consumption by 2014
- › then 20 percent renewables in electricity production by 2014
- › then 33 percent renewables in electricity production by 2020.

South Australia has recently adopted a 50 percent renewable energy target for 2025 (electricity produced) and it is likely the state will meet the new target ahead of schedule (RenewEconomy 2014c).

The ACT aims for renewable energy to supply 90 percent of electricity consumed in the territory by 2020 (ACT Government 2013; Figure 4). Renewable energy produced under the national RET will not count towards the ACT's target, which relies solely on local and regional renewable energy projects.

In 2013, New South Wales released a renewable energy action plan to support the state in meeting its share of the national RET. The plan includes goals to attract investment, build support and expertise.

Solar photovoltaic (PV) costs are rapidly falling. Declining prices coupled with the introduction of the small-scale component of the national RET, provides an alternative incentive for households installing small-scale renewable energy systems. Almost all states and territories have now substantially reduced or closed previous feed-in tariff schemes. Most states and territories now offer less than 10 cents per kilowatt-hour for solar energy fed into the grid or a rate set by the retailer.

The ACT has designed its feed-in tariff policy differently to the other states and territory. The ACT's feed-in tariffs are allocated by reverse auction, aiming at attracting new large-scale wind and solar projects to the territory at the lowest price.

Victoria now has the worst policy environment for renewables in the country

South Australia and the ACT - with progressive renewable energy policies and targets - are winning the Australian renewable energy race

Despite its high quality wind resources and past support for renewable energy (such as the 10 percent by 2010 Victorian Renewable Energy Target), Victoria now has the worst policy environment for renewables in the country. Victoria has no targets or policies to attract renewable energy. It also has planning rules that actively discourage new wind farm developments through extensive “no go” areas and veto right for landowners within two kilometres of a wind turbine.

It is clear that while other states stifle advances in renewable energy uptake, South Australia and the ACT - with progressive renewable energy policies and targets - are winning the Australian renewable energy race.

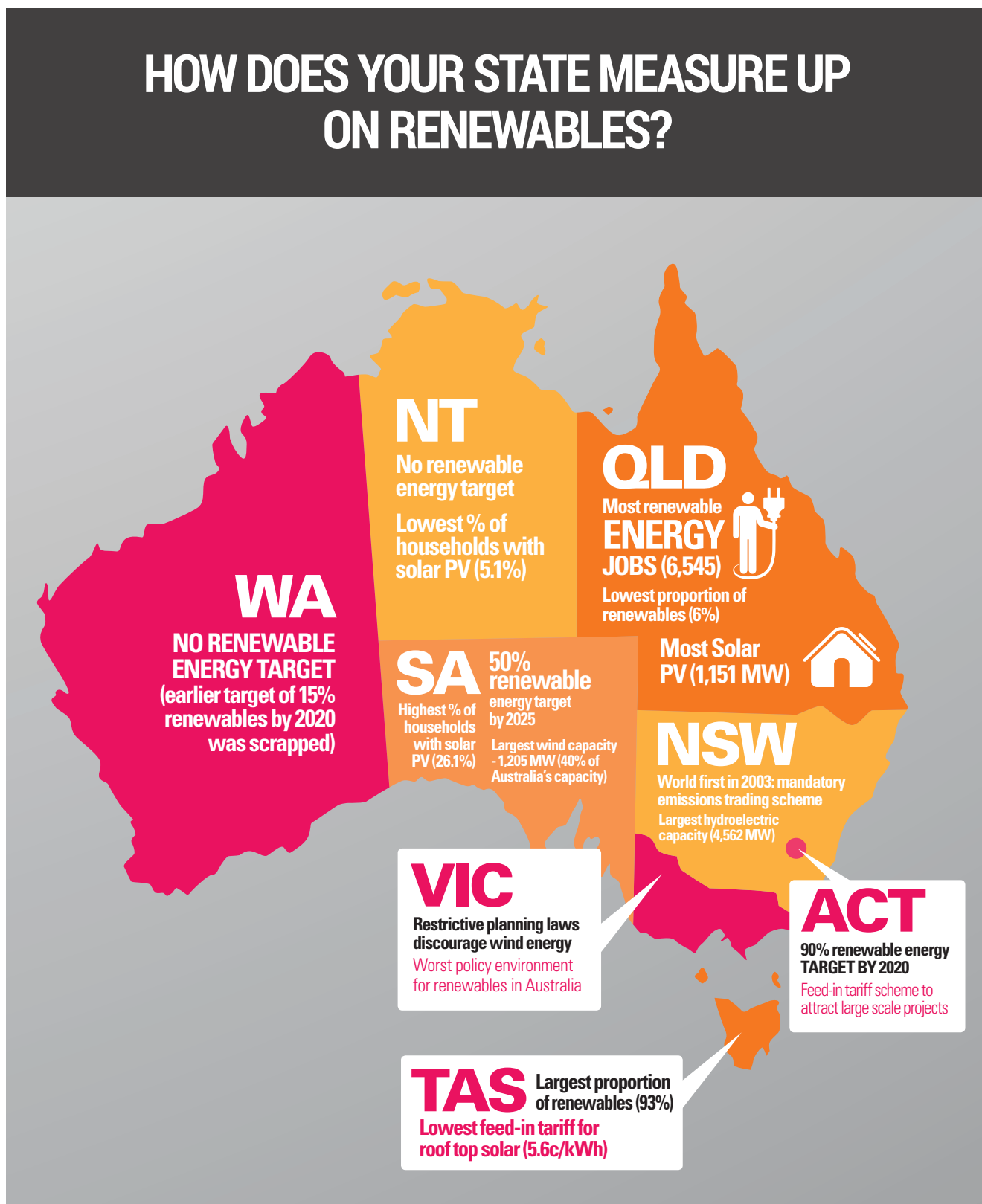


Figure 4: How does your state measure up on renewables?

Source: Data from ABS 2012; ACT Government 2013; Australian PV Institute 2014; Clean Energy Council 2014a; RenewEconomy 2014b

State and territory snapshots

South Australia



Emissions

South Australia's emissions have been decreasing since around 2007. Emissions in 2012 were 29.9 MtCO₂e representing 5.5 percent of Australia's total emissions (2012 figures) (ABS 2012; Department of the Environment 2014).

South Australia's per capita emissions are the third lowest in Australia at 18.07 tCO₂e per person after the ACT and Tasmania (ABS 2012; Department of the Environment 2014).

Emissions reduction targets

South Australia's Strategic Plan establishes targets for limiting the state's greenhouse gas emissions to:

- › 8 percent above 1990 levels by 2012
- › 60 percent below 1990 levels by 2050 (Government of South Australia 2011a).

Renewable energy

In 2013, South Australia had 1,735 MW of installed renewable energy (Clean Energy Council 2014a) – mainly comprising wind and solar PV.

South Australia has installed the most renewable energy capacity of any state or territory since 2001 – 1,478 MW (Commonwealth of Australia 2014).

South Australia leads the country in wind and solar PV. South Australia has the most wind farms of any state – and is home to 40 percent of Australia's wind capacity. 28 percent of South Australia's electricity demand was supplied by wind power in 2013 (Clean Energy Council 2014b). South Australia has the greatest percentage of households with solar PV – 26 percent (see, for example, Figure 5).

Renewable energy targets

The Strategic Plan also set a target for renewable energy to make up 33 percent of South Australia's electricity production by 2020, with an interim target of 20 percent by 2014 (Government of South Australia 2011a).

This year, having already met its 33 percent renewable energy target for 2020, the South Australian Government announced a new target for renewable energy to make up 50 percent of electricity production by 2025. It is likely that the state will again meet this target ahead of schedule (RenewEconomy 2014b).

Renewable energy policy

In 2011, South Australia released its *A Renewable Energy Plan for South Australia* (Government of South Australia 2011b) with the aim to make South Australia the most attractive investment destination for renewable energy. The plan outlined initiatives such as:

- › Introducing legislation to provide renewable energy developers with access to Crown Land areas subject to pastoral lease.
- › Supporting the design and implementation of a concept model for community-owned solar.

- › Consulting on a specific limit on carbon emissions for new electricity generation.
- › Supporting concentrating solar power for heat and electricity in Port Augusta.

Since 2003, there has been \$5.5 billion invested in renewable energy in South Australia, with nearly half occurring in regional areas. The South Australian Government recently set an aspirational target to attract \$10 billion dollars in investment in renewable energy in the state by 2025 (Renewables SA 2014).

South Australia's feed-in tariff for small-scale renewable energy is currently set at a minimum of 6c/kWh (Solar Market 2014).

South Australian policy settings make it a highly desirable location for renewable energy investment



Figure 5: Solar PV on Hahndorf historic house, South Australia

There have been many periods in 2014 when renewable energy generation in South Australia exceeded the total state demand. Notably, on Tuesday September 30, renewable energy provided more than 100 percent of the state's electricity needs for the working day 9:30 to 6 pm (RenewEconomy 2014b).

South Australia is also home to the 1 MW Habanero geothermal pilot plant at Innamincka in South Australia (Clean Energy Council 2014d).

Morphett Vale is South Australia's top solar postcode with 3,968 solar PV systems installed totaling 10 MW (Australian PV Institute 2014).

On Tuesday September 30, renewable energy provided more than 100 percent of SA's power

Table 8: South Australia – key statistics

Statistic	Total	Percentage
Population (million, % of Australian total)	1.655	7
Emissions (MtCO ₂ e, % of Australian total)	29.9	5.5
Per capita emissions (tCO ₂ e per person)	18.07	/
New large-scale renewable energy capacity since 2001 (July 2014) (MW, % of Australian total)	1,478	29
Installed renewable energy capacity (December 2013) (MW, % of Australian total)	1,735	11
Installed wind capacity (December 2013) (MW)	1205	/
Installed solar PV capacity (December 2013) (MW)	533	/
Dwellings with solar PV (%)	/	26
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory)	4345	36
Renewable energy jobs (number, % of Australian total)	3375	16

Note: New large-scale renewable energy capacity reflects additional projects commissioned since December 2013

Sources: ABS 2012; Australian PV Institute 2014; Clean Energy Council 2014a,b and c; Commonwealth of Australia 2014; Department of Environment 2014

Victoria



Emissions

At 129.4 MtCO₂e (in 2012), Victoria's greenhouse gas emissions are the third highest of any state or territory. Victoria is responsible for 23.8 percent of Australia's emissions. The majority of Victoria's emissions are due to stationary energy, particularly brown coal (Department of Environment 2014 and ABS 2012). Around ninety percent of Victoria's electricity and over fifty percent of its greenhouse gas emissions come from five polluting coal-fired

power stations: Hazelwood, Yallourn, Loy Yang A and Loy Yang B in the Latrobe Valley, and the Anglesea Power Station on the Surf Coast (Department of the Environment and Sustainability 2012; Environment Victoria 2014).

Per capita emissions in Victoria were 29.50 tCO₂e per person in 2012 (ABS 2012; Department of the Environment 2014) – fourth highest among the states.

Emissions reduction targets

Victoria does not have an emissions reduction or a renewable energy target in place.

Victoria removed its emissions reduction target (previously 20 percent below 2000 levels by 2020) after the introduction of the national emissions target and Carbon Pricing Mechanism (Victorian Government 2012a). There have been no state initiatives or emissions reduction targets proposed following the removal of the national carbon price.

Renewable energy

In 2013, Victoria had 2,432 MW of installed renewable energy capacity, mainly made up of wind, hydroelectric, and solar PV (Clean Energy Council 2014a). Victoria is second after South Australia for new renewable energy capacity installed since 2001 (Commonwealth of Australia 2014), reflecting the success of the previous state based targets for renewable energy and Victoria's high quality wind resource. On a per capita basis, Victoria is fourth in added renewable energy capacity and restrictive planning rules are discouraging investment in renewable energy.

Victoria has the largest and the third largest wind farms in the country - the 420 MW AGL Macarthur Wind Farm and ACCIONA's 192 MW Waubra Wind Farm. Victoria is home to the first community-owned wind project in Australia – Hepburn Wind Farm.

Renewable energy targets

Victoria's state-based renewable energy target (previously set at 20 percent of energy consumed by 2020) was also closed after the introduction of the expanded national RET for 2020 (Climate Change Authority 2012).

Renewable energy policy

Victoria currently applies an 8c/kWh feed-in tariff for household renewable energy systems less than 100 kilowatts in size. The rate will drop to 6.2 cents from January 2015 (Victorian Government 2014).

In 2014, the State Government released *Victoria's energy statement* (2014) focusing on energy affordability, safety and developing energy resources. The policy supports coal (see, for example, Figure 6) continuing as the main source of Victoria's electricity in the short to medium term, with the national RET acting as the main driver of renewables in the state.

Hoppers Crossing is Victoria's top solar postcode with 4,185 solar PV systems, totalling nearly 10 MW (Australian PV Institute 2014).

Victoria's new planning rules have cost the state an estimated \$4 billion in lost investment and 3,000 jobs

In Victoria, it is now easier to gain planning approval for a new coal mine than a wind farm (Victorian Environment Defenders Office 2011; Table 9).

Table 9: Victorian planning controls for wind farms, coal mines and natural gas drilling

	Wind farm	Coal mine	Natural gas drilling
How close can it be to your home without your consent?	2km	100m The Minister can override this to make it closer	No mandatory buffer distance
Is statutory compensation available to nearby landowners?	Yes For landowners whose property lies within 1km of a wind turbine.	Maybe Only if loss or damage is a direct, natural or reasonable consequence of approving a mine licence.	Maybe Only if loss or damage is a direct, natural or reasonable consequence of approving a mine licence.
Are there blanket exclusions for any places?	Yes In or near national or state parks, Ramsar wetlands; in the Yarra Valley, Dandenong Ranges, Mornington Peninsula, Bellarine Peninsula, Macedon and McHarg Ranges; within five kilometres of the high water mark on the Bass Coast and the Great Ocean road; within five kilometres of regional cities; in locations identified for future urban growth.	National parks But the Minister may allow mining in certain cases.	National parks But the Minister may allow mining in certain cases.

Source: Environment Defenders Office (Victoria) 2011; Victorian Government 2012b



Figure 6: Anglesea opencut coal mine

BOX 3 – VICTORIA'S WIND ENERGY PLANNING RESTRICTIONS

The Victorian Government imposes strict planning rules on wind energy, prohibiting wind farms:

- › With wind turbines proposed within two kilometres of a dwelling without written consent from the owner of the dwelling.
- › In National and State Parks.
- › In Ramsar wetlands.
- › In the Yarra Valley, Dandenong Ranges, Mornington Peninsula, Bellarine Peninsula, Macedon and McHarg Ranges.
- › Within five kilometres of the high water mark on the Bass Coast and the Great Ocean road.
- › Within five kilometres of regional cities.
- › In locations identified for future urban growth.

Source: Victorian Government 2012b.

Victoria's restrictive planning rules discourage renewable energy investment, increase energy costs by forcing wind development in areas with poorer wind resources, and have had flow on negative effects for manufacturers in Victoria (Commissioner for Environmental Sustainability 2013). Only two small wind farms have successfully gained planning approval since the new rules were enacted – Cherry Tree Wind Farm (16 turbines) and Coonooer Bridge (5 turbines) (SMH 2013).

Victoria's Commissioner for Environmental Sustainability (2013) reported Victoria's new planning rules have cost the state an estimated \$4 billion in lost investment and 3,000 jobs.

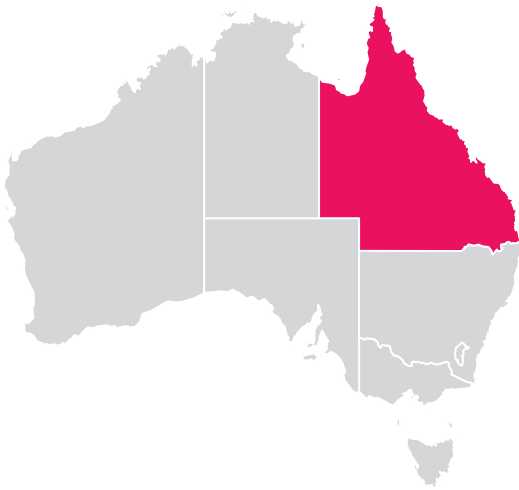
Table 10: Victoria – key statistics

Statistic	Total	Percentage
Population (million, % of Australian total)	5.623	25
Emissions (MtCO ₂ e, % of Australian total)	129.4	23.8
Per capita emissions (tCO ₂ e per person)	23.01	/
New large-scale renewable energy capacity since 2001 (July 2014) (MW, % of Australian total)	1,285	25
Installed renewable energy capacity (MW, % of Australian total) (December 2013)	2,432	15
Installed wind capacity (December 2013) (MW)	939	/
Installed solar PV capacity (December 2013) (MW)	625	/
Dwellings with solar PV (%)	/	11.4
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory)	6,433	12
Renewable energy jobs (number, % of Australian total)	3,700	18

Note: New large-scale renewable energy capacity reflects additional projects commissioned since December 2013

Sources: ABS 2012; Australian PV Institute 2014; Clean Energy Council 2014a,b and c; Commonwealth of Australia 2014; Department of Environment 2014

Queensland



Emissions

Queensland has the second largest total emissions of any Australian state or territory at 134.5 MtCO₂e (in 2012), and emissions have been steadily increasing since 1990. In 2012, Queensland's greenhouse gas emissions represented nearly a quarter, 24.7 percent, of Australia's national emissions with stationary energy and agriculture the main sources of emissions (ABS 2012; Department of the Environment 2014).

Queensland's per capita emissions were the third highest of any state or territory at 29.50 tCO₂e per person in 2012 (ABS 2012; Department of the Environment 2014).

Emissions reduction targets

Queensland does not currently have targets for reducing emissions or expanding renewable energy.

The Queensland government had previously set the following targets to limit greenhouse gas emissions:

- › 30 percent below 2000 levels by 2020.
- › 60 percent below 2000 levels by 2050 (Queensland Government 2007).

Following the election of a new government in March 2012, Queensland abandoned its climate change policies and targets (Jones 2012).

Renewable energy

In 2013, Queensland had 2,219 MW of installed renewable energy (Clean Energy Council 2014a). Only 682 MW of renewable capacity has been added since 2001 (Commonwealth of Australia 2014). Queensland is fifth in terms of new renewable capacity per capita.

Aptly referred to as the "sunshine state", almost half of Queensland's renewable energy capacity is solar PV and Queensland has the most installed solar PV capacity (1,151 MW; Table 11) of any state or territory. Hydro and biomass are also significant sources of renewable energy.

- › Queensland has 6,545 people employed in the renewable energy industry – the most jobs of any state or territory (Clean Energy Council 2014a).

- › However, Queensland has the lowest percentage of renewables in electricity generation of any of the states, with renewable energy only providing 6 percent of electricity generated in 2013 (Clean Energy Council 2014a).
- › Australia's largest solar thermal project, the 44 MW Solar Boost facility is currently under construction in Queensland (Clean Energy Council 2014e).
- › Queensland is home to one of two operational geothermal plants in Australia – the 0.12 MW Birdsville plant (Clean Energy Council 2014e).
- › Bundaberg is Queensland's top solar postcode with 8,015 solar PV systems installed totaling 22.6 MW (Australian PV Institute 2014).

Renewable energy policy

In June 2014, the Queensland Government released its long-term strategy for Queensland's electricity sector. *PowerQ: a 30-year strategy for Queensland's electricity sector* identifies emissions reductions as being led at the international and national level.

Queensland's strategy schedules emissions reduction actions to occur between 2016 and 2026 with the specific action to: *assess Queensland's ability to contribute to emissions reductions* (Department of Energy and Water Supply 2014).

Queensland's state-wide feed-in tariff scheme was closed in 2014. Households in southeast Queensland installing renewable energy systems will now receive payment for electricity exported to the grid at a rate set by the retailer. The Queensland Competition Authority will continue to regulate feed-in tariff rates for regional areas (Ergon Energy territory) with rates currently set at 6.5 cents per kWh (Queensland Competition Authority 2014). Ergon Energy has recently announced it will limit payment of solar feed-in tariffs to systems exporting less than 5kW to the grid (Ergon Energy 2014).

Almost half of Queensland's renewable energy capacity is solar PV and Queensland has the most installed solar PV capacity (1,151 MW)

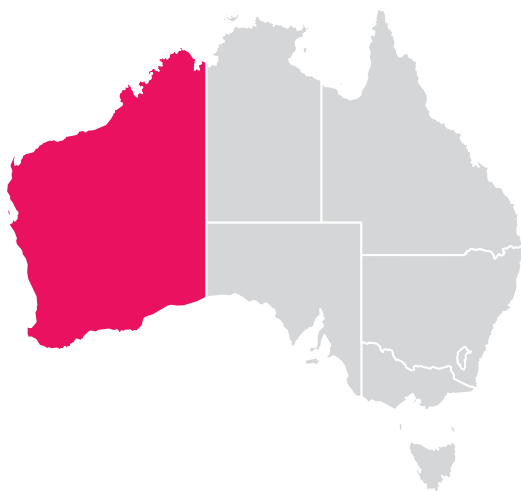
Table 11: Queensland – key statistics

Statistic	Total	Percentage
Population (million, % of Australian total)	4.56	20
Emissions (MtCO ₂ e, % of Australian total)	134.5	24.7
Per capita emissions (tCO ₂ e per person)	29.5	/
New large-scale renewable energy capacity since 2001 (July 2014) (MW, % of Australian total)	682	13
Installed renewable energy capacity (December 2013) (MW, % of Australian total)	2219	14
Installed wind capacity (December 2013) (MW)	12.5	/
Installed wind capacity (December 2013) (MW)	1,151	/
Dwellings with solar PV (%)	/	25
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory)	3478	6
Renewable energy jobs (number, % of Australian total)	6545	31

Note: The referenced large-scale renewable capacity data includes significantly more landfill gas for Queensland - 509 MW of landfill gas more than fifteen times NSW's 33 MW, the next highest amount.

Sources: ABS 2012; Australian PV Institute 2014; Commonwealth of Australia 2014; Clean Energy Council 2014a,b and c; Department of Environment 2014

Western Australia



Emissions

Western Australia's annual greenhouse gas emissions were 75.9 MtCO₂e in 2012, representing 14 percent of Australia's emissions. Western Australia's emissions have been growing since 1990 (Department of Environment 2014, ABS 2012).

Western Australia has the second highest per capita emissions overall (after the Northern Territory) at 31.23 tCO₂e per person (Department of Environment 2014, ABS 2012).

Emissions reduction targets

Previously, Western Australia had a goal to reduce greenhouse gas emissions by 60 percent below 2000 levels by 2050, an aspirational target of 15 percent renewables and 60 percent cleaner energy (gas and renewables) on the South West Interconnected System by

2020 (Western Australian Government 2007). These targets remained 'active' in December 2009 but were subsequently removed with the release of new energy and climate change policies in 2011 and 2012 respectively (Department of Environment and Conservation 2009, Western Australian Government 2011 and 2012). Western Australia, therefore, does not have a state-based greenhouse gas emissions reduction target.

Renewable energy

In 2013, Western Australia had 936 MW of installed renewable energy capacity (Clean Energy Council 2013a), with 642 MW installed since 2001. Wind and solar make up the majority of Western Australia's renewables (Table 12).

Western Australia has the second largest wind farm in the country – 206 MW Collgar Wind Farm.

Mandurah is the top solar postcode with 7,362 solar PV systems, totaling 14.5 MW (Australian PV Institute 2014). Mandurah residents earn less than the average wage in Western Australia, reflecting a nation-wide trend of solar uptake being highest in areas with lower than average incomes (RenewEconomy 2014d).

Renewable energy targets

The state does not have a renewable energy target (Western Australian Government 2011, 2012).

Renewable energy policy

Western Australia's feed-in tariff scheme was closed in 2011. Households installing renewable energy such as solar PV systems receive payment for electricity

exported to the grid at a rate set by the retailer. Synergy customers receive 8.4c/kWh and Horizon Energy customers between 10 to 50c/kWh depending on the location (Solar Market 2014).

Table 12: Western Australia – key statistics

Statistic (measure)	Total	Percentage
Population (million, % of Australian total)	2.43	11
Emissions (MtCO ₂ e, % of Australian total)	75.9	14
Per capita emissions (tCO ₂ e per person)	31.23	/
New large-scale renewable energy capacity since 2001 (July 2014) (MW, % of Australian total)	642	13
Installed renewable energy capacity (December 2013) (MW, % of Australian total)	936	6
Installed wind capacity (December 2013) (MW)	491	/
Installed solar PV capacity (December 2013) (MW)	398	/
Dwellings with solar PV (%)	/	18.4
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory)	2075	11
Renewable energy jobs (number, % of Australian total)	1615	8

Sources: ABS 2012; Australian PV Institute 2014; Clean Energy Council 2014a,b and c; Commonwealth of Australia 2014; Department of Environment 2014

New South Wales



Emissions

New South Wales' annual greenhouse gas emissions are the largest of any state or territory, at 148.9 MtCO₂e and New South Wales is responsible for over a quarter, 27.4 percent of Australia's national emissions (Department of Environment 2014 and ABS 2012).

Greenhouse gas emissions in the state are largely caused by the mining and burning of fossil fuels, particularly coal. Emissions in New South Wales have been decreasing since around 2007. The state's 2012 emissions are 6.1 percent higher than 1990 levels (Department of Environment 2014 and ABS 2012). Per capita emissions in NSW were 20.43 tCO₂e per person in 2012 (Table 13).

Emissions reduction targets

New South Wales does not currently have targets for reducing emissions or expanding renewable energy.

The State Government had previously set targets limiting greenhouse gas emissions to:

- › 2000 levels by 2025.
- › 60 percent below 2000 levels by 2050 (NSW Greenhouse Office 2005).

New South Wales' emissions targets were removed in the process of drafting the new State Plan *NSW 2021* (ABC 2010, NSW Government 2011).

Renewable energy

The vast majority of NSW's renewable energy capacity is from old hydroelectric facilities such as the Snowy Hydro Scheme (Figure 7). New South Wales has the highest total installed renewable energy capacity (Clean Energy Council 2014). In 2013, NSW had 5,681 MW of installed renewable energy. However, only 599 MW of this total comes from new large scale renewable energy capacity installed since 2001 – placing New South Wales sixth lowest for installed renewable capacity per capita and last among the states (Commonwealth of Australia 2014).

NSW is home to Australia's largest solar thermal plant – the 9.3 MW Liddell facility, a plant used to pre-heat feedwater for the Liddell coal-fired power station.

Dubbo is NSW's top solar postcode with 4,024 solar PV systems installed totaling 8.8 MW (Australian PV Institute 2014).



Figure 7: Snowy Hydro Scheme, New South Wales

BOX 4 – NSW WAS A WORLD LEADER IN EMISSIONS TRADING

In 2003, New South Wales led the world by introducing the first mandatory greenhouse gas trading scheme – the Greenhouse Gas Reduction Scheme.

Under the Greenhouse Gas Reduction Scheme, mandatory emissions abatement targets were set and abatement certificates were available for activities such as renewable electricity generation, carbon sequestration, demand reductions or large user abatement.

After operating for nearly a decade, the trading scheme was closed in 2012 when the national Carbon Pricing Mechanism commenced operation. No new carbon pricing initiatives have been proposed in New South Wales since the Carbon Pricing Mechanism was revoked.

In 2003, New South Wales led the world by introducing the first mandatory greenhouse gas trading scheme – the Greenhouse Gas Reduction Scheme

Renewable energy policy

In 2013, the NSW Government released the *NSW Renewable Energy Action Plan* which outlines 24 actions and 3 goals designed to encourage renewable energy in NSW and support the state to meet its share of the national RET. The NSW Government's stated vision is for

a "secure, reliable, affordable and clean energy future for NSW". Goals in the plan include:

1. Attracting renewable energy investment
2. Building community support
3. Attracting and growing renewable energy expertise

The New South Wales Government has appointed a Renewable Energy Advocate to support the plan and facilitate renewable energy development in the state.

Feed-in tariffs for rooftop solar in New South Wales are currently set at 6.6 cents per kWh. This is the amount determined by the Independent Pricing and Regulatory Tribunal (IPART) as reflecting the value of solar PV without subsidy and without increasing the price of electricity in New South Wales (IPART 2013).

The \$743,000 initiative of the South East Region of Renewable Energy Excellence (SERREE) – a partnership formed and funded by the NSW and ACT governments, Regional Development Australia agencies and 20 large industry groups working in the region – was first conceived in mid-2011 to develop the region's economy through renewables. In November 2014, this renewable energy industry cluster in the south east NSW-ACT region received \$305,000 from the Australian Renewable Energy Agency (RenewEconomy 2014e).

Table 13: New South Wales – key statistics

Statistic	Total	Percentage
Population (million, % of Australian total)	7.29	32
Emissions (MtCO ₂ e, % of Australian total)	148.9	27.4
Per capita emissions (tCO ₂ e per person)	20.43	/
New large-scale renewable energy capacity since 2001 (July 2014) (MW, % of Australian total)	599	12
Installed renewable energy capacity (December 2013) (MW, % of Australian total)	5681	36
Installed wind capacity (December 2013) (MW)	282	/
Installed solar PV capacity (December 2013) (MW)	713	/
Dwellings with solar PV (%)	/	11.8
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory)	4554	7
Renewable energy jobs (number, % of Australian total)	4410	21

Note: New large-scale renewable energy capacity reflects additional projects commissioned since December 2013, and does not include 209 MW of field scale PV currently under construction.

Sources: ABS 2012; Australian PV Institute 2014; Clean Energy Council 2014a,b and c; Commonwealth of Australia 2014; Department of Environment 2014

Tasmania



Emissions

In 2012, Tasmania's greenhouse gas emissions were 7.8 MtCO₂e, the lowest of any state, and second lowest overall in Australia after the ACT. Tasmania is responsible for 1.4 percent of Australia's total emissions (2012 figures). Agriculture, Transport, Industrial processes and stationary energy are all significant contributors to Tasmania's emissions (Department of Environment 2014 and ABS 2012).

Tasmania has the lowest per capita emissions of any Australian state at 15.23 tCO₂e per person (in 2012) (Department of Environment 2014 and ABS 2012; Table 14).

Emissions reduction targets

Tasmania retains a 2050 target for emissions set in legislation, but no longer has targets for expanding renewable energy or interim targets for reducing emissions. Tasmania's *Climate Change (State Action) Act 2008* sets a greenhouse gas emissions reduction target of 60 percent below 1990 levels by 2050.

As recently as 2013, *Climate Smart Tasmania: A 2020 Climate Change Strategy* set a non-binding aspirational goal to reduce emissions 35 percent below 1990 levels by 2020 and Tasmania's Climate Action Council was consulting on a 100 percent renewable energy target for Tasmania's stationary energy by 2020 (Tasmanian Climate Action Council 2013).

Following the election of a new government in March 2014, Tasmania has abandoned its 2020 emissions reduction goal and abolished the state's Climate Action Council.

Following the election of a new government in March 2014, Tasmania has abandoned its 2020 emissions reduction goal and abolished the state's Climate Action Council

Renewable energy

In Tasmania, renewable energy such as hydroelectric and wind power already represent 87 percent of the state's installed electricity generation capacity. Despite the state's relatively small population, Tasmania followed New South Wales in total installed renewable capacity (2,695 MW) (Clean Energy Council 2014a). However, compared with the other states, Tasmania has installed the least new renewable energy capacity (344 MW) since 2001 (Commonwealth of Australia 2014).

In 2013, renewables made up 93 percent of electricity generated in Tasmania (Clean Energy Council 2014a).

Launceston is the State's top solar postcode with 1,701 solar PV systems installed totaling 5.4 MW (Australian PV Institute 2014).

Renewable energy policy

Tasmania currently applies 5.6 c/kWh feed-in tariff for household renewable energy systems less than 10 kilowatts in size (Office of the Tasmanian Economic Regulator 2014). Tasmania's feed-in tariff rate is the lowest in Australia (Solar Market 2014).

**In 2013, renewables made up
93 percent of electricity generated
in Tasmania**

Table 14: Tasmania – key statistics

Statistic	Total	Percentage
Population (million, % of Australian total)	0.512	2
Emissions (MtCO ₂ e, % of Australian total)	7.8	1.4
Per capita emissions (tCO ₂ e per person)	15.23	/
New large-scale renewable energy capacity since 2001 (July 2013) (MW, % of Australian total)	344	7
Installed renewable energy capacity (December 2013) (MW, % of Australian total)	2695	17
Installed wind capacity (December 2013) (MW)	310	/
Installed solar PV capacity (December 2013) (MW)	72	/
Dwellings with solar PV (%)	/	10
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory)	12235	93
Renewable energy jobs (number, % of Australian total)	990	5

Sources: ABS 2012; Australian PV Institute 2014; Clean Energy Council 2014a,b and c;
Commonwealth of Australia 2014; Department of Environment 2014

Australian Capital Territory (ACT)



Emissions

The ACT has the lowest per capita emissions in the country at 3.48 tCO₂e per person (Department of Environment 2014 and ABS 2012; Table 16).

The ACT has the lowest total greenhouse gas emissions of any Australian state or territory. ACT emissions in 2012 were 1.3 MtCO₂e representing 0.2 percent of Australia's national emissions (ABS 2012; Department of the Environment 2014).

The ACT Independent Competition and Regulatory Commission (2014) conducted its own assessment of the ACT's emissions and renewable energy use in 2012. Its ACT Greenhouse Gas Inventory Report found the territory's emissions were higher than the Department of the Environment (2014) figures when the ACT's reliance on stationary energy from the NEM was taken into account - the ACT's total emissions were 4.36 MtCO₂e and per capita emissions were 11.6 tCO₂e per

person (ACT Independent Competition and Regulatory Commission 2014). Based on these figures, the ACT remains the lowest total and per capita emitter among the states and territories.

The ACT's relatively small population, small land mass and lack of heavy industry contributes to the territory's low total and per capita emissions.

Emissions reduction targets

The ACT's *Climate Change and Greenhouse Gas Emission Reduction Act 2010* (the Act) establishes targets to reduce greenhouse gas emissions by:

- › 40 percent below 1990 levels by 2020.
- › 80 percent below 1990 levels by 2050.
- › Zero net greenhouse gas emissions by 2060.

The Act also sets a target for 90 percent of electricity consumed in the ACT to be provided by (large-scale) renewable energy by 2020 with an interim target of 20 percent to be achieved by the end of this year.

The ACT's 90 percent renewables target relies solely on local and regional renewable energy investments, meaning renewables contributing to the national large-scale RET will not count towards the ACT's target (ACT Government 2012).

Renewable energy

In 2013, the ACT had 47 MW of installed renewable energy (Clean Energy Council 2014a), the majority of which (42 MW) was solar PV. Although there are a number of wind farms close to the ACT, all of these are officially located in New

South Wales.

The recently completed 20 MW Royalla Solar PV plant successfully bid for a feed-in tariff under the ACT's first solar auction held in 2012 along with a further two projects totaling 20 MW. Some of the wind farms bidding for the ACT's wind auction may be located in NSW, which has attracted criticism from a handful of New South Wales parliamentarians (Canberra Times 2014).

Renewable energy policies and initiatives

The ACT's emissions and renewable energy targets are supported by *AP2 A new climate change strategy and action plan for the Australian Capital Territory* (ACT Government 2012). The ACT's plan proposes development of around 690 MW of large-scale renewable energy capacity by 2020 (Table 15) and a further 72 MW of small and medium scale solar PV.

Table 15: Targeted renewable energy generation sources in 2020

Source	Installed capacity (MW)	Annual generation (GWh)	Greenhouse gas abatement (ktCO ₂ -e)
Solar	90	150	114
Biomass	23	158	120
Wind	583	1,633	1,238

Source: ACT Government 2012

In order to achieve its renewable energy target, the ACT has established a system of reverse auctions under its *Electricity Feed-in (Large-Scale Renewable Energy Generation) Act 2011* whereby renewable energy projects compete for the right to a feed-in tariff. In 2012, the ACT government conducted its first solar auction for 40 MW of large-scale solar capacity. The first wind auction of 400 MW was held this year with more than 18 proposals (more than 1,000 MW capacity) bidding (ACT Government 2014).

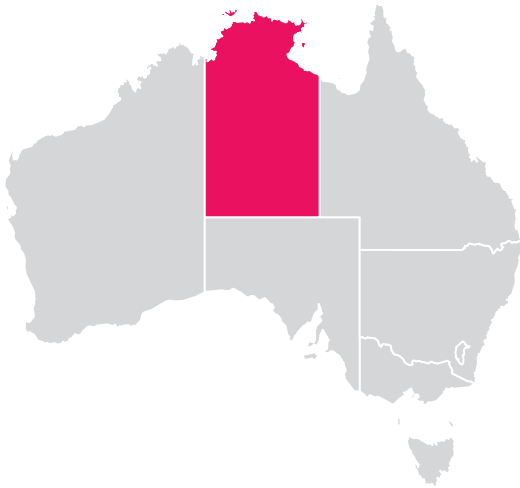
The ACT Government also provides a specific feed-in tariff to support Community Solar, enabling individuals to pool their resources and fund larger-scale solar projects (ACT Government 2014).

Table 16: Australian Capital Territory – key statistics

Statistic	Total	Percentage
Population (million, % of Australian total)	0.374	1.6
Emissions (MtCO ₂ e, % of Australian total)	1.3	0.2
Per capita emissions (tCO ₂ e per person)	3.4	/
New large-scale renewable energy capacity since 2001 (July 2014) (MW, % of Australian total)	26	0.5
Installed renewable energy capacity (December 2013) (MW, % of Australian total)	47	0.3
Installed wind capacity (December 2013) (MW)	0	/
Installed solar PV capacity (December 2013) (MW)	42	/
Dwellings with solar PV (%)	/	11.7
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory) - data not available	/	/
Renewable energy jobs (number, % of Australian total)	295	1

Sources: ABS 2012; Australian PV Institute 2014; Clean Energy Council 2014a,b and c;
Commonwealth of Australia 2014; Department of Environment 2014

Northern Territory



Emissions

The Northern Territory's total emissions in 2012 were 14.8 MtCO₂e, representing 2.7 percent of Australia's national emissions. The Northern Territory's emissions profile is unique in that its emissions are heavily influenced by the burning of savannas (ABS 2012; Department of the Environment 2014).

The Northern Territory has the highest per capita emissions in Australia at 62.98 tCO₂e per person (ABS 2012; Department of the Environment 2014).

Emissions reduction and renewable energy targets

The Northern Territory does not currently have targets for reducing emissions or expanding renewable energy. Indeed, the Northern Territory currently has no formal climate change policy.

The Northern Territory had previously established an aspirational goal to reduce emissions by 60 percent by 2050 from 2007 levels (Northern Territory Government 2009). The policy also established a goal to make the Territory a world-leading provider of green energy in remote areas.

Renewable energy

In 2013, the NT had 16 MW of installed renewable energy capacity (Clean Energy Council 2014a; Table 17). The Northern Territory's main source of renewable energy was solar PV - 15 MW.

Renewable energy policy

In the Northern Territory, most electricity retailers offer a solar buyback scheme (feed-in tariff). Feed-in tariff rates in the Northern Territory are the most generous in Australia. One retailer is currently offering 25.6 c/kWh (Jacana Energy 2014; Solar Market 2014).

Table 17: Northern Territory – key statistics

Statistic	Total	Percentage
Population (million, % of Australian total)	0.235	1
Emissions (MtCO ₂ e, % of Australian total)	14.8	2.7
Per capita emissions (tCO ₂ e per person)	62.98	/
New large-scale renewable energy capacity since 2001 (July 2014) (MW, % of Australian total)	5	0.1
Installed renewable energy capacity (December 2013) (MW, % of Australian total)	16	0.1
Installed wind capacity (December 2013) (MW)	0	/
Installed solar PV capacity (December 2013) (MW)	15	/
Dwellings with solar PV (%)	/	5.1
Electricity generation from renewables (December 2013) (GWh, % of total generation for state/territory) - data not available	/	/
Renewable energy jobs (number, % of Australian total)	95	0.5

Sources: ABS 2012; Australian PV Institute 2014; Clean Energy Council 2014a,b and c; Commonwealth of Australia 2014; Department of Environment 2014

Australia Now: An opportunity for states and territories to take the lead

In Australia, the states have historically led the way on emissions and renewable energy policy, and in doing so have influenced action at the national level.

- › In 2003, New South Wales introduced the Greenhouse Gas Reduction Scheme - the world's first mandatory emissions trading scheme. This state-based scheme preceded the adoption of the national Carbon Pricing Mechanism in 2011 (Parliament of Australia 2013; Figure 4).
- › In 2000, a national 2 percent by 2010 national mandatory renewable target precipitated the South Australian and Victorian governments introducing their own more substantial state based targets. The success of these state targets influenced the expansion of the national RET to 20 percent of projected demand by 2020 (legislated as 41,000 GWh of generation from large-scale renewable energy) (Parliament of Australia 2014).

Following the introduction of a national price on carbon and the expanded RET, some states and territories pulled back from their own emissions and renewable energy targets to instead work within and contribute towards the national schemes.

Now, with the federal government stepping back from carbon pricing and with ongoing uncertainty around the national RET, the states and territories have a prime opportunity to help Australia keep pace with international investment and uptake of renewable electricity. It is likely this shift will accelerate as nations work to avoid severe and irreversible climate change impacts. The most recent Intergovernmental Panel on Climate Change (2014) report has estimated that renewable energy must make up more than 80 percent of electricity generation by 2050 to avoid dangerous levels of global warming.

Australia's shift to competitive low emissions technology is fundamental to the country's long-term wealth creation and healthy future. The economics for renewables has changed dramatically in recent years, with wind and solar costs falling rapidly as global take-up accelerates (Climate Council 2014b). There are additional economic benefits for states and territories from encouraging investment in renewables – in job creation, investment (particularly in regional areas), and reduced electricity costs.

As other states step back, South Australia and the ACT have maintained and increased emissions reduction and renewable energy targets as well as positive policy settings encouraging renewable energy. This places South Australia and the ACT in the best position to reap the benefits of the global shift to cleaner energy and leaves the others playing catch up.

Abbreviations and acronyms

ACT	Australian Capital Territory
CO ₂ e	Carbon dioxide equivalent
kW	Kilowatt (1,000 watts)
Mt	Megatonne
MW	Megawatt (1,000,000 watts)
NEM	National Electricity Market
NSW	New South Wales
NT	Northern Territory
PV	Photovoltaic
QLD	Queensland
RET	Renewable Energy Target (refers specifically to Australia's national 41,000 GWh target)
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia

References

- Australian Broadcasting Corporation (ABC) (2010) Questions over NSW's commitment to reducing emissions. The World Today. Accessed at <http://www.abc.net.au/worldtoday/content/2010/s2857091.htm>.
- ABS (Australian Bureau of Statistics) (2012) 3218.0 - Regional Population Growth, Australia, 2011-12. Accessed at <http://www.abs.gov.au/ausstats/abs@.nsf/Products/3218.0~2011-12~Main+Features~Main+Features?OpenDocument#PARALINK0>.
- ACT (Australian Capital Territory) Government 2012 AP2 A new climate change strategy and action plan for the Australian Capital Territory. Accessed at http://www.environment.act.gov.au/___data/assets/pdf_file/0006/581136/AP2_Sept12_PRINT_NO_CROPS_SML.pdf.
- ACT Government (2013) 90 percent renewable energy target. Accessed at http://www.environment.act.gov.au/energy/90_percent_renewable.
- ACT Government (2014) Environment and Planning Directorate. Accessed at <http://www.environment.act.gov.au/energy>.
- ACT Independent Competition and Regulatory Commission (2014) ACT Greenhouse Gas Inventory Report 2011-12 Final Report.
- AEMO (Australian Energy Market Operator) (2013) 100 per cent renewables study modeling outcomes. Accessed at http://www.climatechange.gov.au/sites/climatechange/files/documents/08_2013/100-percent-renewables-study-modelling-outcomes-report.pdf.
- AEMO (2014) Generation Information. Accessed at <http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information>.
- Australian Energy Regulator (2012) State of the energy market 2013. Accessed at <http://www.aer.gov.au/node/18959>.
- Australian PV Institute (2014) Mapping Australian Solar PV installation (data from June 30).
- ATSE (Australian Academy of Technological Sciences and Engineering) (2009) The Hidden Costs of Electricity: Externalities of Power Generation in Australia. Accessed at <http://www.atse.org.au/Documents/Publications/Reports/Energy/ATSE%20Hidden%20Costs%20Electricity%202009.pdf>.
- Canberra Times (2014) Put windfarms on Red Hill, not in NSW, say politicians. Accessed at <http://www.canberratimes.com.au/act-news/put-windfarms-on-red-hill-not-in-nsw-say-politicians-20140401-35v1w.html>.
- Chapman S (2013) The Conversation. Wind turbine syndrome: farm hosts tell a different story. Accessed at <http://theconversation.com/wind-turbine-syndrome-farm-hosts-tell-very-different-story-18241>.
- Clean Energy Council (2014a) Clean Energy Australia Report 2013.
- Clean Energy Council (2014b)

Wind energy in Australia: 2013 in focus. Accessed at <http://www.cleanenergycouncil.org.au/technologies/wind-energy.html>.

Clean Energy Council (2014c) Solar PV in Australia: 2013 in focus. Accessed at <http://www.cleanenergycouncil.org.au/technologies/solar-pv.html>.

Clean Energy Council (2014d) Geothermal energy in Australia: 2013 in focus. Accessed at <http://www.cleanenergycouncil.org.au/technologies/wind-energy.html>.

Clean Energy Council (2014e) Concentrated solar thermal in Australia. Accessed at <http://www.cleanenergycouncil.org.au/technologies/wind-energy.html>.

Climate Change Authority (2012) Renewable energy target review Issues Paper. Accessed at <http://climatechangeauthority.gov.au/sites/climatechangeauthority.gov.au/files/RET-Review-20120820.pdf>.

Climate Commission (2013) The Critical Decade 2013: Climate Change Science, Risks and Responses. Steffen W and Hughes L. Accessed at <http://www.climatecouncil.org.au/uploads/b7e53b20a7d6573e1ab269d36bb9b07c.pdf>.

Climate Council (2014a) Lagging Behind: Australia and the global response to climate change. Flannery T, Hueston G and Stock A. Accessed at <https://www.climatecouncil.org.au/category/reports>.

Climate Council (2014b) Australia's Electricity Sector: Ageing, Inefficient and Unprepared. Stock A. Accessed at [https://www.climatecouncil.org.au/australia-s-electricity-sector-ageing-inefficient-](https://www.climatecouncil.org.au/australia-s-electricity-sector-ageing-inefficient-and-unprepared)

and-unprepared.

Climate Institute (2011) Clean energy jobs in regional Australia Snapshot Nationwide.

Cludius J, Forrest S and MacGill I (2014) Distributional effects of the Australian Renewable Energy Target (RET) through Wholesale and Retail Electricity Price Impacts. Centre for Energy and Environmental Markets, University of New South Wales.

Commissioner for Environmental Sustainability Victoria (2013) Science Policy People Victoria: State of the Environment. Accessed at <http://www.ces.vic.gov.au/victorias-environment/state-of-environment-victoria-2009-2013>.

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

Department of Sustainability and Environment (2012) "Report on Climate Change and Greenhouse Gas Emissions in Victoria". March 2012. Accessed at http://www.climatechange.vic.gov.au/__data/assets/pdf_file/0005/136490/DSE_Greenhouse-Report_online.pdf.

Department of the Environment (2014) State and Territory Greenhouse Gas Inventories 2011-12 Australia's National Greenhouse Accounts. Accessed at <http://www.environment.gov.au/system/files/resources/255447ab-3c51-412e-9756-921ef23cb8aa/files/state-territory-inventories-11-12.pdf>.

Department of Environment and Conservation (2009) Western Australian Complementary Measures Review Final Report to COAG. Office of Climate Change.

Department of Energy and Water Supply (2014) PowerQ: a 30-year strategy for Queensland's electricity sector. Accessed at http://www.dews.qld.gov.au/__data/assets/pdf_file/0004/172273/powerq.pdf.

Department of State Development Business and Innovation (2014) Victoria's Energy Statement. Accessed at http://www.energyandresources.vic.gov.au/__data/assets/pdf_file/0005/214655/Victorias-Energy-Statement.pdf.

Elliston B, I MacGill and M Diesendorf (2014) Comparing least cost scenarios for 100% renewable electricity with low emission fossil fuel scenarios in the Australian National Electricity Market. *Renewable Energy*, 66: 196-204.

Environment Defenders Office (Victoria) Wind farms or coal mines? Which one will be subject to stricter planning controls. Accessed at http://envirojustice.org.au/sites/default/files/files/Submissions%20and%20reports/wind_farm_comparison_paper.pdf.

Environment Victoria (2014) Sun Blocks and Wind Breaks: 25 Attacks on Clean Energy by the Baillieu and Napthine Governments. Accessed at http://environmentvictoria.org.au/sunblocksandwindbreaks#.VGA5j_mUdDN.

Epstein PR, Buonocore JJ, Eckerle K, Hendryx M, Stout III BM, Heinberg R, Clapp RW, May B, Reinhart NL, Ahern MM, Doshi SK and Glustrom L (2011) Full cost accounting for the life cycle of coal in "Ecological Economics Reviews." Costanza R, Limburg K and Kubiszewski I, Eds. *Ann. N.Y. Acad. Sci.* 1219: 73-98.

Epuron (2014) Landowners. Accessed at

<http://www.epuron.com.au/community/landowners/>.

Ergon Energy (2014) New solar standards allow more customer choice.

Geoscience Australia and ABARE (2010) Australian Energy Resource Assessment, Canberra. Accessed at <http://arena.gov.au/files/2013/08/Australian-Energy-Resource-Assessment.pdf>.

Government of South Australia (2011a) In a great state South Australia's Strategic Plan. Accessed at <http://saplan.org.au/media/>.

Government of South Australia (2011b) A Renewable Energy Plan for South Australia. Accessed at <http://www.renewablenessa.sa.gov.au/files/111019-renewable-energy-plan-for-south-australia.pdf>.

IPART (Independent Pricing and Regulatory Tribunal) (2013) Solar feed-in tariffs The subsidy-free value of electricity from small-scale PV units from 1 July 2013

IPCC (Intergovernmental Panel on Climate Change) (2014) Climate Change 2014 Synthesis Report Summary for Policy Makers http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_SPM.pdf.

Jacana Energy (2014) Photovoltaic (PV) systems. Accessed at http://jacanaenergy.com.au/sustainability_and_environment/photovoltaic_pv_solar_systems accessed 23 October 2014.

Jones M (2012) State climate schemes still worthwhile under a carbon price.

The Conversation. 29 March 2012.
Accessed at <http://theconversation.com/state-climate-schemes-still-worthwhile-under-a-carbon-price-6131>.

Northern Territory Government (2009) Northern Territory Climate Change Policy. Accessed at <http://www.savanna.org.au/nailsma/forum/downloads/Climate-change-policy-NTG.pdf>.

NSW Government (2011) NSW 2021: A plan to make NSW number one. Accessed at http://www.nsw.gov.au/sites/default/files/nsw_2021_plan.pdf.

NSW Government (2013) NSW Renewable Energy Action Plan. Accessed at http://www.resourcesandenergy.nsw.gov.au/__data/assets/pdf_file/0010/475318/Renewable-Energy-Action-Plan.pdf.

NSW Greenhouse Office (2005) NSW Greenhouse Plan. Accessed at <http://www.environment.nsw.gov.au/resources/climatechange/2811FINALNSWGHPlanweb.pdf>.

Office of the Tasmanian Economic Regulator (2014) Feed-in Tariffs. Accessed at <http://www.energyregulator.tas.gov.au/domino/otter.nsf/elect-v/30>.

Organisation for Economic Cooperation and Development (OECD) 2014 StatExtracts. Accessed at http://stats.oecd.org/Index.aspx?DataSetCode=AIR_GHG.

Parliament of Australia (2013) Australian climate change policy: a chronology. Accessed at http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1314/ClimateChangeTimeline.

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.

Queensland Competition Authority (2014) Carbon exclusive regional feed-in tariff 5 September 2014. Accessed at <http://www.qca.org.au/Media-Centre/Media-Releases/Media-Releases/2014/Sep/Carbon-exclusive-regional-feed-in-tariff>.

Queensland Government (2007) ClimateSmart 2050: Queensland climate change strategy 2007: A low carbon future.

REN21 (2014) Renewables 2014: Global Status Report. Accessed at <http://www.ren21.net/REN21Activities/GlobalStatusReport.aspx>.

Renewables SA (2014) \$10 billion target for Low Carbon Investment. Accessed at <http://www.renewablessa.sa.gov.au/about-us/publications-and-reports>.

RenewEconomy (2014a) South Australia hits 100% renewables – for a whole working day .Giles Parkinson, 7 October. Accessed at <http://reneweconomy.com.au/2014/south-australia-hits-100-renewables-whole-working-day-86069>.

RenewEconomy (2014b) Who is the greenest energy retailer in Australia? Giles Parkinson, 6 June 2014. Accessed at <http://reneweconomy.com.au/2014/who-is-the-greenest-energy-retailer-in-australia-90911>.

RenewEconomy (2014c) 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>.

RenewEconomy (2014d) Top WA solar postcodes have lower than average incomes. Accessed at <http://reneweconomy.com.au/2014/top-wa-solar-postcodes-have-lower-than-average-incomes-70354>.

RenewEconomy (2014e) NSW-ACT renewable energy cluster gets backing from ARENA. Accessed at <http://reneweconomy.com.au/2014/arena-backs-development-actnsw-renewables-industry-cluster-88005>.

Sinclair Knight Merz (2013) Estimating the Impact of the RET on Retail Prices. Gerardi W and Nidras P.

Sinclair Knight Merz (2014) Impact of Wind Generation on Spot Prices in Victoria and South Australia. Meridian Energy.

SMH (Sydney Morning Herald) (2013) Wind farms may be more acceptable in Victoria 19 December 2013.

Solar Market (2014) Solar Feed-in Tariffs. Accessed at <https://www.solarmarket.com.au/learn/tariffs/>.

Tasmanian Climate Action Council (2013) A blueprint for action Responding to Climate Change in Tasmania. Accessed at http://www.dpac.tas.gov.au/__data/assets/pdf_file/0005/197267/TCACpaper_Blueprint_for_Action_May2013.PDF.

The Guardian (2014) Australia's investment in renewable energy slumps 70% in one

year. Accessed at <http://www.theguardian.com/australia-news/2014/oct/03/australias-investment-in-renewable-energy-slumps-70-in-one-year>.

Victorian Government (2012a) Victorian Government response to the Climate Change Act Review. Accessed at http://www.climatechange.vic.gov.au/__data/assets/pdf_file/0010/136486/CCAREV-Report_online.pdf.

Victorian Government (2012b) Policy and planning guidelines for the development of wind energy facilities in Victoria Department of Planning and Community Development. Accessed at http://www.dtpli.vic.gov.au/__data/assets/pdf_file/0009/231768/Policy-and-planning-guidelines-for-development-of-wind-energy-facilities-in-Victoria-July-2012.pdf.

Victorian Government (2014) Victorian Feed in tariff schemes Department of State Development Business and Innovation, website accessed 21 October 2014. Accessed at <http://www.energyandresources.vic.gov.au/energy/environment-and-community/victorian-feed-in-tariff-schemes>.

Western Australian Government (2007) Making Decisions for the Future: Climate Change. The Premier's Climate Change Action Statement.

Western Australian Government (2011) Energy 2031 Strategic Energy Initiative Directions Paper A smarter energy future for Western Australians.

Western Australian Government (2012) Adapting to our changing climate Department of Environment and Conservation.

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