Renewable Energy Index

October 2018

Green Energy Markets, November 2018

Key highlights

The recent rapid rate of wind and solar installations puts Australia's main grids on track to have three-quarters of their electricity from renewables by 2030.

The renewable energy industry has built itself up to such a significant scale that even a 50% by 2030 renewables target will involve a significant contraction in activity and employment in the industry. The government's 2030 target would involve a collapse.

- October saw another record broken as Australian homes and businesses installed more than 150 megawatts of solar on rooftops for the first time. This is 76% greater than the monthly average of last year - which itself was a record year for installations.
- The total amount of rooftop solar installed so far this year has already passed last year's total and now stands at 1,243 megawatts. This exceeds the Liddell coal power station's average capacity over last summer's peak period. By the end of the year it's quite likely the total capacity installed in 2018 will exceed the peak capacity of the recently closed Hazelwood coal power station. Such an amount of capacity could be expected to save solar system owners close to $3 billion in energy costs over the next ten years.
- In terms of large-scale projects (wind and solar farms) there were 412 megawatts committed to construction in October, bringing the year to date total to just over 3,200 megawatts. This comes on top of 3,933 megawatts committed in the prior year.
- If we maintained over the next decade the record rate of both rooftop solar installations and wind and solar farm construction commitments that have prevailed since 2017 then renewable energy would represent 78% of electricity supply across Australia's west and east coast main grids. By comparison renewables made up 22.5% in October this year.
- While a number of interest groups have criticised the 50% by 2030 renewable energy targets of the Federal Labor Party and several state Labor governments as too ambitious, they would in fact involve a major contraction in construction activity and employment in the renewable energy industry.
- The amount of megawatts of new renewable energy capacity required each year to achieve a 50% target is around 1,850 megawatts. By comparison the average rate of construction commitments and rooftop solar installations over January 2017 to October 2018 is running at almost 5,150 megawatts per year. The Coalition's 2030 emissions target, as embodied within the proposed National Energy Guarantee would involve a collapse to 839 megawatts per year.
- Currently large-scale projects under construction as well as the October rate of solar installations support over 24,000 jobs per annum. The rate of installations required to deliver **50% renewable energy would see employment drop by three quarters** to just under 5,900 jobs per annum. **The Coalition's target under the NEG would see more than 20,000 jobs lost in the renewable energy industry, with annual jobs dropping to 3,039.**

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About this report

The Green Energy Markets' Renewable Energy Index tracks on a monthly basis the amount of renewable energy Australia relies on, the jobs it's creating, the power bill savings it is delivering for Australian households, and the environmental benefits of the rising use of clean power.

This edition covers the period of October 2018.

The Renewable Energy Index is funded by GetUp! to provide a reliable, up-to-date record on renewable energy's contribution to Australia.

Green Energy **Markets** Pty Ltd
ABN 92 127 062 864
2 Domville Avenue
Hawthorn VIC 3122 Australia
T +61 3 9805 0777
F +61 3 9815 1066
insight@greenmarkets.com.au
greenmarkets.com.au

1. Australia's current rate of installs would deliver 78% renewables if maintained to 2030

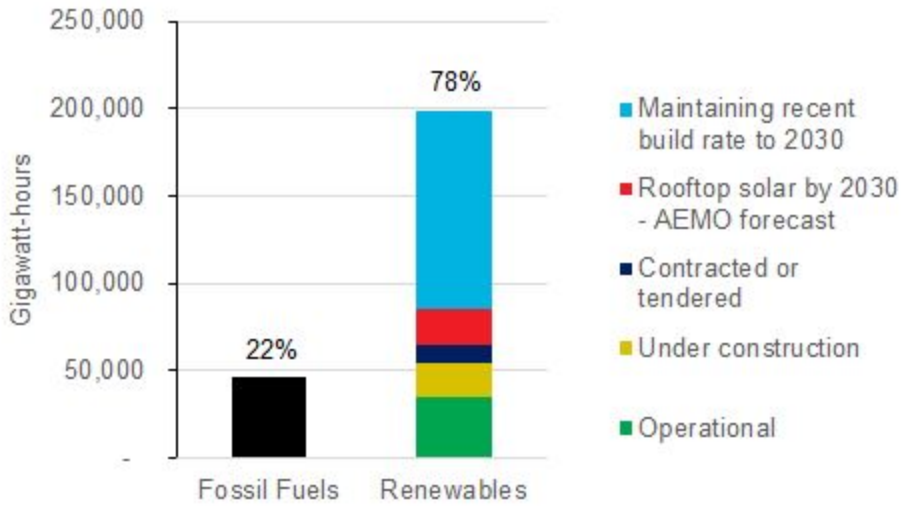

Figure 1: Projected sources of power generation in 2030 across East and West Coast main grids under scenario where the rate of renewable energy commitments since 2017 were maintained over 2020-2030

2. A 50% renewables target will involve installations falling to almost a third of recent rates

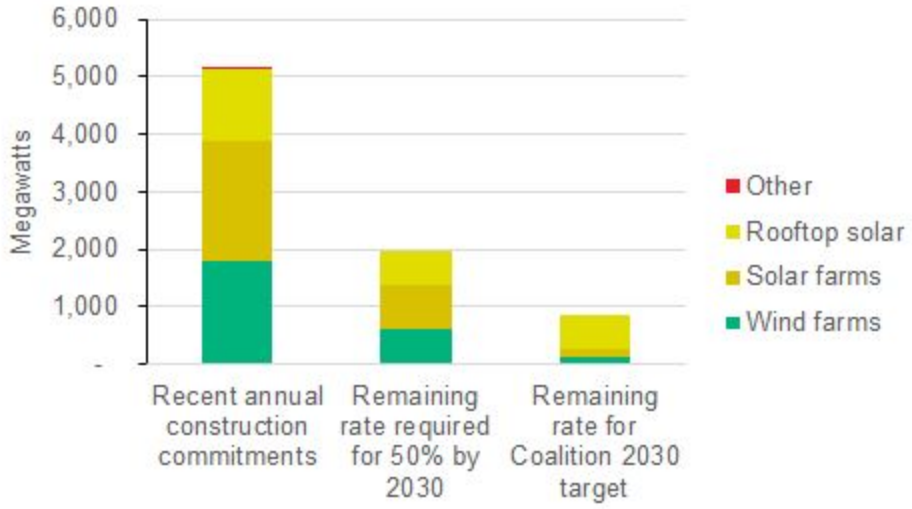

Figure 2: Annualised rate of renewable energy installation/construction commitments based on monthly averages Jan 2017 to Oct 2018 compared to additional annual capacity required to meet 50% by 2030 or Coalition's 2030 emissions target under prior National Energy Guarantee.

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3. Installs to deliver 50% by 2030 target will only need a quarter of the current renewables workforce

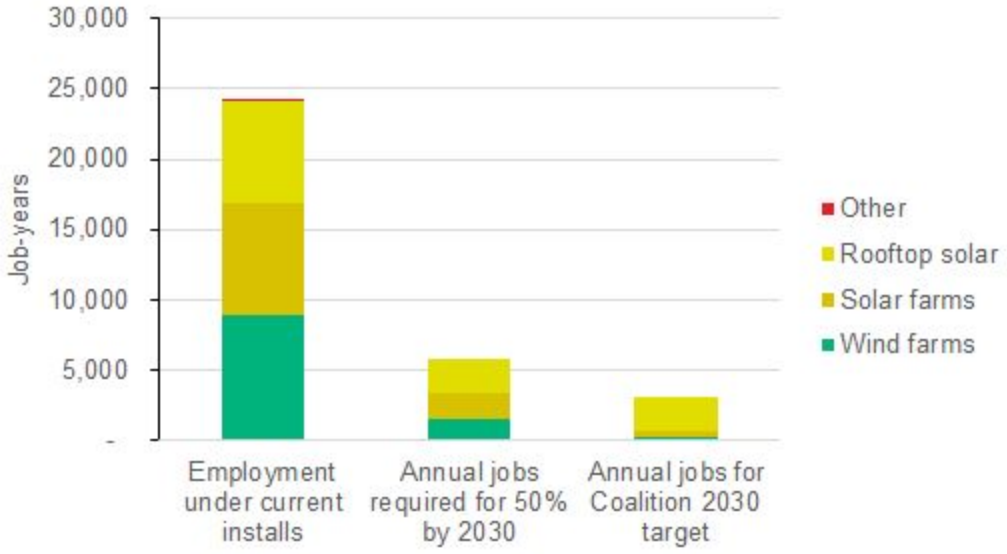

Figure 3: Job years of employment in projects under construction and rooftop solar installs for October 2018 compared to annual jobs sustained under build rate required for 50% renewables by 2030 or Coalition's 2030 emissions target under prior National Energy Guarantee.

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What renewable energy is contributing to the grid

4. In October renewables made up 22.5% of the electricity generated in Australia's main grids

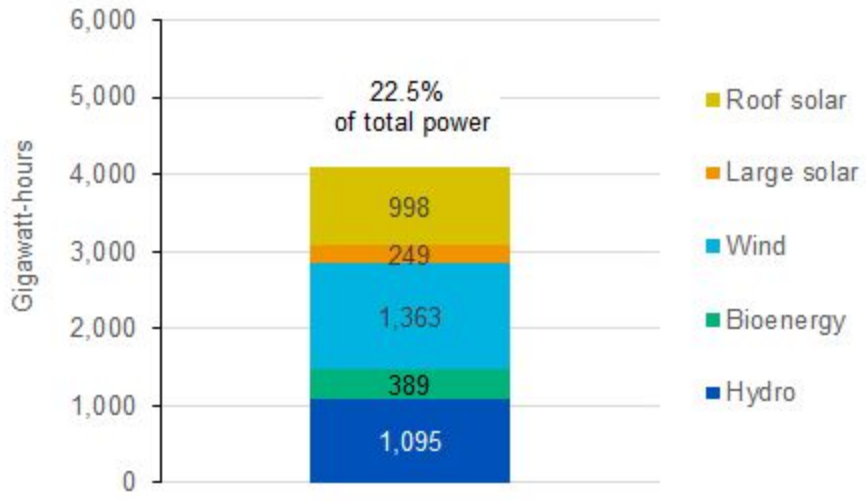

Figure 4: Renewable energy power generation by fuel & market share for west & east coast power grids – October 2018

5. Enough renewable energy over October to power 10 million homes

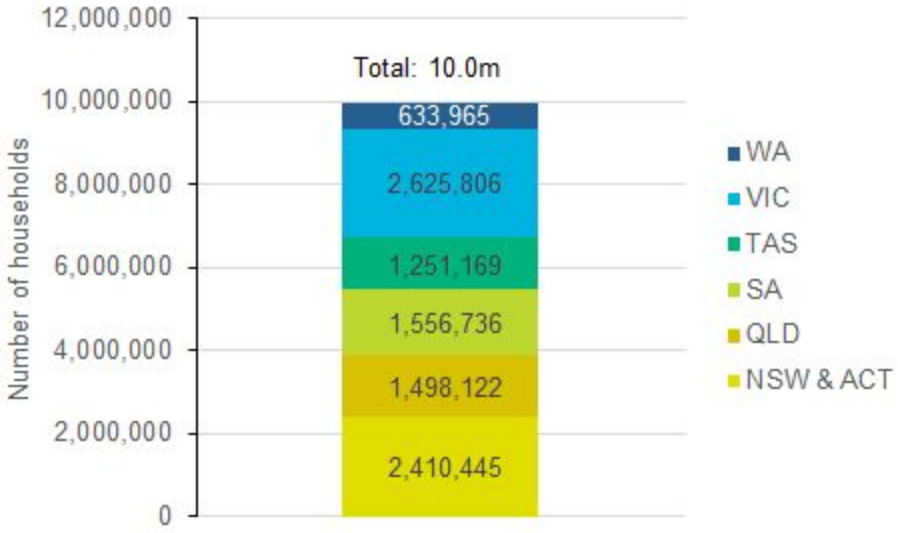

Figure 5: Renewable energy power generation October 2018 in terms of number of households' power consumption by state

6. Renewable energy avoided 2.8 million tonnes of CO2 pollution in October

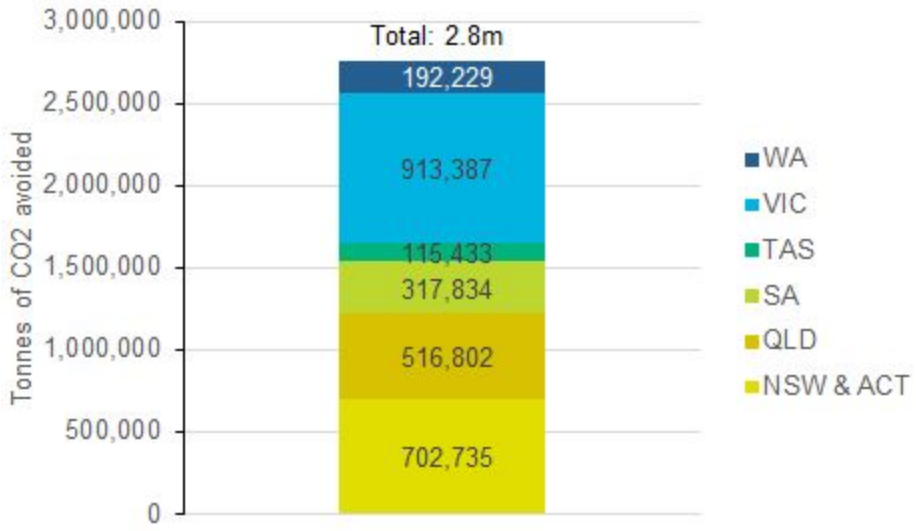

Figure 6. CO2 pollution avoided by renewable energy generation over October 2018

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7. Renewable energy avoided 10.5 million cars' worth of CO2 pollution in October

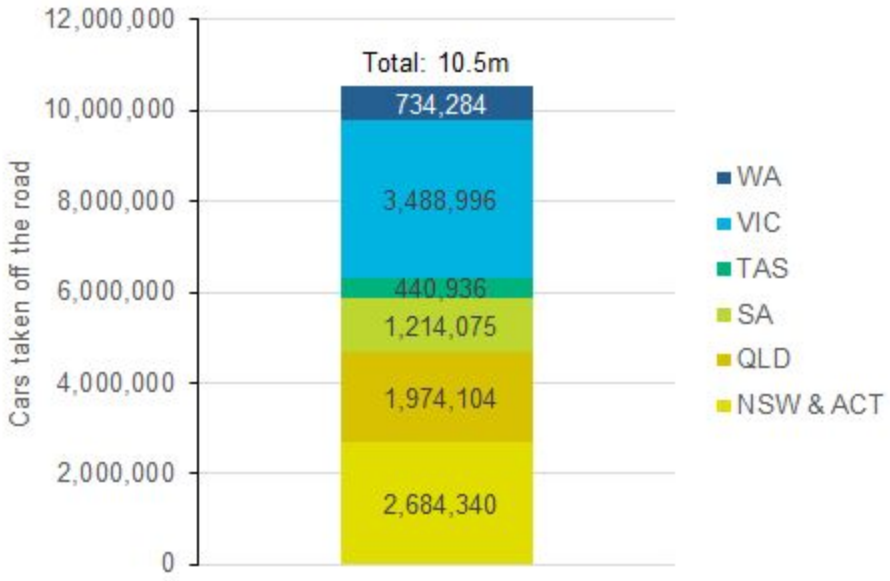

Figure 7. Number of cars' CO2 pollution avoided by renewable energy generation over October 2018

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Large-scale renewables construction activity

8. 6,778 megawatts of large-scale renewables currently under construction

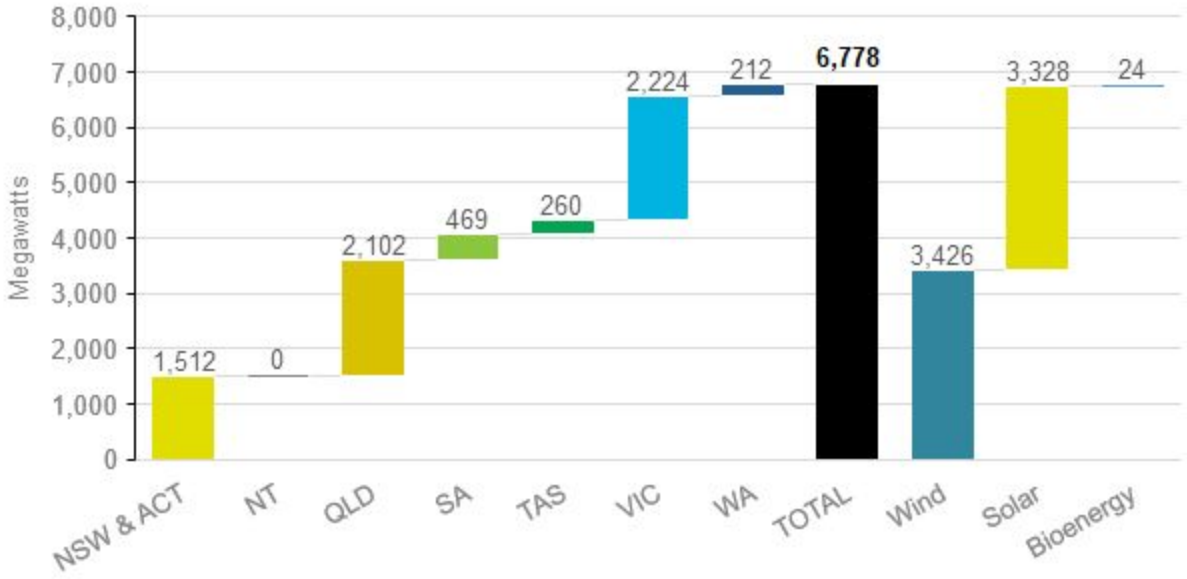

Figure 8: Megawatts of large-scale renewable energy projects under construction by state and fuel at end of October 2018

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9. Enough work to employ 16,944 people

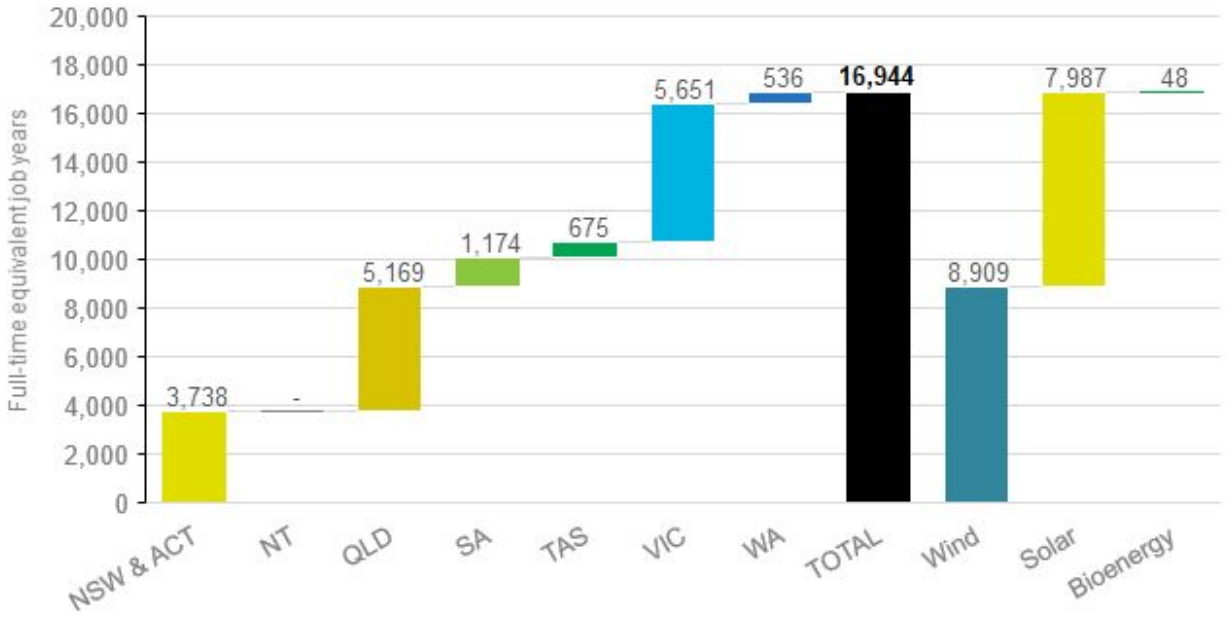

Figure 9: Job-years created by renewable energy projects currently under construction by state and fuel - as at end of October 2018

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Rooftop solar installation activity

10. 21,173 small-scale solar systems installed in October

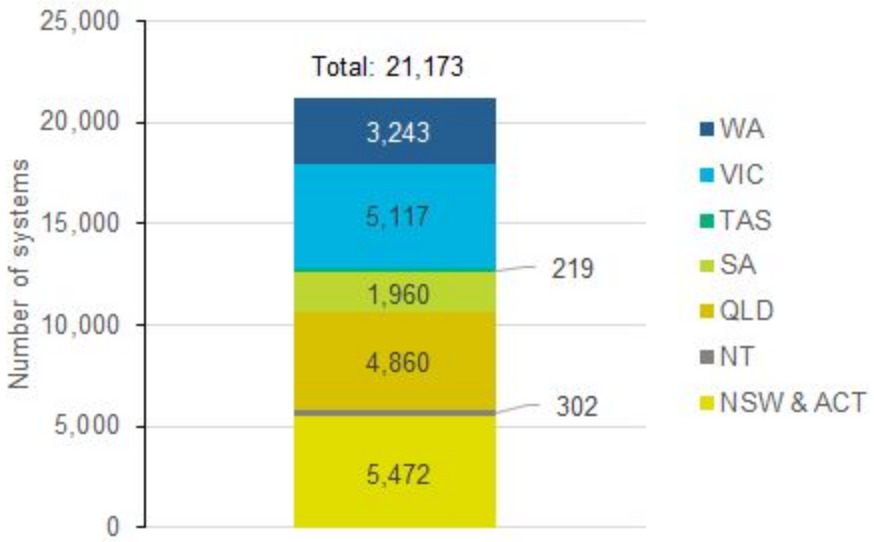

Figure 10: Small-scale solar PV systems installed by state - October 2018

11. Rooftop solar employed 7,368 people in October

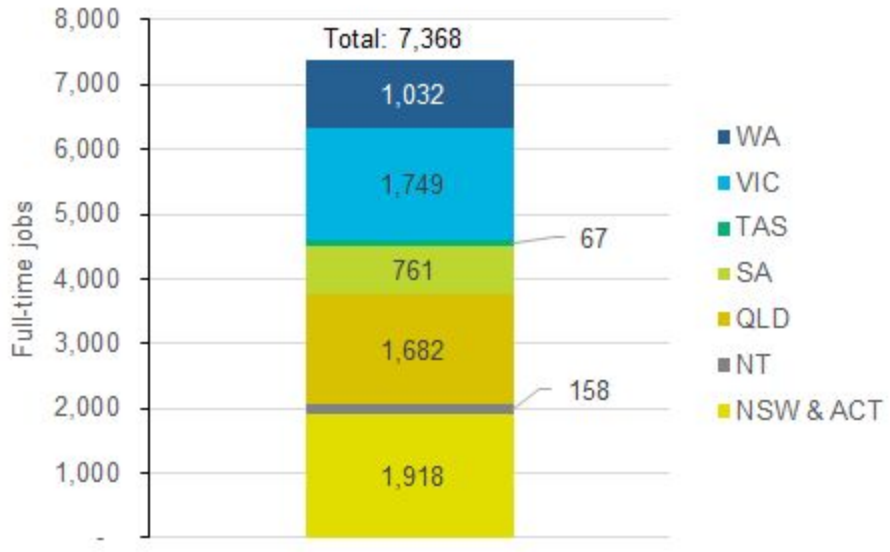

Figure 11. Number of full-time equivalent jobs by state in the installation and sale of rooftop solar PV systems installed over October 2018

12. Enough rooftop solar installed in October to power 45,684 homes

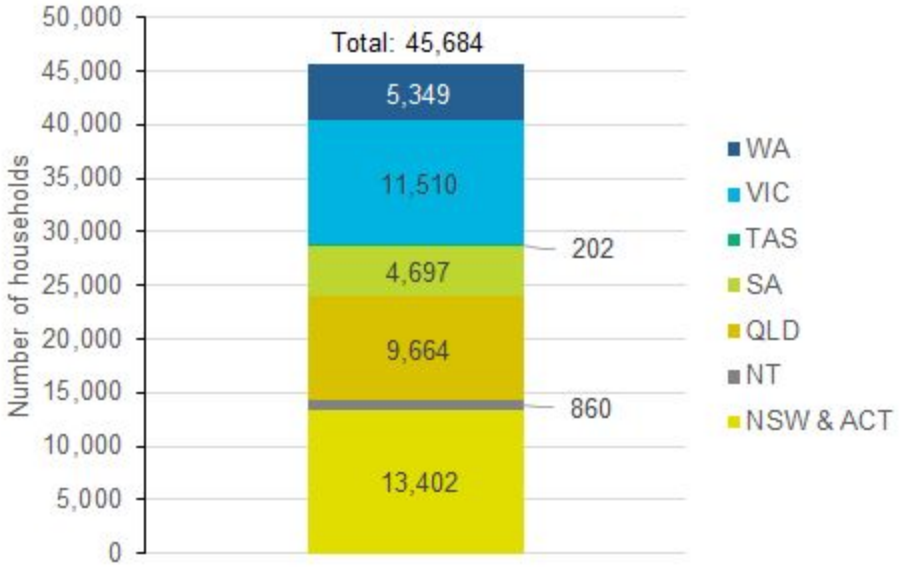

Figure 12: Expected generation from solar systems installed over October in terms of number of households' power consumption

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13. Rooftop solar installed in October will deliver $299 million in bill savings

Figure 13: Power bill savings (in $millions) over next ten years from rooftop solar systems installed in October 2018

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Notes on sources and methodology

Figure 1 – Generation from rooftop solar PV under business as usual by 2030 is based on projections from the Australian Energy Market Operator's (AEMO) Statement Of Opportunities publications for the National Electricity Market and Western Australian South-West Interconnected System with Western Australian solar generation extrapolated from 2027-28 based on the growth rate of rooftop solar generation for that year - 5.7% per annum. Generation for operational, under construction and contracted renewable energy projects sourced from Green Energy Markets' Power Plant Database which tracks information on every renewable energy project in the country that is currently registered or likely to register under the Large-Scale Renewable Energy Target. The block of generation from maintaining the recent build rate is based on the generation we estimate from the installation levels of rooftop solar and project construction commitments of large-scale renewable energy projects (mainly wind and solar farms) between January 2017 and October 2018. These are converted into an average annualised level of additional generation and then multiplied by ten years. Total electricity consumption is based on AEMO's Statement of Opportunities projections for "Native" energy consumption plus rooftop solar generation to 2030 in the case of the National Electricity Market. For the Western Australian South-West Interconnected System, electricity consumption is based on "operational" energy consumption plus rooftop solar PV generation projections in AEMO's WA Statement of Opportunities extrapolated from 2027-28 to 2030-31 based on an average annual growth rate of 0.9%. The residual of demand not covered by renewables is assumed to be satisfied by fossil fuels. The analysis does not take into account time of day patterns for renewable energy generation and their possible mismatch with demand which would be resolved through a combination of energy storage, demand management and greater use of dispatchable sources of renewable energy.

Figure 2 - Recent annual construction commitments for large scale renewable energy projects are based on commitments between January 2017 and October 2018 converted into an annualised rate and sourced from Green Energy Markets' Power Plant Database. Rooftop solar installations are also taken from the period between January 2017 and October 2018 converted into an annualised rate and sourced from Green Energy Markets' Solar Report based on the creation date of Small Scale Technology Certificates associated with solar PV systems with data extracted from the Clean Energy Regulator's registry of Small Scale Technology Certificates. The amount of commitments required to achieve 50% renewable energy is derived from AEMO's Statement of Opportunities projections for "Native Energy" consumption plus rooftop solar generation to 2030 in the case of the National Electricity Market and for the Western

Australian South-West Interconnected System, it is based on “operational” energy consumption which are extrapolated from 2027-28 to 2030-31 based on an average annual growth rate of 0.9% (with rooftop solar also added). To estimate the amount of additional renewable energy to achieve 50% of this electricity consumption we first deduct the expected generation from large scale projects that are operational, under construction and likely to be delivered under long term contracts and tenders (sourced from Green Energy Markets’ Power Plant Database) as well as current installed capacity of rooftop solar PV. Rooftop solar estimates are based on expected 2030 rooftop solar generation projected in AEMO’s Statement of Opportunities for the National Electricity Market and WA’s South-West Interconnected System with WA’s solar generation extrapolated from 2027-28 based on the growth rate of rooftop solar generation for that year - 5.7% per annum. The remaining generation required to deliver 50% of electricity demand is then assumed to be met half by wind and half by solar photovoltaics. The amount of wind capacity is based on a 35% capacity factor and the amount of solar is based on a 27% capacity factor. To estimate the amount of additional capacity required to achieve the Coalition’s 2030 NEG target we first deduct the the expected generation from large scale projects that are operational, under construction and likely to be delivered under long term contracts and tenders (sourced from Green Energy Markets’ Power Plant Database) as well as current installed capacity of rooftop solar PV. The additional rooftop solar going forward is based on expected 2030 rooftop solar generation projected in AEMO’s Statement of Opportunities for the National Electricity Market and WA’s South-West Interconnected System with WA’s solar generation extrapolated from 2027-28 based on the growth rate of rooftop solar generation for that year - 5.7% per annum. This leaves a residual of electricity demand within the NEM (SWIS is not covered by the NEG) that needs to be met by other sources of generation while keeping emissions 26% below 2005 levels but with an allowance for use of ACCUs which we assume could deliver at least 10m tonnes of CO2. We constrain gas generation to its 2010-2017 annual average, and reduce black and brown coal to levels consistent with the emission contraint with the remainder of electricity demand met by new wind and solar farms on 50/50 basis.

Figure 3 - The amount of employment under current installations is derived from a combination of the estimates shown in Figure 9 and Figure 11. The amount of annual jobs required for a 50% Renewable Energy Target and Coalition’s 2030 NEG target takes the annual capacity installations to achieve that target detailed in Figure 2 and then applies the same methods used for Figures 9 and Figure 11 to extrapolate an amount of job years of employment to install that capacity.

Figure 4 – Data sourced from the Australian Energy Market Operator (AEMO) via NEM Review for all power except rooftop solar PV generation in the WEM. Rooftop solar PV generation in the WEM is derived from an estimate of the cumulative installed capacity in WA multiplied by a

generic capacity factor for each month derived from AEMO's 2017 WA Electricity Statement of Opportunities with a discount to align it with Clean Energy Regulator estimates for solar PV annual average generation.

Figure 5 – This chart is calculated by dividing the amount of renewable energy produced in each state by the average annual electricity consumption of households in that state which are sourced from the Australian Energy Market Commission's 2016 Residential Electricity Price Trends publication.

Figure 6 – This chart is calculated by multiplying the amount of renewable energy produced in each state by the average emissions intensity of grid power in that state sourced from the Australian Government's National Greenhouse Accounts Factors – July 2017. Readers should note this is an approximate measure because estimating abatement precisely depends on a complex array of factors. The method employed in the Index is highly likely to underestimate abatement delivered by renewable energy in Tasmania and South Australia while potentially overestimating abatement in Victoria and to a lesser extent other states.

Figure 7 – This chart is calculated by dividing the estimated tonnes of CO2 avoided by renewable energy generation by the average emissions of an Australian passenger car. The average annual emissions of an Australian passenger car was derived by dividing the total CO2 emissions of Australia's passenger cars sourced from the Australian Government's 2016 Emissions Projections by the number of passenger vehicles in Australia as estimated in the Australian Bureau of Statistics' 2016 Motor Vehicle Census (31 Jan 2016).

Figure 8 – This data is sourced from Green Energy Markets' Power Plant Register which tracks information on every renewable energy project in the country that is currently registered or likely to register under the Large-Scale Renewable Energy Target.

Figure 9 – This chart is calculated by multiplying the number of megawatts under construction by an estimate of the job years (a person employed full-time for a year) involved in constructing renewable energy projects by fuel type. Readers should note that for wind projects we have adjusted the assumed job years per megawatt downwards commencing from July 2018 onwards compared to prior editions of the Renewable Energy Index as a result of more up to date information. This is based on a review of employment estimates from a range of Australian wind farms and data on employment involved in wind tower manufacture. Estimated employment in solar farm construction is based on discussions with construction industry participants. Bioenergy construction employment factors were sourced from analysis undertaken by University of Technology Sydney for the Climate Institute. Readers should note that job estimates provided by individual project proponents may not align due to inconsistent definitions of how to measure job creation that are not necessarily reported in job-years.

Figure 10 - Data sourced from Green Energy Markets' Solar Report based on the creation date of Small Scale Technology Certificates associated with solar PV systems with data extracted from the Clean Energy Regulator's registry of Small Scale Technology Certificates.

Figure 11 – This chart is calculated by sorting solar PV systems into different kilowatt size categories using information sourced from the Green Energy Markets Solar Report using data extracted from the Clean Energy Regulator's register of Small Scale Technology Certificates. These are then multiplied by estimates of the average person-hours involved in selling, designing and installing such sized systems based on a Green Energy Markets' survey of solar PV industry participants which is then converted into full-time equivalents working a 37.5 hour work week.

Figure 12 - This chart is calculated by using data on the number of small-scale technology certificates within the Clean Energy Regulator's registry as a proxy for the expected average annual power generation from solar PV systems installed in each state. This is then divided by the average annual electricity consumption of households in that state which are sourced from the Australian Energy Market Commission's 2017 Residential Electricity Price Trends publication.

Figure 13 - This chart is calculated by using data on the number of small-scale technology certificates within the Clean Energy Regulator's registry as a proxy for the expected average annual power generation from solar PV systems installed in each state. To determine how much of this generation is displacing imported power from the grid at retail rates or exported to the grid where it receives a feed-in tariff tied to wholesale electricity prices, systems are sorted into different kilowatt size categories using information sourced from the Green Energy Markets Solar Report using data extracted from the Clean Energy Regulator's register of Small Scale Technology Certificates. The amount exported by solar power systems rises from 50% for 2 kilowatts systems up to 90% for 8-10kW systems based on advice received from the Alternative Technology Association. Systems larger than 15kW are assumed to only avoid or receive an electricity rate equal to the export feed-in tariff we estimate for residential customers in each state. The imported retail rate of electricity and the export feed-in rate is based on an average of the AGL, Origin and EnergyAustralia lowest post-discounted published offer for the capital cities in the states of QLD (Energex), NSW (Ausgrid), VIC (Citipower) and SA (SA Power Networks). For Tasmania, WA, ACT and NT we use the regulated and standard feed-in tariff rates of the Government-owned retailer in each state.