frontier economics

Expert report – Matt Harris

9 August 2023

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1 Introduction

Personal

1. I have a B.Com (Hons) and a L.L.B. (Hons) from the University of Melbourne.
2. I joined Frontier Economics Pty Ltd as an economic consultant in 2004 and became a Director in 2022. I lead the firm's climate change and renewables work in Australia.
3. I have provided electricity price forecasts, policy and market advice for around 7GW or $24B worth of renewable and storage projects in Australia, including for RES, Origin, Infigen (now Iberdrola), Trustpower (now Tilt Renewables), APA, QIC, AMP Capital, Macquarie Infrastructure and Real Assets (MIRA), REST, Squadron Energy and Queensland Hydro (Borumba pump hydro).
4. I have advised on renewable energy procurement and net zero/carbon offset strategies for SA Government, GFG Alliance, Tomago smelter, Amazon, Melbourne Water, SEQWater, South East Water and Frasers Property.
5. I have advised on State renewable scheme impacts (Victoria, Queensland and NSW), the Commonwealth Liddell Taskforce (2019) and Commonwealth "Contract for Closure" program to retire brown coal generators (2012).
6. I assisted the South Australian Government with their energy plan from 2016-18 in response to a blackout in 2016. This included the 100MW Tesla battery and a 250MW Virtual Power Plant on government-owned public housing.
7. I have advised the Queensland Government on restructuring government owned generation assets to create a "CleanCo" generation portfolio and, separately, the 50% Renewable Energy Target and how this aligns with the Queensland Hydrogen Industry Strategy (2017, 2019, 2020).
8. In 2009 I designed an Emissions Intensity Scheme (EIS) for Malcolm Turnbull (then Federal Opposition leader) and Nick Xenophon. I presented the policy and emissions modelling to the Federal Coalition (Australia), media and stakeholders.
9. I have advised the AEMC and COAG on various emissions reduction policy options for electricity, including an EIS (2016) a Clean Energy Target (CET) (2017) and the National Energy Guarantee (NEG) for the Energy Security Board.
10. Other emissions work I have led includes:
    - transport: electric vehicle forecasts and policy recommendations for Austroads, including projected road emissions and abatement costs. Developed a Net Zero 2050 roadmap for the Australian aviation sector.
    - industry: built a model for the Singapore government to project industry sector emissions; advised on potential for "green steel" production at Whyalla steelworks.

This report

11. I have been retained by Baker McKenzie, lawyers for the ACCC, to provide an opinion.

12. In a letter of instruction dated 25 July 2023 I was asked to address the following questions under s.90(6)(d) of the Competition and Consumer Act 2010 (Cth):

    1. Is Australia on track to meet the emissions and renewables targets it has committed to at both Commonwealth and State & Territory Level? Why/why not?

    2. By reference to the period 2017 – 2033, please describe the nature of the key Commonwealth and State & Territory policy mechanisms and incentives for private investment in renewable generation and complementary technologies (eg network and storage) in Australia? What are the key government investments (both direct as well as government-sponsored or underwritten) in renewable generation and complementary technologies?

    3. What is the impact of government policies and interventions when it comes to attracting private investment in renewables generation and storage in Australia? Do existing policies and interventions, as currently operating, provide sufficient incentives to attract investment with a view to meeting: (a) the objectives of the relevant policy measure and (b) Commonwealth and State & Territory emissions and renewables targets.

    4. In what respects are the nature or characteristics (including ownership) of an individual investor likely to influence the likelihood and speed that investment in renewables and storage occurs?

    5. In your view, what are the biggest impediments to Australia securing private investment in renewable generation? Please include your views on supply chain dynamics, costs, securing financial close on projects, network constraints or build out and anything else you consider relevant.

    6. In your view, what are the advantages (if any) to a potential investor in renewable generation from having a retail customer base relative to other offtake arrangements the investor might seek to enter?

13. This report is my response to those questions.

14. I have read and had regard to the Federal Court of Australia Practice Note GPN-EXPT Expert Witnesses in Proceedings in the Federal Court of Australia, including the Harmonised Code of Conduct.

15. All the opinions expressed in this Report are my own.

2 Question 1: Australia's emissions and renewables targets

Is Australia on track to meet the emissions and renewables targets it has committed to at both Commonwealth and State & Territory Level? Why/why not?

16. In this section I provide my opinion on whether Australia is on track to meet emissions and renewables targets, and why. First, I describe the different targets in Section 2.1. Second, I provide my opinion on whether Australia is "on track" in Section 2.2. In summary:

    a Australia's latest official emissions projections are very close to, but do not currently meet, the 2030 emissions target of 43% reduction on 2005 emissions.

    b Historically, the national emissions projections fall significantly in every annual update compared with the previous projection. There are consistent improvements in technology and new policies introduced (at national and state level) aimed at further emissions reductions, which causes each new projection to be lower than the previous.

    c There are seven years still to achieve the 2030 target, which allows sufficient time for further technology and policy improvements to achieve the relatively small gap to the target. On this basis, I expect the emissions target to be met.

    d Australia will require an acceleration of the recent trend in renewable energy growth to meet a goal of 82% renewable share of generation by 2030. The required increase in renewable investment is likely given:

        i An acceleration in investment is reflected in the AEMO ISP Step Change forecasts; this is the most likely scenario according to industry stakeholders.

        ii The pipeline of new proposed projects is well in excess of capacity needed.

        iii Most new renewable investment will be supported by government contracting and direct public investment, which should ramp up once network and connection bottlenecks are addressed. New investment should accelerate as a result of significant (but recent) new investment in network and renewable zones and as a result of other new policies to support accelerated growth.

        iv AEMO reports an increase in connection applications and projects in construction relative to 12 months ago, which should lead to faster growth in operating projects.

2.1 Australia's emissions and renewable targets

17. In June 2022, Australia committed to reducing its greenhouse gas emissions by 43% below 2005 levels by 2030 and achieving net zero emissions by 2050.[1] This was an increase from the previous target of 26-28% below 2005 levels by 2030. This increased national target is largely consistent

[1] DCCEEW 2022, *Australia's emissions projections 2022*, Department of Climate Change, Energy, the Environment and Water, Canberra, December. https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf accessed 31 July 2023

with emissions targets that most States and Territories had already adopted. A summary of the targets by region is shown in Table 1.

Table 1: 2030 Emissions targets

Region	% reduction on 2005 emissions by 2030	Notes
Australia	43%	Submitted to United Nations Framework Convention on Climate Change (UNFCCC) June 2022.[2] This is a cumulative target from 2021-2030 and a target for the year 2030.
QLD	30%	Net zero 2050.[3]
NSW	50%	Net zero 2050. Target increased from 35% Sept 2021[4]
VIC	45-50%	Net zero 2050; 45-50% reduction by 2030[5]
WA	n/a	Net zero 2050. No Statewide 2030 target but adopted a target 80% reduction on 2020 Government entity emissions by 2030
SA	50%	Aspirational goal of 50% below 2005 emissions by 2030, net zero 2050[6]
TAS	100%	Net zero or lower by 2030. Net zero was achieved in 2015, with negative net emissions in 2020.[7]
NT	n/a	No target.
ACT	54%	65-75% reduction on 1990 emissions (equivalent to 54% reduction on 2005 emissions); net zero by 2045[8]

18. A summary of National, State and Territory renewable targets is shown in Table 2.

2 https://www.dcceew.gov.au/about/news/australia-submits-new-emissions-target-to-unfccc accessed 1 August 2023. DCCEEW 2022, *Australia's emissions projections 2022*, Department of Climate Change, Energy, the Environment and Water, Canberra, December. https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf accessed 31 July 2023.

3 https://www.des.qld.gov.au/climateaction accessed 1 August 2023.

4 https://www.energy.nsw.gov.au/sites/default/files/2022-12/NSW-Net-Zero-Plan-Implementation-Update-2022.pdf accessed 1 August 2023; https://www.soe.epa.nsw.gov.au/all-themes/climate-and-air/net-zero-plan-stage-1-2020-2030 accessed 31 July 2023.

5 https://www.climatechange.vic.gov.au/victorian-government-action-on-climate-change accessed 31 July 2023.

6 https://www.environment.sa.gov.au/topics/climate-change/net-zero-pathway accessed 1 August 2023.

7 https://recfit.tas.gov.au/climate/climate_change_action_plan accessed 1 August 2023. https://www.premier.tas.gov.au/site_resources_2015/additional_releases/tasmanian-greenhouse-gas-emissions-report-2022-released accessed 1 August 2023.

8 https://www.climatechoices.act.gov.au/policy-programs/act-climate-change-strategy accessed 1 August 2023.

Table 2: Renewable targets (including rooftop PV)

Region	2030	Notes
Australia	82%	Large Renewable Energy Target (LRET) of 33TWh annually from 2020-30, which is already met. This is equivalent to approximately 20%. 82% renewable share was the projected level of renewables resulting from that *Powering Australia* policy, which includes $20B in low cost finance for electricity network projects[9]
QLD	50%	70% 2032, 80% 2035[10]. Queensland expects to be at 60% by 2030[11].
NSW	12GW	We estimate this to be equivalent to around 80% of NSW generation, depending on the mix of wind or solar capacity.
VIC	65%	95% 2035[12]
WA	n/a	State owned coal to be retired by 2030[13].
SA	100%[14]	
TAS	150%	200% 2040[15]
NT	50%[16]	
ACT	100%[17]	Net target based on contracted projects in other regions

19. Australia's Large Renewable Energy Target (LRET) is 33TWh annually from 2020-2030. This is equivalent to approximately 20% of electricity generation, which was met in January 2021[18].

9 https://www.energy.gov.au/government-priorities/australias-energy-strategies-and-frameworks/powering-australia accessed 1 August 2023.

10 https://www.des.qld.gov.au/climateaction/sector-action/energy accessed 1 August 2023.

11 https://www.epw.qld.gov.au/__data/assets/pdf_file/0031/32989/queensland-energy-and-jobs-plan-overview.pdf accessed 1 August 2023.

12 https://www.energy.vic.gov.au/renewable-energy/victorian-renewable-energy-and-storage-targets accessed 1 August 2023.

13 https://www.wa.gov.au/government/announcements/state-owned-coal-power-stations-be-retired-2030-move-towards-renewable-energy accessed 1 August 2023.

14 https://www.energymining.sa.gov.au/industry/modern-energy/leading-the-green-economy accessed 1 August 2023.

15 https://www.premier.tas.gov.au/site_resources_2015/additional_releases/state-on-track-to-reach-tasmanian-renewable-energy-target accessed 1 August 2023.

16 https://territoryrenewableenergy.nt.gov.au/about/our-renewable-energy-target accessed 1 August 2023.

17 https://www.climatechoices.act.gov.au/energy/what-the-act-government-is-doing accessed 1 August 2023.

18 https://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Achieving-the-target accessed 1 August 2023.

Australia does not have a legislated 82% renewables target by 2030, or a specific mechanism to achieve it: an 82% renewable share was the projected share of renewables under a proposed *Powering Australia* policy that included $20B in low cost finance for network projects, which would enable more renewable investment. The 82% renewable share is described as a target in the 2022 Australian Emissions Projections.[19]

2.2 My opinion on whether Australia is "on track" to meet emissions and renewable targets?

Emissions

20. Under the latest Commonwealth emissions projections, the 43% emissions target is not currently expected to be met. [20] The projections include a "With additional measures" scenario that reflects (a) reform to the Safeguard Mechanism[21] and (b) a national 82% renewable electricity target by 2030.

21. Under this "with additional measures" scenario, the projections are 17MtcO2-e above the point estimate for 2030, which equals a 40% reduction on 2005 levels. The cumulative emissions budget from 2021-30 is 48MtCO2-e above the target. This equates to a 42% reduction on the 2005 levels, though it is expressed as 1% above budget.

Figure 1: 2002 Australian emissions projections

Table 1 Tracking towards Australia's 2030 point target

	Emissions in 2030 (Mt CO_2-e)	% below 2005 levels
2030 point target	**354**	**43%**
Baseline scenario	425	32%
With additional measures scenario	371	40%

Table 2 Tracking towards Australia's 2030 emissions budget target

	Cumulative emissions 2021-2030 (Mt CO_2-e)	% above emissions budget
2021-2030 emissions budget	**4,381**	**-**
Baseline scenario	4,620	5%
With additional measures scenario	4,429	1%

Source: DCCEEW 2022, Australia's emissions projections 2022

22. The fact that the latest projections do not currently meet the target does not mean that Australia is not on track to meet that target. The basis for this is as follows:

    a The national emissions projections have fallen materially in every annual update. There are consistently improvements in technology and new policies introduced (at national and

19 DCCEEW 2022, *Australia's emissions projections 2022*, Department of Climate Change, Energy, the Environment and Water, Canberra, December. https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf accessed 31 July 2023.

20 DCCEEW 2022, *Australia's emissions projections 2022*, Department of Climate Change, Energy, the Environment and Water, Canberra, December. https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf accessed 31 July 2023.

21 A policy that covers large emitting facilities.

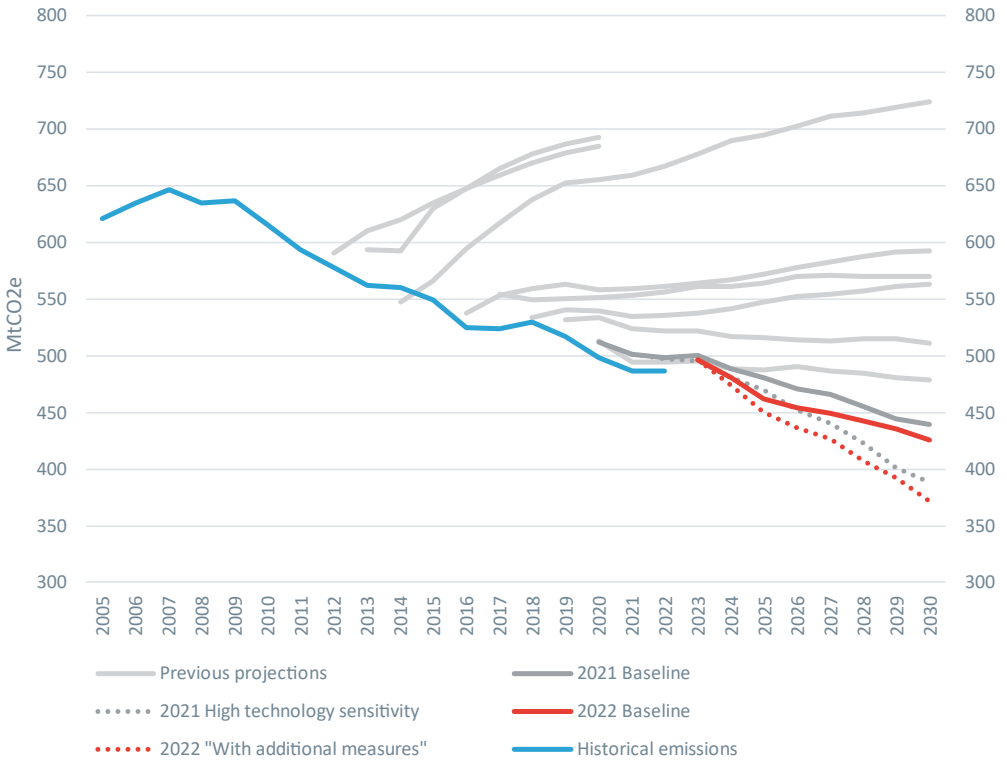
state level) aimed at further reductions, which has caused each new projection to be lower than the previous. This is shown in Figure 2 and Figure 3.

b There are seven years still to achieve the 2030 target, which allows sufficient time for further technology and policy improvements to achieve the relatively small gap to the target.

23. This opinion on the emissions projections is often published in public Frontier Economics Bulletins. For example, in 2019[22] we concluded that Australia would comfortably beat the previous 2030 emissions target (26-28% reduction on 2005 emissions) even though the official 2018 projections at the time were 695MtCO2-e above the target. This position has been confirmed by continued improvement in the emissions projections.

24. Figure 2 shows a summary of the national emissions projections. Each series reflects an annual update since 2012. For clarity, projections before 2021 are all shown in grey but each of these is lower than the previous.

Figure 2: Australian emissions projections



Source: https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2022 *(and previous annual projections)*

25. Figure 3 shows the cumulative emissions reduction task from 2021-2030 to meet a 26% emissions target. Each bar reflects the cumulative difference between each annual projection and the target (where zero on the y-axis reflects the 26% emissions target). The projection in

22 https://www.frontier-economics.com.au/documents/2019/05/briefing-lacking-vision-australian-emissions.pdf/ accessed 1 August 2023.

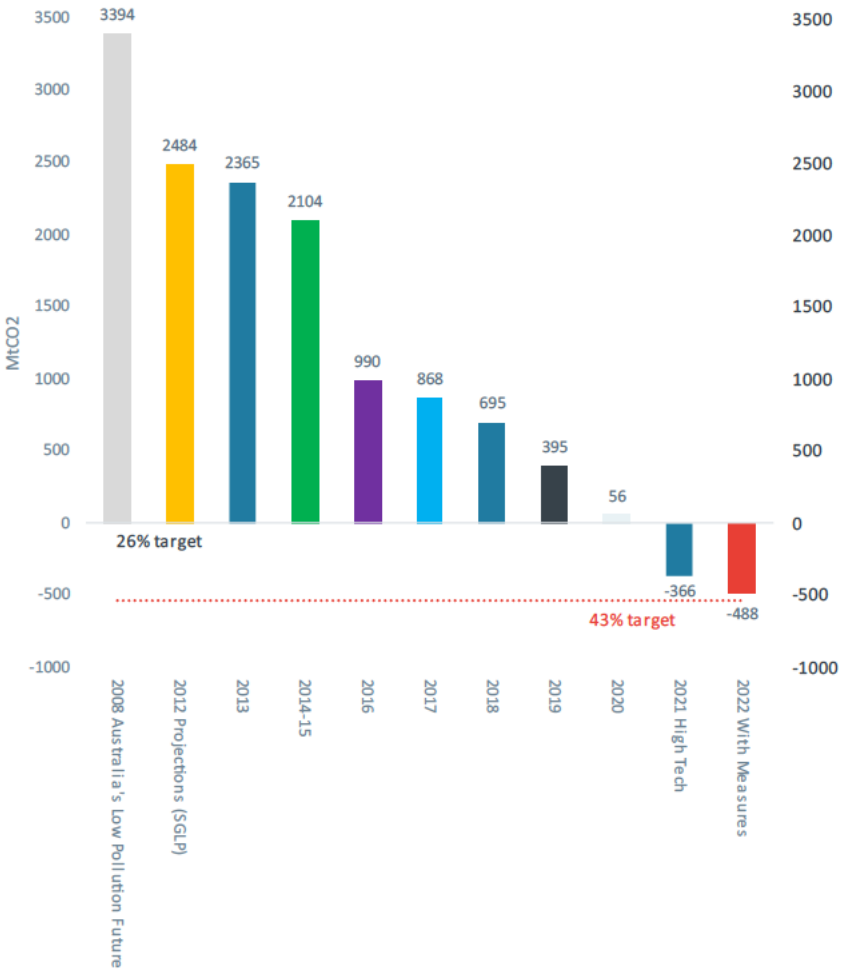
2008 had Australia 3394Mt above a 26% emissions target. This fell to 2484Mt in 2012, 695Mt in 2018 and 56Mt in 2020.

26. It was only in 2021 and 2022 that projections fell below the 26% target, and the projections continue to fall. The emissions target has since been increased to a 43% reduction, as shown by the red dashed line. The latest official projections are already close to this target, with seven years remaining.

27. Given the historical trend of falling emissions projections due to technology improvement and new policies, I expect that the projections will officially meet the target before 2030.

28. I have not reviewed each State and Territory against their individual emissions targets.

Figure 3: Cumulative abatement required, 2021-30



Excludes surplus carryover from 2008-2020. Source: https://www.industry.gov.au/publications/australias-emissions-projections-2020, adapted for 2021, 2022.

Renewables

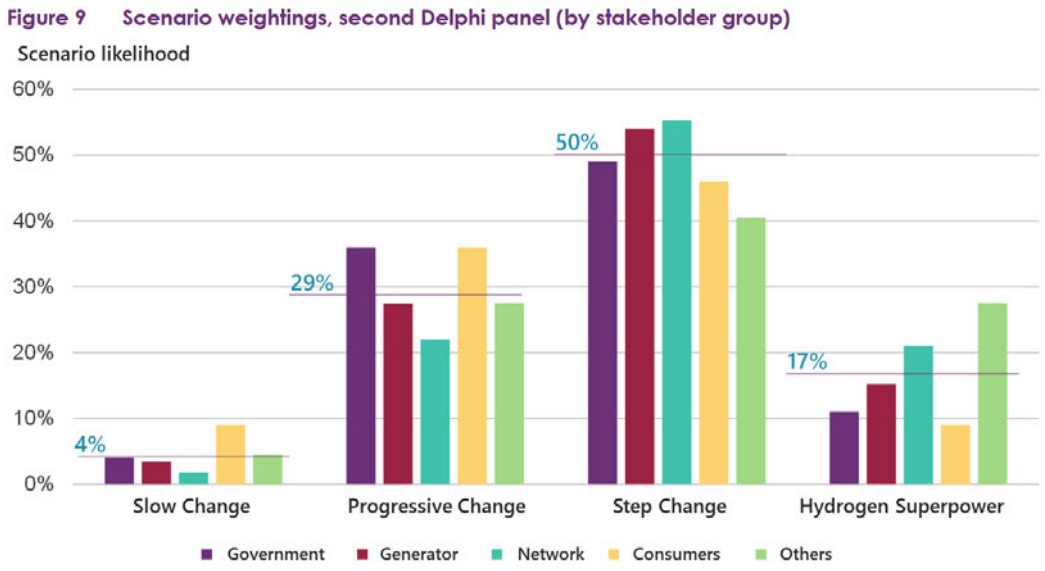
29. I have reviewed the electricity market operator's electricity projections to 2030 that produce estimates of the required investment to meet an 82% renewable target for Australia (AEMO's Integrated System Plan (ISP) 2022 Step Change scenario (generation outlook[23])

30. The ISP Step Change scenario projects the National Electricity Market (NEM) renewable share of 79% for financial year ending (FYe) 2030 and 83% for FYe 2031[24]. This simple calculation reflects a share of generation including storage load and losses. AEMO described this scenario as the most likely according to stakeholders:

> *Stakeholders identified the most likely to be the relatively fast Step Change scenario, with renewables generating 83% of NEM energy by 2030-31*[25]

Figure 4 shows the scenario likelihood weighting by stakeholder group in the AEMO ISP 2022.

Figure 4: ISP scenario



Source: AEMO ISP 2022, https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf

23 https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp accessed 1 August 2023. Specifically the generation outlook file (https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/generation-outlook.zip?la=en), and the worksheet: [2022 Final ISP results workbook - Step Change - Updated Inputs.xls]Capacity'!], using "Candidate Development Path (CDP) 2.

24 ISP generation outlook file (https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/generation-outlook.zip?la=en), and the worksheet: [2022 Final ISP results workbook - Step Change - Updated Inputs.xls] Generation'!], using "Candidate Development Path (CDP) 2, accessed 1 August 2023.

25 AEMO ISP 2022 https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf p7.

31. The **cumulative** new renewable capacity in the NEM for the Step Change scenario is 44GW between 2023 and 2030[26]. This is split by:

    a 21.4GW wind and 3.8GW utility solar (combined utility scale wind and solar 25.2GW)

    b 18.8GW distributed rooftop solar

32. The **average annual** new renewable capacity in the NEM for the Step Change scenario from 2024-2030 is 6.3GW[27]. This is split by:

    a 3.1GW wind and 0.5GW utility solar (combined utility scale wind and solar is 3.6GW)

    b 2.7GW distributed ("rooftop") solar

33. I have reviewed recent trends in new renewable projects reaching financial close based on Clear Energy Regulator (CER) (Figure 5). This shows rooftop PV (which is the small renewable energy scheme (SRES) capacity) has averaged 3GW new investment annually over the past 3 years, with utility scale renewables (wind and solar) reaching financial close averaging 3.5GW new capacity per year.

Figure 5: Renewable investment trend, CER

Total investment in wind and solar generation capacity 2016-2023 (H1)

Year	Utility scale wind and solar FID (MW)	SRES capacity (MW)*	Total (MW)
2016	1,326	748	2,073
2017	4,019	1,119	5,138
2018	4,874	1,617	6,492
2019	2,334	2,165	4,499
2020	3,231	2,965	6,196
2021	2,962	3,192	6,154
2022	4,333	2,793#	7,126
2023 (H1)	520	1,426#	1,945

* Installation data has been used as a proxy for investment under the SRES

2022 and 2023 installation capacity has been lag-adjusted to account for 12-month creation rule

Note: A 12 month creation period for registered persons to create small-scale technology certificates applies under the *Renewable Energy (Electricity) Act 2000*. The 2022 and 2023 SRES capacity may change. Data is correct as at 17 July 2023.

Source: CER, https://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Large-scale-Renewable-Energy-Target-market-data/large-scale-renewable-energy-target-supply-data#Total-investment-in-wind-and-solar-generation-capacity-20162022 accessed 1 August 2023. FID refers to final investment decision or financial close.

26 Generation outlook file (https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/generation-outlook.zip?la=en), and the worksheet: [2022 Final ISP results workbook - Step Change - Updated Inputs.xls]Capacity'!], using "Candidate Development Path (CDP) 2. Accessed 1 August 2023

27 Generation outlook file (https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/generation-outlook.zip?la=en), and the worksheet: [2022 Final ISP results workbook - Step Change - Updated Inputs.xls]Capacity'!], using "Candidate Development Path (CDP) 2. Accessed 1 August 2023

34. The CER reported FID (final investment decision) data does not split wind or solar capacity.

35. The capacity reaching financial close is a leading indicator of new capacity, as financial close typically precedes construction and operation (energy output).

36. Although the CER historical data reflects all Australian data (including WA), the recent historical investment (2020-2022) is similar to AEMO's projected new capacity projected for the NEM (Table 3.

Table 3: Renewable capacity additions: projection versus recent historical trend

	ISP Step Change Cumulative growth projected 2023-30 (GW, NEM)	ISP Step Change Annual average projected 2023-30 (GW, NEM)	CER Historical trend, renewables reaching financial close (FID) , 2020-2022, (GW, Australia)
1. Wind	21.4	3.1	Not reported
2. Utility Solar	3.8	0.5	Not reported
3. Rooftop solar	18.8	**2.7**	**3.0**
Total large scale (1+2)	25.2	**3.6**	**3.5**
Total (1+2+3)	44	**6.3**	**6.5**

37. I have also reviewed the recent trend for growth in renewable energy produced in the NEM. Based on OpenNem[28] data, between financial year ending (FYe) 2018 and FYe 2023:

    a Utility wind increased from 13TWh to 27TWh, averaging 2.8TWh growth per year

    b Utility solar increased from 0.8TWh to 12.8TWh, averaging 2.4TWh growth per year

    c Rooftop solar increased from 6.7TWh to 20.9TWh, averaging 2.8TWh growth per year

    d Total large scale renewables (wind and solar) averaged 5.2TWh growth per year

    e Total renewables (wind, solar and rooftop solar) averaged 8TWh growth per year

    f The total renewable share grew from 18% (FYe2018) to 37% (FYe2023), averaging 3.9 percentage points growth per year.

38. Simple extrapolation of the 5 year trend growth in energy would result in a renewable share of 64% FYe2030 to 68% FYe2031.

39. The AEMO ISP Step Change scenario has average annual growth in the total renewable share of 5.8 percentage points per year from FYe2024 to FYe2031 to reach an 83% share. This forecast growth begins at 4.2 percentage points in FYe2024 (which is similar to the current trend) but it projects a ramping up of growth.

[28] https://opennem.org.au accessed 2 August 2023

40. The AEMO ISP Step Change forecasts average annual energy growth from FYe2024 to FYe2031 of:

    a 10TWh in wind;

    b 2TWh in utility solar

    c 3.3TWh in distributed rooftop solar PV

    d 12TWh in total large scale renewables (wind and solar)

    e 15TWh in total renewables (wind, solar and distributed rooftop solar PV)

41. This comparison is shown in Table 4.

Table 4: Renewable capacity additions: required versus recent trend

	ISP Step Change projected annual growth(FYE24-31)	Recent trend, NEM annual average (OpenNem, FYe2018-23)
1. Wind (TWh/year)	10.0	2.8
2. Utility Solar (TWh/year)	2.0	2.4
3. Rooftop solar (TWh/year)	3.3	2.8
Total large scale (1+2) (TWh/year)	12.0	5.2
Total (1+2+3) (TWh/year)	15.3	8
Renewable share of energy generation by FYe2031	83%	68% (assuming simple extrapolation of historical trend)
Annual growth in renewable share of energy generation: (average percentage point growth per year)	5.8% (projected)	3.9% (recent trend)

42. Although the recent current trend in capacity growth is similar to the required trend from 2024-2030, it does require an increase in the recent trend in energy growth to meet a goal of 82% renewables. The reasons for this difference are:

    a AEMO ISP Step Change projects that 85% of new utility scale renewable capacity will be wind, which produces more energy per MW of capacity than solar, but the recent trend for new utility scale capacity in the NEM has been 43% wind and 56% solar (based on LGC accreditation of wind versus solar capacity)

    b AEMO assumed capacity factors for future projects are higher than recent historicals, which likely reflects larger wind turbine capacities.

43. On the basis of energy, an acceleration of the recent growth trend will be required to meet a goal of 82% for the NEM by 2030. This is likely to occur given:

    a An acceleration in investment is reflected in the AEMO ISP Step Change forecasts, which is the most likely scenario according to industry stakeholders;

b There is a sufficient pipeline of new proposed projects: AEMO Generator Information (July 2023)[29] lists 43.8GW of proposed utility solar projects, 77.4GW of proposed onshore wind projects and 52.5GW of proposed offshore wind projects;

c AEMO reports a recent increase in connection applications:

i 30GW progressing through the connection process at end of Q2 2023 compared with 25GW at end of Q2 2022

ii 10.3GW at various stages of construction at end of Q2 2023 compared with 6.5GW at end of Q2 2022.

d New investment should accelerate as a result of new investment in network and renewable zones and as a result of other new policies to support accelerated growth. These are discussed in the following questions but include EnergyConnect, North Queensland Supergrid and the national Rewiring the Nation (RTN) policy more broadly.

44. In terms of the emissions implications if an 82% renewable target is not met by 2030, Australia' s 2022 Emissions Projections[30] includes a "Baseline" scenario that does not include an assumed 82% national target. In these projections, the NEM still reaches a renewable share of 76% by 2030 and 82% by 2035 (Figure 6), largely driven by State renewable targets.

Figure 6: Renewable share in Australia's 2022 emissions projections, Baseline

Table 11 Renewable share of generation[24] in the baseline scenario, %

Grid	2020	2025	2030	2035
National Electricity Market		52	76	82
Queensland		45	58	75[25]
New South Wales/ACT		47	87	97
Victoria		47	70	72
South Australia		76	98	86[26]
Tasmania		100	100	100[27]
Western Australia Wholesale Electricity Market		44	60	64
On-grid (NEM, WEM, NWIS, DKIS)		50	73	80
Off-grid[28]		7	11	16
Whole sector	**23[29]**	**47**	**68**	**75**

Note: totals may not sum due to rounding.

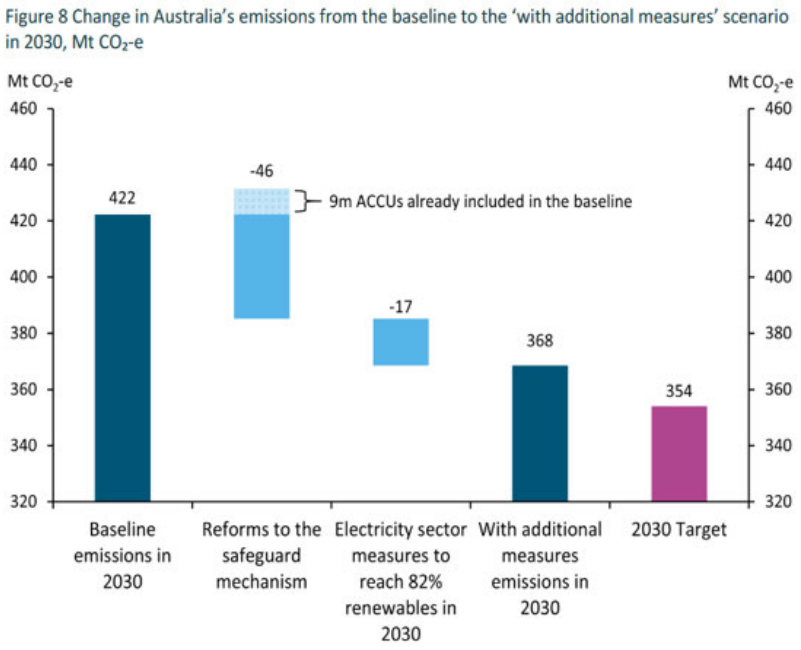
Source: https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2022

29 https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information accessed 2 August 2023.

30 https://www.dcceew.gov.au/about/news/australia-submits-new-emissions-target-to-unfccc accessed 1 August 2023. DCCEEW 2022, *Australia's emissions projections 2022*, Department of Climate Change, Energy, the Environment and Water, Canberra, December. https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf accessed 31 July 2023.

45. The estimated emissions difference between the 82% 2030 renewable target and the "baseline scenario" is 17Mt in 2030 (Figure 7), which I estimate to reflect approximately 14Mt in the NEM and 3Mt in the WEM.

Figure 7: Impact on emissions from electricity sector measures



Source: https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2022

46. The 2022 Australian emission projections also assume no improvement in off-grid emissions, which remains at only 11% renewable share with 19Mt (Figure 8) even in the "With measures" scenario. This is one area with significant scope for further improvement not already reflected in the projections, which could complement emissions gains in the NEM to further assist in meeting 2030 emissions targets.

Figure 8: Electricity emissions by grid in the Baseline scenario

Table 10 Electricity emissions in the baseline scenario, Mt CO_2-e

Grid	2005	2020	2025	2030	2035	Total generation by grid in 2030 (%)
National Electricity Market	176	141	97	54	43	82%
Queensland	46	47	32	25	16	
New South Wales/ACT	58	49	30	8	2	
Victoria	63	41	33	20	24	
South Australia	8	3	2	<1	1	
Tasmania	<1	<1	<1	<1	<1	
Western Australia Wholesale Electricity Market	11	12	9	5	5	8%
Other grids, including off-grid	10	19	19	19	18	10%
Total electricity sector	**197**	**172**	**124**	**79**	**66**	**100%**

Note: totals may not sum due to rounding.

Source: https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2022

47. With respect to the cumulative emissions impact, the 2022 emissions projections report an estimated shortfall to the cumulative target of 239Mt in the Baseline Scenario and 48Mt in the "With Measures" scenario (Figure 9). This means that the full impact of "With Measures" is 191Mt cumulative from 2021-30. The two additional policies included in the "With Measures" scenario are:

    a The 82% renewable target and

    b Reforms to the Safeguard Mechanism, which is an emissions intensity (credit) scheme that will cover large industrial facilities other than electricity generation. These reflect combustion, industrial and fugitive emissions (largely coal mines and LNG facilities).

48. The projections do not separately report the cumulative contributions of the Safeguard Mechanism reform relative to the 82% renewable target. Based on the impact in year 2030 (Figure 7), the Safeguard Mechanism reform is estimated to contribute around 70% of the difference between the Baseline and "With Measures" scenarios.

Figure 9: Cumulative emissions against budget

Table 4 Tracking towards Australia's 2030 emissions budget target

	Cumulative emissions 2021-2030 (Mt CO_2-e)
2021-2030 emissions budget	**4,381**
Baseline	4,597
Voluntary cancellation of ACCUs[4]	23
Emissions reduction task	239
With additional measures	4,406
Voluntary cancellation of ACCUs[4]	23
Emissions reduction task	48

Source: https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2022

49. More recent analysis of the impact of the Safeguard Mechanism reforms[31] estimated a cumulative impact of at least 205Mt from 2024 to 2030 for the Safeguard alone, which is a material contribution to closing the emissions gap even if the 82% renewables target is not met. The Regulatory Impact Analysis of the Safeguard Mechanism Reform also states (page 13):

> *The Safeguard reforms, in combination with the Government's target of 82 per cent renewable electricity generation by 2030 and the Rewiring the Nation program, are projected to put Australia on track to 40 per cent below 2005 levels by 2030. It is expected the remaining gap will close as more policies are developed and implemented.*

[31] DCCEEW, *Regulatory Impact Analysis of the Safeguard Mechanism Reform* (2023) https://oia.pmc.gov.au/sites/default/files/posts/2023/05/Publish%20Version%20-%20Impact%20Analysis.pdf accessed 4 August 2023.

3 Question 2: Key Commonwealth and State & Territory policy mechanisms and incentives for private investment in renewable generation

By reference to the period 2017 – 2033, please describe the nature of the key Commonwealth and State & Territory policy mechanisms and incentives for private investment in renewable generation and complementary technologies (eg network and storage) in Australia?

What are the key government investments (both direct as well as government-sponsored or underwritten) in renewable generation and complementary technologies?

50. In this section I summarise key Commonwealth, State and Territory policy mechanisms for private investment in renewable generation and complementary technologies. Given the wide range of policies and changes, I focus on key policies: this is not an exhaustive list.

Commonwealth Policies

51. There are references to a Commonwealth target of 82% renewables by 2030, for example in the 2022 Emissions Projections modelling[32]. This appears to be a projected outcome from policies such as RTN but it is not an announced or legislated target and there is no single mechanism to deliver it. This will largely reflect the aggregation of State targets, given the AEMO ISP Step Change scenario (which projects 83% renewables by FYe2031) did not explicitly model an 82% national target.

52. Commonwealth renewable and complementary policies include the:

53. **Large-scale Renewable Energy Target (LRET):**[33] this is a tradeable certificate scheme that effectively provides a subsidy for renewable generation. Eligible (large scale) generators earn credits for output that they can sell to liable parties (typically electricity retailers). The target is set at 33TWh annually for 2020-2030;

54. **Small-scale Renewable Energy Scheme (SRES**):[34] this is a certificate credit scheme that provides an effective subsidy for small scale renewable generation. Credits are sold to liable entities (typically electricity retailers).

32 DCCEEW 2022, *Australia's emissions projections 2022*, Department of Climate Change, Energy, the Environment and Water, Canberra, December. https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf page 6. Accessed 31 July 2023.

33 https://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/How-the-scheme-works/Large-scale-Renewable-Energy-Target accessed 2 August 2023.

34 https://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/How-the-scheme-works/Small-scale-Renewable-Energy-Scheme accessed 2 August 2023.

55. **Australian Renewable Energy Agency (ARENA):** [35] this government body often provides grant funding to support renewables and complementary technologies. This included $90m of grant funding for 12 large solar projects (490MW) during one funding round.

56. **Clean Energy Finance Corporation (CEFC):** this government body provides concessional finance for renewable and complementary projects. This has reported investments of $3B to support 5GW of solar and wind capacity[36]. The CEFC has been allocated a further $19B to deliver a policy called Rewiring the Nation (RTN)[37], with a focus on network investment and long duration storage to support new renewables.

57. **Direct investment**: in 2018 the Commonwealth committed to direct investment in Snowy 2.0, a 2GW pump hydro project in NSW developed by the Commonwealth owned Snowy Hydro.[38]

Queensland

58. Queensland has a renewable target of 50% by 2030 but expect to reach 60% by 2030 and announced renewable targets of 70% by 2032 and 80% 2035 in September 2022[39]. Policies include:

59. **Direct investment and contracting**: CleanCo was established as a government owned portfolio in 2018. This initially included ownership of around 1GW of "firming" generation and a mandate to contract for 1GW of new renewables by 2025[40]. This is via power purchase agreements (PPA) with projects developed and owned independently. These long term PPAs provide improved price certainty (and reduced risk), which is important for securing project finance at lower cost. This target was subsequently increased to 1.4GW by 2025.[41]

    a CleanCo typically contracts around 70% of capacity for projects to secure finance, allowing remaining capacity to be contracted or sold to the market. For Macintyre Wind Farm, CleanCo signed a PPA for 400MW on a project of 923MW. In total, CleanCo has signed around 1GW of PPAs on projects with total capacity of 1.8GW.

60. **Direct investment and public ownership**: The Queensland Energy and Jobs Plan (announced September 2022)[42] included several direct investment projects, which were increased in the most recent budget, including:

    a Total investment of $19B over 4 years for new wind, solar, storage and network[43]

    b A commitment to network investment (Supergrid) to allow more renewable and storage connection

35 https://arena.gov.au/news/arenas-perfect-score-large-scale-solar-12-12/ accessed 2 August 2023.

36 https://www.cefc.com.au/media/media-release/cefc-reaches-5-gw-and-3-billion-clean-energy-milestone-with-walla-walla-solar-farm-commitment/ accessed 2 August 2023.

37 https://www.cefc.com.au/where-we-invest/renewable-energy/energy-grid/ accessed 2 August 2023.

38 https://www.premier.vic.gov.au/victoria-finalises-snowy-hydro-sale-commonwealth accessed 2 August 2023.

39 https://www.epw.qld.gov.au/__data/assets/pdf_file/0031/32989/queensland-energy-and-jobs-plan-overview.pdf accessed 2 August 2023.

40 https://s3.treasury.qld.gov.au/files/CleanCo-fact-sheet.pdf accessed 2 August 2023.

41 https://cleancoqueensland.com.au/our-portfolio/#contracted accessed 2 August 2023.

42 https://www.epw.qld.gov.au/__data/assets/pdf_file/0031/32989/queensland-energy-and-jobs-plan-overview.pdf accessed 2 August 2023.

43 https://statements.qld.gov.au/statements/97925 accessed 2 August 2023.

c A commitment to progress two large pump hydro projects (PHES) of 2GW and 5GW. This commitment was recently increased to $14B for Borumba PHES[44].

d $4.5B to a Queensland Renewable Energy and Hydrogen Jobs Fund which will invest directly in renewables, hydrogen and batteries[45].

e Commitment to convert all of Queensland's publicly-owned coal-fired power stations into clean energy hubs by 2035, backed by a Job Security Guarantee for workers

f The draft laws for the renewable targets includes "**Public Ownership Targets"** of 100% for network and deep storage and more than 50% for generation, which would include utility wind and solar[46]

NSW

61. **Contracting**: The NSW Electricity Infrastructure Roadmap will target 12GW new renewable generation and 2GW new long-duration storage by 2030[47]. A "consumer trustee" (AEMO Services) signs long-term contracts Long Term Energy Service Agreements (LTESAs) with projects setting an effective floor price to reduce price risk and attract private investors and developers.

62. The first round of LTESAs for generation were announced in May 2023 for 1.4GW of capacity (1.1GW utility solar and 275MW wind)[48].

63. NSW Labor has a policy for a $1B Energy Security Corporate to provide concessional finance similar to the CEFC.

Victoria

64. **Victorian Renewable Energy Target (VRET), contracting:** VRET operates as government backed contracts for difference (CFDs), signed with new entrant renewables to fix a long term supply price per MWh. This largely removes price risk for projects to attract private investment. Two rounds of tenders have been conducted.

a VRET1 delivered 800MW over 5 projects (mostly wind)[49]

b VRET2 has committed to 623MW renewable capacity over 6 projects (mostly solar)[50]

44 https://www.afr.com/companies/energy/qld-to-commit-14b-for-mega-pumped-hydro-project-20230609-p5dfba accessed 2 August 2023.

45 https://www.treasury.qld.gov.au/programs-and-policies/queensland-renewable-energy-and-hydrogen-jobs-fund/ accessed 2 August 2023.

46 https://www.allens.com.au/insights-news/insights/2023/06/next-step-in-delivering-the-queensland-energy-and-jobs-plan/ accessed 2 August 2023.

47 https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap accessed 2 August 2023.

48 https://www.nsw.gov.au/media-releases/first-round-of-renewable-energy-projects-puts-nsw-one-third-of-way-to-12-gigawatt-renewable-energy-goal accessed 2 August 2023.

49 https://www.energy.vic.gov.au/renewable-energy/victorian-renewable-energy-and-storage-targets/victorian-renewable-energy-target-auction-vret1 accessed 2 August 2023.

50 https://www.energy.vic.gov.au/renewable-energy/victorian-renewable-energy-and-storage-targets/victorian-renewable-energy-target-auction-vret2 accessed 2 August 2023.

65. **Ownership:** Victoria has announced a publicly owned State Electricity Commission (SEC) with initial investment of $1B for delivering 4.5GW of renewable generation capacity.[51]

66. **Offshore wind:** Victoria has announced offshore wind targets of 2GW by 2032, 4GW 2035 and 9GW by 2040. At this stage there is no price mechanism or subsidy to support this. Actions to date focus on transmission planning and development and preparing ports and the supply chain for future construction. Due to development times, offshore wind is unlikely to enter at scale before 2030.

Tasmania

67. Tasmania has legislated a 150% renewable target by 2030 (200% by 2040). There is no direct mechanism to achieve this in the form of subsidies or credits.[52]

ACT

68. **Contracts:** The ACT has a 100% renewable target achieved by signing contracts for difference (CFDs) with large renewable projects. Most of these are in other states but the volume contracted is equivalent to consumption from ACT electricity customers[53]. These contracts remove price risk for projects.

South Australia

69. South Australia (SA) is projected to reach 85% renewables by 2025 and 100% by 2030.[54]

70. SA is already at 70% renewables. Further growth will come from continued growth in rooftop PV and from a new interconnect between SA-NSW (EnergyConnect) due to open in 2025, which will allow new sites to connect to the grid in SA and NSW.

51 https://www.vic.gov.au/state-electricity-commission-victoria accessed 2 August 2023.

52 https://recfit.tas.gov.au/__data/assets/pdf_file/0012/313041/Tasmanian_Renewable_Energy_Action_Plan_December_2020.pdf accessed 2 August 2023.

53 https://www.environment.act.gov.au/__data/assets/pdf_file/0007/987991/100-Renewal-Energy-Tri-fold-ACCESS.pdf accessed 2 August 2023.

54 https://www.energymining.sa.gov.au/industry/modern-energy/leading-the-green-economy accessed 2 August 2023.

4 Question 3: The impact of government policies attracting private investment in renewables

What is the impact of government policies and interventions when it comes to attracting private investment in renewables generation and storage in Australia?

Do existing policies and interventions, as currently operating, provide sufficient incentives to attract investment with a view to meeting: (a) the objectives of the relevant policy measure and (b) Commonwealth and State & Territory emissions and renewables targets.

71. Government renewable policies and interventions targeting decarbonisation are the key driver of new renewable investment.

72. Most policies encourage further private investment in renewables by reducing price or volume risk or providing grants or concessional finance. These include grants (ARENA), certificate based subsidies (LRET), concessional finance (CEFC), long-term contracts (guaranteeing prices (CFDs or PPAs with government owned entities), or providing a price floor (LTSEA) and direct investment in network capacity.

73. Many of the policies aim to reduce the policy risk that projects face from government interventions in the market, which can include changes to existing scheme rules and targets (for example, removing the carbon price).

74. Increasingly, there is significant direct government investment or commitments in transmission network and renewable generation. Investment in transmission will encourage private investment in renewable generation by removing network bottlenecks.

75. Renewable investors without long contracts can face risk of oversupply *caused by* government interventions to increase renewable supply and to lower prices for consumers. The rate of new renewable supply required to meet 2030 targets is faster than what is required to meet demand growth and coal retirements. This is arguably contributing to earlier coal retirements. Following the announcement of the NSW Electricity Infrastructure Roadmap (Nov 2020) the owners of Yallourn[55] and Eraring[56] announced earlier retirement dates, though this may also be driven by owner decarbonisation commitments.

    a Yallourn is a 1450MW Victorian brown coal generator. Retirement was brought forward from 2032 to 2028 in March 2021.

    b Eraring is a 2880MW NSW black coal generator. Retirement was brought forward from 2032 to 2025 in Feb 2022.

55 https://aemo.com.au/en/newsroom/media-release/energy-australia-announces-the-early-retirement-of-yallourn, accessed 2 August 2023.

56 https://www.originenergy.com.au/about/investors-media/origin-proposes-to-accelerate-exit-from-coal-fired-generation/ accessed 2 August 2023.

76. Many renewable policies now provide greater investor certainty on prices and financial returns. Early renewable investors often faced price risk due to changes in renewable policies and targets after investing. For example, the removal of the national carbon price (introduced for FYe 2013 and FYe2014 but removed from July 2014[57]).

77. There has been a broader shift away from legislated schemes (carbon pricing and tradeable certificates) towards contracting (CFDs, LTESA), direct investment and ownership. The latter provide more price certainty relative to legislated targets that can change with a change of government. Reduced price risk often results in lower financing costs.

78. There is a wide range of National, State and Territory policies, including direct investment in projects, indirect support via transmission investment, indirect support via contracts (either directly via VRET and LTESA, or indirectly via publicly owned entities such as CleanCo and Snowy Hydro). As such, it is difficult to estimate the proportion of projects that receive some form of government support.

79. There are 6.3GW of large wind and solar projects listed as "committed" by the Clean Energy Relator (CER).[58] All of these would receive credits under the LRET as one form of support, which may be sold to liable parties or to meet voluntary corporate demand. I estimate that around 66% of that committed capacity receives another form of support such as LTSEA, VRET, CEFC finance, other direct government finance or indirect support via PPAs with government owned entities.

80. An increase in the rate of renewable investment is likely due to recent increases in government support, particularly the large investment for new network capacity. There has only been one round of LTESA and two rounds of VRET held to date, but more rounds will occur.

81. Other mechanisms involving direct investment have only recently been established: the Victorian SEC was announced October 2022 and the Queensland Energy and Jobs Plan announced September 2022. These will increase overall renewable investment but depending on implementation, they may also crowd out some private investment. If these invest as partners to private developments than this is likely to encourage additional private investment.

82. The existing policies address any investor issues related to obtaining finance by providing price certainty to reduce risk. The cost of capital faced by projects with government contracts or direct investment is generally lower than private capital costs (see AEMO Services estimate of weighted average cost of capital (WACC) for NSW Roadmap projects versus Non-roadmap projects[59] (Figure 10). This largely reduces advantages for larger developers of vertically integrated retailers.

57 https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1314/QG/CarbonPriceRepealBills accessed 2 August 2023.

58 https://www.cleanenergyregulator.gov.au/DocumentAssets/Pages/Power-stations-and-projects---committed.aspx accessed 2 August 2023.

59 AEMO Services, *NSW Electricity Infrastructure Roadmap benefits modelling report* (June 2023) https://www.energy.nsw.gov.au/sites/default/files/2023-06/202306_NSW_Electricity_Infrastructure_Roadmap_benefits_modelling_report_v2.PDF p25 accessed 3 August 2023. These estimates are based on an earlier NAB cost of capital report.

Figure 10: AEMO Services WACC assumptions with and without the NSW Roadmap (LTESAs)

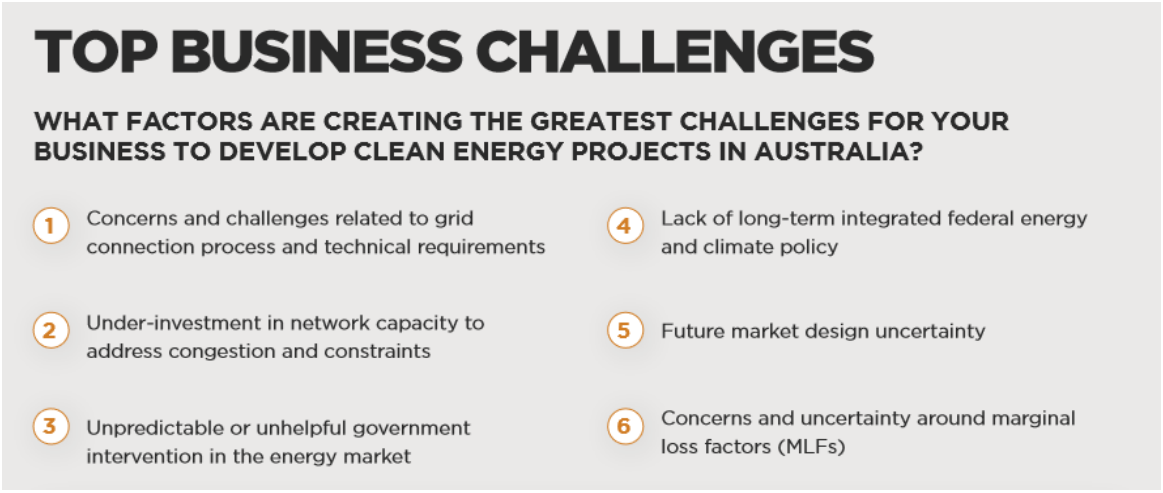
Table 6: Technology-specific WACC assumptions in the Roadmap model and the no-Roadmap model

Technology	Roadmap model assumption	No-Roadmap model assumption
Wind	1.8%	5.0%
Solar PV	1.5%	5.2%
LDS	5.5%	7.9%
Firming	2.4%	4.8%

Source: AEMO Services, NSW Electricity Infrastructure Roadmap benefits modelling report *(June 2023)*

83. The biggest barriers to new renewable investment, as identified by renewable investors, are grid connection bottlenecks and network capacity (Figure 11), which is also being addressed by direct government funding to support transmission build and grid connection. This includes the Commonwealth Rewiring the Nation (RTN) and Queensland Supergrid (and Queensland government network investment). Victoria also passed laws to exempt new transmission from standard planning processes to allow faster network investment[60].

Figure 11: Renewable investor survey



Source: Clean Energy Council, Clean Energy Outlook Confidence Index, Dec 2021[61].

84. Overall, the policies and interventions involving government contracts and direct investment should provide sufficient incentives to address barriers related to financing projects.

60 https://www.energymagazine.com.au/victoria-side-steps-nem-with-new-amendment-act/ accessed 3 August 2023.

61 https://assets.cleanenergycouncil.org.au/documents/resources/reports/clean-energy-outlook/Clean-Energy-Outlook-Confidence-Index-%E2%80%93-December-2021-report.pdf accessed 3 August 2023.

85. There are many new policies and interventions introduced in the past 12 months aimed at addressing barriers related to grid connection and network capacity. These will significantly improve the likelihood of meeting the 2030 renewable targets but it is too early to assess whether this will fully overcome all network and grid connection barriers in time given the complexity of some project delays. But these delays caused by delays in network capacity will affect private developments with or without other policy support.

86. Direct government investment in renewable generation may risk crowding out some new private investment, but direct public investment should increase overall renewable investment to meet 2030 targets.

87. On the other hand, given that most additional growth in renewable investment will be driven by government targets, any increase in private renewable investment is likely to reduce the need for further government support for other projects. An increase in private investment in renewable generation is as likely to crowd out other private or public investment in generation.

5 Question 4: Individual investor influence on investment in renewables

In what respects are the nature or characteristics (including ownership) of an individual investor likely to influence the likelihood and speed that investment in renewables and storage occurs?

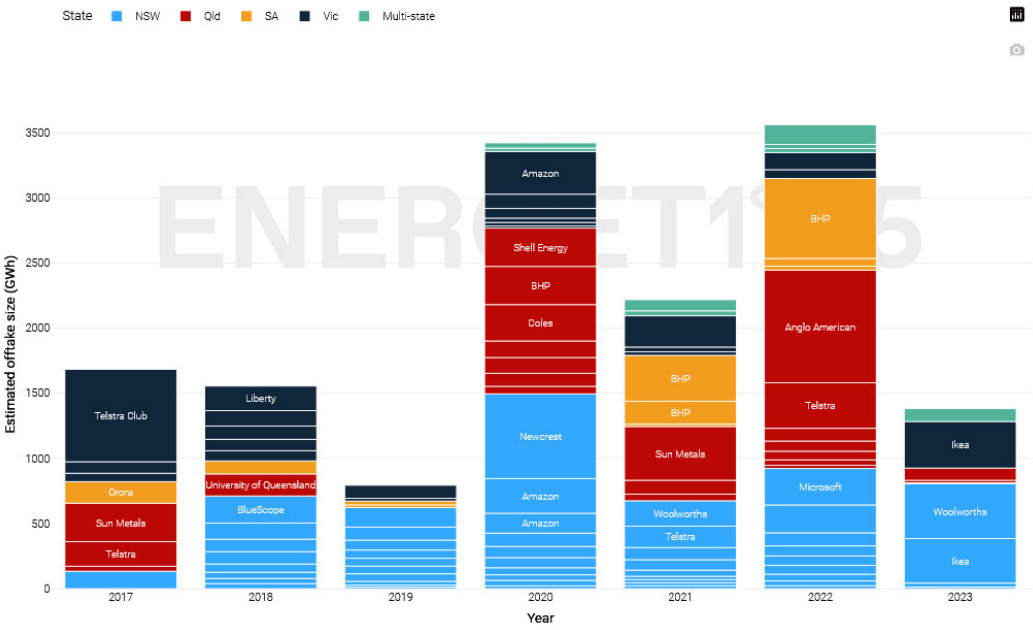
88. The nature and ownership of an individual renewable investor should have minimal bearing on the speed of renewable and storage investment due to the type of renewable investment barriers and the policies and interventions introduced to reduce those barriers.

89. Most issues related to finance and access to capital should be addressed by long term government contracts that reduce price risk, or direct government investment and ownership that reduces the need for private investment. Victoria, NSW and Queensland have adopted these policies (explained above) and these will support most of the investments required to meet their state targets. This reduces the relative advantages of vertically integrated generator-retailers because it reduces the cost of finance for any project that has a government counterparty.

90. In addition to government interventions, there is also a growing market for corporate power purchase agreements (PPAs) to fulfil voluntary corporate renewable targets. Many of these involve the largest global companies such as Apple, Amazon, Microsoft, BHP, and Telstra (Figure 12). By December 2022, corporations have contracted with around 5.8GW of renewable capacity supporting projects of 14GW.[62] Direct PPAs with large global companies would provide a similar reduction in price and counterparty risk to contracting with a large private electricity retailer. Many of these projects also likely receive some government support, as government contracts such as ACT-FIT, VRET or LTESA underwrite the price but allow the energy to be onsold to consumers.

[62] Business Renewables Centre Australia, *Corporate Renewable Power Purchase Agreements in Australia: State of the Market 2022*, https://climate-kic.org.au/wp-content/uploads/2023/03/SOM22.pdf accessed 3 August 2023.

Figure 12: Corporate PPAs in Australia by offtaker

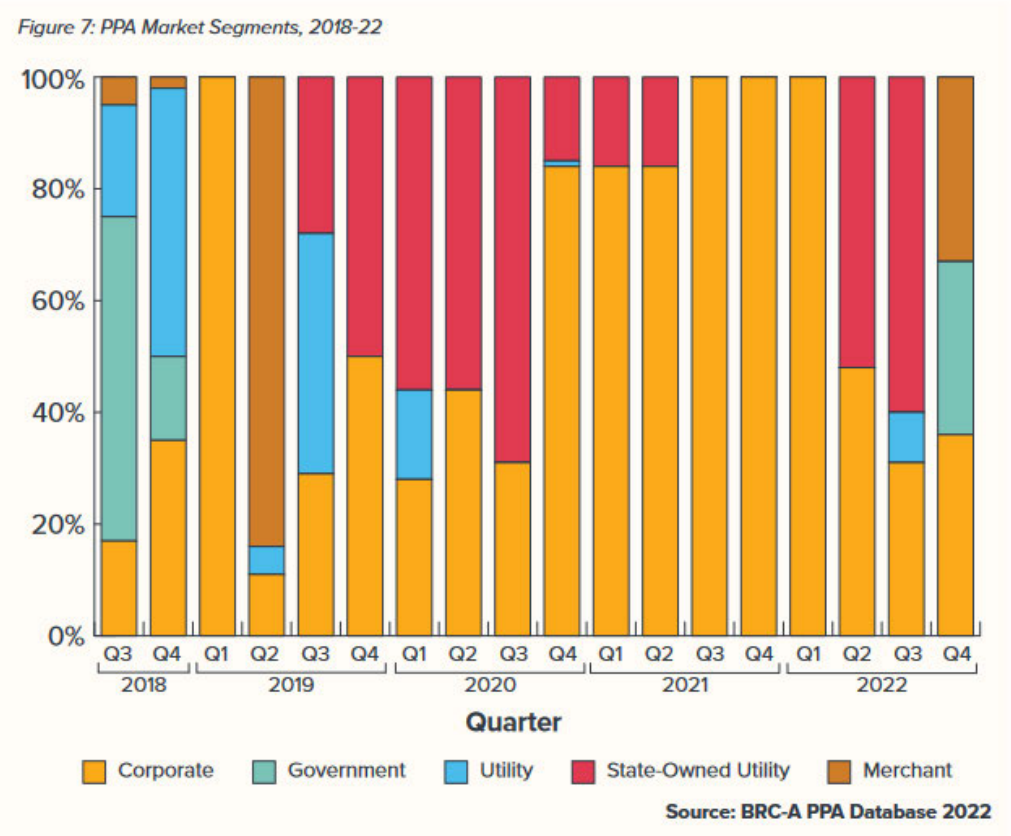


Source: Energetics Corporate Renewable PPA Deal Tracker[63].

91. Many early renewable developments (before 2016) involved long-term PPAs with large electricity retailers. Increasingly, projects are contracting directly with either large corporate users, governments or publicly-owned utilities in Queensland or Snowy Hydro. In recent years only a relatively small share of PPAs were signed with larger private retailers (Figure 13). This suggest that the there is minimal advantage signing PPAs with large private electricity retailers compared with contracting directly with large corporate consumers.

63 https://www.energetics.com.au/corporate-renewable-ppa-deal-tracker accessed 3 August 2023.

Figure 13: PPAs market segments in Australia



Source: Business Renewables Centre Australia, Corporate Renewable Power Purchase Agreements in Australia: State of the Market 2022.

92. Recently announced direct interventions such as the Victorian publicly owned SEC and the Queensland Energy and Jobs Plan (with 50% ownership mandate) should increase the rate of renewable investment and reduces the private capital requirements.

93. Large contributions to new network capacity (under Rewiring the Nation) will also reduce risk associated with new renewable projects and address any barriers related to accessing private finance.

94. The new renewable project pipeline also suggests that there is minimal advantage for large private electricity retailers. AEMO's Generator Information for July 2023 reports new projects by status. This list includes 45.3GW of utility solar and 53.5GW onshore wind that are either Committed, Anticipated, "in commissioning" or Publicly Announced.

95. AEMO lists many projects and subsidiaries separately: the list includes aggregation of major major projects and subsidiaries (showing only the top 30 owner/developers: Table 5). This is not an exhaustive list of all projects and subsidiaries. These are generally specialist renewable developers rather than large electricity retailers.

96. This table excludes a pipeline of 77.4GW of offshore wind which is unlikely to be operating before 2030 (and mostly involving specialist developers without a pipeline of onshore developments).

Table 5: New renewable capacity: Committed, Anticipated, Publicly Announced, In commissioning

Owner	Solar PV MW	Wind Onshore MW	Total MW	Cumulative MW
ARK Energy	412	7,149	7,561	7,561
Squadron Energy (Windlab, CWP)	800	4,945	5,745	13,306
Spark Renewables	1,227	2,912	4,139	17,445
ACEN	1,420	2,529	3,949	21,394
Acciona	403	3,387	3,791	25,184
RES Australia	266	2,755	3,021	28,206
Lightsource BP	2,506	-	2,506	30,712
Renewable Energy Partners	2,480	-	2,480	33,192
Tilt	144	2,228	2,372	35,564
Genex Power Limited	1,970	258	2,228	37,792
Neoen	349	1,643	1,991	39,783
Sunshine Energy	1,500	-	1,500	41,283
WestWind Energy Pty Ltd	-	1,500	1,500	42,783
Canadan Solar	1,404	-	1,404	44,187
CleanSight P/L	-	1,200	1,200	45,387
Mainstream	-	1,165	1,165	46,552
Edify Energy Pty Ltd	980	58	1,038	47,590
Kariboe Wind Farm Pty Ltd	-	1,020	1,020	48,610
Walcha Energy Pty Ltd	450	405	855	49,465
Wind Prospect	-	763	763	50,228
Total Eren	758	-	758	50,986
TagEnergy Golden Plains Investments Pty Ltd	-	756	756	51,742
ESCO Pacific	729	-	729	52,471
brightnightpower_NR	426	300	726	53,197
Crossroads Energy Pty Ltd	650	-	650	53,847
Piambong Wind Farm Pty Ltd	-	632	632	54,479
Fera Australia Pty Ltd	-	630	630	55,109
unitedgreen_NR	608	-	608	55,717
Vena Energy	605	-	605	56,322
Alinta Energy Retail Sales Pty Ltd	-	600	600	56,922

Source: AEMO Generator Information Jul 2023.

97. Renewable investors have identified network capacity and grid connection as larger barriers to investment than obtaining finance. These barriers, along with social licence, declaring renewable zones (for offshore wind) and potential supply chain constraints are likely to be no worse for large specialised renewable developers than for large vertically integrated generator-retailers.

98. While network and grid bottlenecks do continue, any increase in renewable investment by one private developer is as likely to delay or crowd out projects by other developers as opposed to delivering a faster overall rollout.

99. The lower risk associated with renewable projects with long term government-backed contracts are also appealing to investors seeking lower risk and lower returns. This often appeals to large superannuation funds as investors.

6 Question 5: Biggest impediments to private investment in Australian renewable generation

In your view, what are the biggest impediments to Australia securing private investment in renewable generation? Please include your views on supply chain dynamics, costs, securing financial close on projects, network constraints or build out and anything else you consider relevant.

100. The biggest barriers to new renewable investment, as identified by renewable investors, are grid connection bottlenecks and network capacity (Figure 11). This is because new renewable capacity is located where solar and wind resources are high. The existing electricity network is built for existing large coal fired generation, which is located at coal mines (Latrobe Valley, Hunter Valley).

101. Additional network capacity is being addressed by direct government funding to support transmission build and grid connection. This includes the Commonwealth RTN and Queensland Supergrid (Queensland government network investment). Victoria also passed laws to exempt new transmission from standard planning processes to allow faster network investment[64].

102. Other material risks identified by renewable investors are "unpredictable or unhelpful government intervention in the energy market", "lack of long-term integrated federal energy and climate policy" and future market design uncertainty". I interpret these to largely relate to:

    a risk of direct government investments in generation crowding out private sector investment. Examples include the Victorian publicly owned SEC and the Queensland Energy and Jobs Plan (with 50% ownership mandate); and

    b other proposed government interventions to extend or retain coal capacity in the market, such as:

        i the Energy Security Board (ESB) proposed a change in electricity market design to a capacity market that would include payments to coal and gas capacity. This was labelled a "coal keeper" policy by green groups that opposed it[65].

        ii Victorian signed a contract with Yallourn brown coal power station to continue operating until 2028[66];

64 https://www.energymagazine.com.au/victoria-side-steps-nem-with-new-amendment-act/ accessed 3 August 2023.

65 https://www.afr.com/companies/energy/tension-over-energy-crisis-plan-as-esb-backs-coal-and-gas-20220619-p5ausx accessed 3 August 2023.

66 https://www.energyaustralia.com.au/about-us/energy-generation/yallourn-power-station/energy-transition accessed 3 August 2023.

iii the Commonwealth Liddell Taskforce investigated potential market interventions to delay the closure of Liddell black coal power station[67].

iv NSW government is considering options to delay the early retirement of Eraring[68];

103. Government contracts (price guarantees) are a significant enabler of private investment as it largely removes price risk. Direct government investment and ownership of generation is a barrier that crowds out private investment. However, this would still drive renewable growth through public investment.

104. Delays in connection approval and lack of network capacity are a significant barrier to private investment as it delays or prevents operation (volume risk). It follows that direct government investment in network (Rewiring the Nation) will allow more renewable capacity. For example, the new EnergyConnect (between SA-NSW) is forecast to "unlock" 1800MW of renewable capacity.[69] Delays in large network projects will mean that barriers remain.

105. Securing financial close on projects depends on both price and volume risk; projects typically obtain a connection approval and some price guarantee (either via government contracts or corporate PPA) before reaching financial close. Some will proceed on a "merchant" basis without a PPA.

106. Recently, technology costs are estimated to have increased by 9% for solar and 35% for onshore wind due to higher material costs.[70] This will increase the cost of new projects, and given most new investment will be driven by government renewable targets, this may increase the cost of government support but should not delay investment.

107. Attracting finance does not appear to be a barrier once a connection approval and a PPA is secured (including government contracts).

67 https://www.energy.gov.au/publications/liddell-taskforce-terms-reference-report-statement-and-response accessed 3 August 2023.

68 https://www.afr.com/companies/energy/crunch-time-looms-for-origin-on-eraring-closure-20230217-p5clb4 accessed 3 August 2023.

69 https://www.cefc.com.au/where-we-invest/case-studies/energyconnect-to-unlock-cheaper-greener-power/ accessed 3 August 2023.

70 CSIRO, *Gencost 2022-23 Consultation Draft* (Dec 2022) https://publications.csiro.au/rpr/download?pid=csiro:EP2022-5511&dsid=DS1 accessed 3 August 2023, p ix.

7 Question 6: Advantages (if any) to a renewable generator investor having a retail customer base

In your view, what are the advantages (if any) to a potential investor in renewable generation from having a retail customer base relative to other offtake arrangements the investor might seek to enter?

108. The benefit of a retail customer base appears to be minimal given current policy settings and development of the PPA market.

109. Many earlier renewable projects (before 2016) were developed by large electricity retailers. At the time, projects faced price and policy risk, including risk of policy and target changes, changes to energy and renewable certificate prices under the LRET tradeable certificate scheme. A retail customer base provided a hedge against renewable generation projects, as retailers need to acquire both energy and renewable credits for customer load. Some projects were developed by large retailers and the projects sold with a long term PPA in place. The credit rating of the large retailers (as a PPA counterparty) is an advantage relative to smaller electricity retailers. This reduces risk for generation projects.

110. Many policies introduced since then have reduced the advantage of large retailer PPAs over other PPAs. Government contracts (ACT FIT, VRET, LTESA) and PPAs with Government-owned entities (Snowy Hydro, CleanCo) reduce counterparty risk.

111. There has also been strong growth in corporate PPAs with highly creditworthy global counterparties, including Amazon, Apple, Microsoft, BHP, Anglo American, Telstra, Woolworths, Coles and Ikea (Figure 12). These are effectively bypassing the retailers to contract directly for the largest loads.

112. This appears to be confirmed by the profile of the largest developers in the project pipeline (Table 5), where most of the development pipeline is specialist renewable developers with minimal developments owned by the large electricity retailers. Similarly, private utilities reflect only a small share of PPA counterparties in recent years (Figure 13).

Statement

- I have had regard to the Federal Court of Australia Practice Note including the Harmonised Code of Conduct.
- I confirm that:

  a. the factual matters stated in this report are, so far as I know, true;

  b. I have made all the enquiries I considered appropriate in addressing the questions I was instructed to consider;

  c. the opinions stated in this report are genuinely held by me;

  d. this report contains reference to all matters that I consider are significant in addressing the questions I was instructed to consider; and

  e. I understand my duty to the Court, and I have complied with that duty.

Signature

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