NET ZERO MOMENTUM TRACKER

ENERGY SECTOR

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ClimateWorks AUSTRALIA

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This report is part of a series focusing on sectors within the Australian economy.

Net Zero Momentum Tracker – an initiative of ClimateWorks Australia with the Monash Sustainable Development Institute – demonstrates progress towards net zero emissions in Australia. It brings together and evaluates climate action commitments made by Australian businesses, governments and other organisations across major sectors. Sector reports from the project to date include: property, banking, superannuation, local government, retail, transport, resources and energy.

The companies assessed by the Net Zero Momentum Tracker represent 61 per cent of market capitalisation in the ASX200, and are accountable for 61 per cent of national emissions. Achieving net zero emissions prior to 2050 will be a key element of Australia's obligations under the Paris Agreement on climate (UNFCCC 2015). The goal of the agreement is to limit global temperature rise to well below 2 degrees Celsius above pre-industrial levels and to strive for 1.5 degrees.

SUMMARY

Australia's energy sector must accelerate its pace of decarbonisation if Australia is to reach net zero emissions, in line with the global climate goals.

This report analyses the 20 highest emitting electricity generators and energy (electricity and gas) retailers in Australia. These companies account for almost one-third of the country's total emissions.

This assessment considers specific requirements and opportunities associated with the critical role the energy sector plays in enabling decarbonisation across all sectors of Australia's economy.

It focuses on Australia's electricity generators and significant 'gen-tailers' – companies that both generate electricity and retail energy to consumers. Collectively, the 20 companies assessed are responsible for 71 per cent of total national electricity generation and account for 89 per cent of Australia's electricity sector scope 1 and 2 emissions. For these companies, fossil fuels purchased or burnt for the power they generate are a material source of emissions (scope 1 and 2). Where companies also retail gas, we have included this as part of our analysis, as gas retail can be a significant source of indirect (scope 3) emissions when gas is used by their customers.

Each company's decarbonisation commitments have been assessed against ClimateWorks' Decarbonisation Futures scenarios (ClimateWorks 2020). These scenarios map least-cost sector decarbonisation trajectories for Australia. This modelling indicates that for scenarios in line with Australia's share in limiting global emissions, the electricity sector should achieve at least 64 per cent in emissions reductions by 2030 (from a 2017 base year), reach near zero emissions by 2040 and zero emissions by 2050.

Overall, energy sector commitments are insufficient for Australia to achieve a Paris-aligned transition to net zero.

This report finds none of the companies assessed are fully aligned with the Paris climate goals, and most fall well short of these. Of the energy companies featured in this report, our assessment finds:

- One – ENGIE – is 'partially aligned' based on its 2030 target covering a small proportion of its total emissions.
- Fourteen companies – AGL, APT Pipelines, ATCO, C S Energy, CK William, Delta, EnergyAustralia, Origin, Pioneer Sail, Snowy Hydro, Stanwell, Synergy, Territory Generation and TransAlta – are 'not aligned' but are taking some steps to reduce their emissions.
- Five companies – Arrow Energy, Bluewaters Power 1&2, NewGen Kwinana, NRG Gladstone Operating Services and OzGen – have not disclosed any emissions reduction activities.

Progress on emissions reduction has been made in recent years. Reported emissions from this sector have decreased and investment in renewable energy has risen over the past decade. The transition to date has been driven by falling renewable energy costs, along with state and territory government policies, federal renewable energy targets, consumer demand and pressure from investor groups.

Some of Australia's largest energy companies have adopted decarbonisation commitments. Australia's biggest electricity sector emitters are AGL, EnergyAustralia, Stanwell and Origin which are collectively responsible for 54 per cent of the country's electricity emissions. Of these, AGL, EnergyAustralia and Origin have decarbonisation commitments. Origin has an aspiration to achieve net zero emissions by 2050 and has set interim reduction targets for its scope 1, 2 and 3 emissions. AGL and EnergyAustralia have committed to achieve net zero operational (scope 1 and 2) emissions by 2050, but have no interim emissions reduction commitments. Stanwell, which operates two of Queensland's largest coal-fired generators, has no emissions reduction targets.

Of the remaining 16 companies, three – APT Pipelines, ENGIE and TransAlta – have decarbonisation commitments. ENGIE has an aligned 2030 target which covers its scope 3

emissions from use of sold gas. APT Pipelines has a net zero by 2050 operational target but no interim reduction commitments. TransAlta has a global target to reduce operational emissions by 60 per cent by 2030 (2015 baseline) and reach net zero emissions by 2050, but it has no current plans to transition the gas-fired plants it operates in Australia in line with these goals.

Strategies reported by companies to address their operational (scope 1 and 2) emissions include increasing renewable generation, improving power plant efficiency and retiring coal-fired power plants early. Efforts to disclose and reduce scope 3 emissions are limited among energy companies.

This is a critical decade for climate action, during which global emissions must fall by at least 45 per cent from 2010 levels to limit global temperature rise to 1.5 degrees Celsius (United Nations 2021). The IEA says the energy sector, as the major source of emissions, holds the key to responding to the world's climate challenge (International Energy Agency 2021).

The energy sector plays a crucial role in Australia achieving the Paris climate goals. Zero emissions electricity is fundamental to achieving zero emissions in sectors such as transport and buildings, and net zero emissions in industry. This includes the production of renewable 'green' hydrogen, which can be used to decarbonise some hard-to-abate sectors, such as freight and heavy industry. Replacing gas use in buildings and industry through electrification or use of low-emissions fuel is also key for Australia to align with global climate goals. Therefore, early decarbonisation of the energy sector is fundamental.

Recent analysis shows shifting from fossil fuel generation to renewables would lower average system costs (e.g. AEMO 2020). This shift is feasible for Australian energy companies using existing technologies. Indeed, some energy companies are already adopting business models that rely on renewable energy.

Companies have started to move, but they can and must set a faster transition pace. A strong national energy transition strategy with emission reduction targets would drive greater ambition among power companies. This ambition would be bolstered if other levels of government match the strong state and territory policies, which are already driving change in many areas. These government policies would enable electricity market operators and investors to plan an orderly transition aligned with the Paris climate goals.

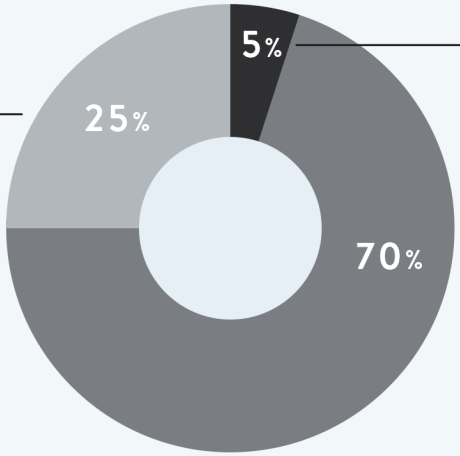
NET ZERO BY 2050 EMISSIONS ASSESSMENT OF AUSTRALIA'S ENERGY SECTOR

WE ASSESSED THE CLIMATE COMMITMENTS AND ACTIVITIES OF AUSTRALIA'S 20 BIGGEST ENERGY SECTOR EMITTERS (ELECTRICITY GENERATION, ELECTRICITY RETAIL AND GAS RETAIL), AND FOUND THAT:

+1 (5%)
has a climate commitment for some emissions in line with efforts required to support Australia's Paris-aligned decarbonisation trajectory.

+14 (70%)
are taking steps to reduce emissions, but not in line with efforts required to support Australia's Paris-aligned decarbonisation trajectory.

+5 (25%)
have no disclosed emissions reduction targets or commitments.



1
ENGIE

5
Arrow Energy, Bluewaters Power 1&2, NewGen Kwinana, NRG Gladstone Operating Services, OzGen

14
AGL, APT Pipelines, ATCO, C S Energy, CK William, Delta, EnergyAustralia, Origin, Pioneer Sail, Snowy Hydro, Stanwell, Synergy, Territory Generation, TransAlta

- **FULLY ALIGNED**
  Net zero by 2050 target for all emissions supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
- **CLOSELY ALIGNED**
  Net zero by 2050 target for a significant proportion of emissions supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
- **ALIGNED ASPIRATION/PATHWAY**
  Aspiration or interim targets covering a significant proportion of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.
- **PARTIALLY ALIGNED**
  Aspiration or targets covering a small proportion of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.
- **NOT ALIGNED**
  Undertaking some activities to reduce emissions but not in line with the trajectory required for the sector to support a national Paris-aligned trajectory in Australia - or the alignment is unclear.
- **NO TARGETS**
  No disclosed emissions reduction targets or commitments.

Context

This section presents the context in which the featured companies have been assessed, including their current emissions sources, why the energy sector is so important and the factors influencing why this sector's transition is not currently aligned with what is needed for Australia to support the Paris climate goals.

Australia's electricity generation is dominated by fossil fuels.

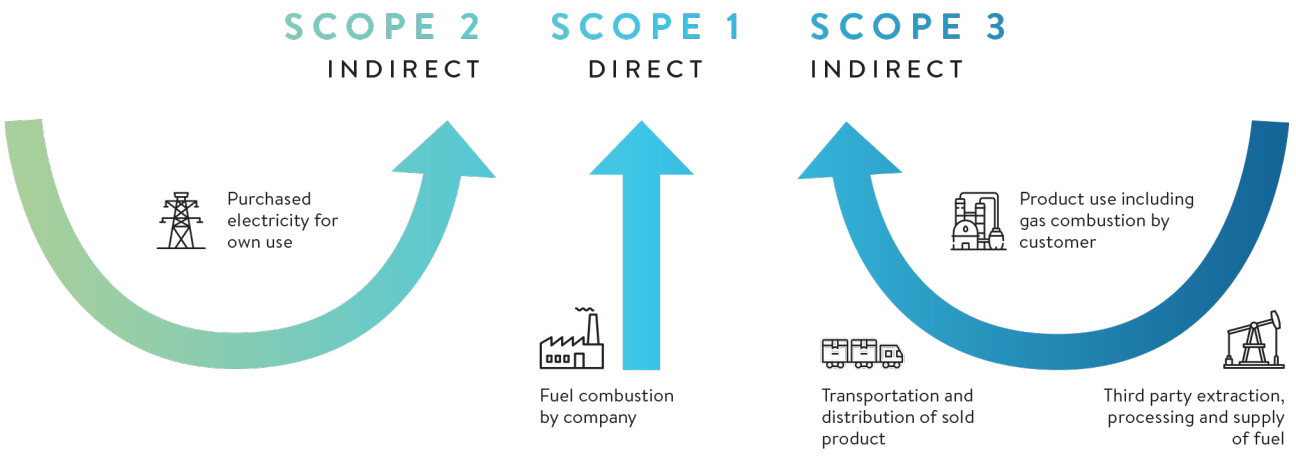
The energy generation and retail sector (hereafter referred to as the 'energy sector' or 'sector') is a key component of Australia's economy, powering homes, businesses and industries.

The sector is dominated by fossil fuels. In 2020, fossil fuels were used to generate 72 per cent of Australia's electricity and provided over 90 per cent of the energy consumed (Australian Government 2020a, Clean Energy Council 2021). The sector is in transition, with the share of electricity from renewable sources increasing from seven per cent in 2008 to 28 per cent in 2020 (made up of six per cent hydropower, two per cent bioenergy and 10 per cent each from wind and solar power). A fifth of this increase occurred between 2019 and 2020, with both small and utility scale solar making a significant contribution (Atholia, Flannigan & Lai 2020; Clean Energy Council 2021).

This transition is reflected in a 19 per cent decrease in emissions since the peak in 2007 (Australian Government 2020b) driven largely by an increase in renewable energy in Australia's electricity supply. However, electricity generation remains Australia's largest source of greenhouse gas emissions, contributing to 33 per cent of the country's emissions in the year to June 2020. Coal-fired generation is responsible for more than 80 per cent of this proportion, or approximately one quarter of all Australian emissions (Clean Energy Regulator 2021; Australian Government 2020b).

The most material source of emissions for companies that generate and retail electricity are direct (scope 1) and indirect (scope 2) emissions from fossil fuels combusted to produce the energy they generate or purchase. In comparison, indirect value chain emissions (scope 3) – such as those from upstream activities including extraction, production and transportation of fuel – are minimal. For companies also involved in gas retailing, however, scope 3 emissions – including those from downstream activities such as distribution of gas to customers and its subsequent combustion – can make up a significant proportion of their total emissions. A summary of scope 1, 2 and 3 emissions boundaries and sources for the energy sector is illustrated in Figure 1.

***Figure 1**: Emissions throughout the energy supply system (Adapted from: Ranganathan and Bahtia, 2004)*



Rapid decarbonisation of Australia's energy sector is critical – and possible.

The energy sector's pace of decarbonisation is critical for Australia to decrease its emissions in line with the Paris climate goal of limiting global temperature rise to well below 2 degrees Celsius, aiming for 1.5 degrees. The decarbonisation of the energy sector facilitates emissions reductions across other economic sectors in Australia, including the hard-to-abate transport and industry sectors, which must satisfy energy demand through a transition to zero carbon electricity where feasible (ClimateWorks 2020).

A recent report by the International Energy Agency (2021) reinforces that 'the energy sector […] holds the key to averting the worst effects of climate change.' Their report details a global net zero pathway and finds there should be no new investments in fossil fuel supply beyond projects committed in 2021.

ClimateWorks' Decarbonisation Futures analysis shows that the electricity sector can reach 64 per cent emissions reductions by 2030 from a 2017 base year, near zero emissions by 2040 and zero by 2050. In all the Decarbonisation Futures scenarios aligned with the Paris Agreement, renewables reach over 70 per cent of electricity generation by 2030 and are at or near to 100 per cent by 2040. This analysis also indicates that coal and gas could be phased out of Australia's energy mix as soon as 2035 through deployment of existing technologies such as batteries, solar thermal storage and pumped hydro.

The contested role of gas in the energy sector transition.

In 2019, gas represented 26 per cent of the energy consumed in Australia (Australian Government 2020a). Decarbonising the sector requires Australia to transition away from gas use for electricity generation and for heat and power in buildings and industry. In a recent study of the National Electricity Market (NEM), the Australian Energy Market Operator (AEMO) has indicated that industrial demand for gas is not expected to increase in the next two decades and could be significantly reduced as industries decarbonise (AEMO 2021).

To achieve the global climate goals, Australia must move away from gas usage through electrification or by switching to low-emissions fuels, such as biofuels or hydrogen (Wood & Dundas 2020). Transitioning to a green hydrogen economy could achieve a 20 per cent reduction in gas consumption for direct use by 2040 relative to 2021, with an even faster decline then projected to 2050 (AEMO 2021).

Green technologies are key to the energy transition, and have economic benefits.

Australia is well placed to become a global renewable energy superpower (Garnaut 2019). The country is endowed with an abundance of renewable energy resources and is currently deploying new renewables 10 times faster per capita than the global average (Blakers & Stocks 2020). Relative to current penetration, large-scale wind and solar generation in the NEM is expected to almost double to 9.4GW by 2023 (Leitch 2021).

A significant factor in this shift towards clean energy is the comparative cost of renewables relative to fossil-fuelled electricity generation. A recent joint study of current and future generation costs by CSIRO and AEMO confirmed that wind, solar and storage technologies are now cheaper than fossil-fuelled alternatives in Australia (Graham et al. 2020). Shifting from fossil fuel generation to renewables would lower average system costs, especially if complemented with green hydrogen, and associated necessary transmission network enhancements would deliver market benefits for customers (AEMO 2018; AEMO 2020; Ueckerdt et al. 2019).

In the international context, a transition to clean energy also has economic benefits. Several of Australia's biggest trading partners have committed to achieving net zero emissions, with the US, Japan, South Korea and the EU aiming to achieve this by 2050 and China aiming for 2060. Other countries are expected to follow (Hare 2020). In 2020, two of Australia's largest renewable energy export projects, the Australia-ASEAN Power Link and Asia Renewable Energy Hub, reported a growing demand for zero emissions energy across Asia (Mazengarb 2020c). Analysis conducted by Climate Action Tracker (2020) also noted that new opportunities are likely to arise for Australia to export green electricity and green hydrogen (produced through

renewable energy powered electrolysis of water). If Australia transitions its energy sector well, the nation could be well placed to become a top exporter of renewable energy and renewable-based energy-intensive goods, supporting policy-driven clean energy demand and the global transition to a net zero economy (Ueckerdt et al. 2019).

In Australia, investors are already advocating the financial importance of transitioning away from fossil fuels. Companies operating Australia's ageing coal- and gas-fired power plants face the risk of asset write downs and increasing cost of capital as investors seek to decarbonise their portfolios. Australia's biggest four banks – ANZ, Commonwealth, NAB and Westpac – have all stated that they are taking steps to limit financing for coal-fired power generation and have all committed to exit thermal coal by 2030 (IEEFA 2020a; Thornhill 2020). In 2020, several Australian asset owners, including AustralianSuper, Australia's largest superfund by members and total assets, committed to achieve net zero by 2050 across their investment portfolios, signalling that this would be achieved through a transition away from high carbon investments and towards renewables (IEEFA 2020b). Several energy utilities operating in Australia, including AGL and Origin, two of Australia's largest energy retailers, are also being targeted by Climate Action 100+, a coalition of over 500 global investors targeting 167 of the world's largest greenhouse gas emitting companies to ensure they have sufficiently ambitious net zero business strategies (Climate Action 100+ 2020).

State and territory policies are driving progress, but a strong federal policy is also needed.

Despite recent growth in renewable energy generation capacity, investment in large-scale renewable energy projects in Australia slumped in 2020 to its lowest level since 2017 (Clean Energy Council 2020b). The Clean Energy Council suggests that this is due to uncertainty over long-term federal policy, federal government interventions in the energy sector – including strong advocacy for new gas generation – and underinvestment in the energy network resulting in grid connection delays for new renewable infrastructure (Readfearn 2020).

BloombergNEF's G20 Zero Carbon Policy scorecard, which grades the climate policies of the world's 20 biggest economies, has put Australia in 10th position, with the weakest climate policies of the largest developed economies in the world, behind Germany, France, the UK, Canada, Italy and the US (BloombergNEF 2021). By comparison, countries such as Spain, South Korea, Uruguay and Kenya, which are among the regional frontrunners, are setting carbon-neutral targets and pushing ahead with major green energy funding to cut emissions and reduce energy prices (Watts 2020).

The federal government's Renewable Energy Target (RET) of 33,000GWh by 2020 was met and has not been increased (Australian Government 2020c). New investment in renewable energy is therefore being driven primarily by state and territory policies, along with demand from residential and commercial energy markets (Atholia, Flannigan & Lai 2020). Since 2017, it is estimated that corporate power purchase agreements have supported 8,200MW of renewable energy capacity (Energetics 2020).

All of Australia's states and territories have committed to net zero by 2050, and all but one (Western Australia) have renewable energy targets to support this goal (Table 7). This includes the Australian Capital Territory and South Australia, who have committed to a 100 per cent renewable energy target by 2020 and 2030 respectively, and Tasmania which has a 200 per cent by 2040 target. In addition, Victoria and Queensland's post-pandemic recovery plans, New South Wales's Electricity Infrastructure Investment Act 2020 and the City of Melbourne's Renewable Energy Projects (MREP1 and MREP2) have all encouraged renewable generation investment, often via reverse auctions where renewable energy developers bid for power supply contracts with state governments (NSW Government 2020; City of Melbourne n.d.). South Australia's most recent climate plan indicates that the state's transformation to a net zero emissions economy and a national and international exporter of clean energy could require a renewable energy generation level five times greater by 2050 than current local demand (Government of South Australia 2020).

To limit global temperature rise to 1.5 degrees Celsius above pre-industrial levels, emissions

must fall by at least 45 per cent by 2030 relative to 2010 levels (United Nations 2021). The decade prior to 2030 has been flagged as a critical window for climate action, during which a ‘fivefold increase in existing nation climate commitments is required’ to achieve this goal (UNEP 2019). Despite this, Australia’s national commitment remains at a 26–28 per cent cut by 2030 relative to 2005. By contrast, at April’s US convened Leaders Summit on Climate, several countries including the UK, US, Japan and Canada, bolstered their interim decarbonisation goals. The US has committed to reduce greenhouse gas emissions by between 50 and 52 per cent by 2030, based on 2005 levels, and the UK committed to a 78 per cent cut in greenhouse gas emissions by 2035 relative to 1990 (Milman 2021; UK Government 2021).

Analysis

Assessing the top 20 emitting energy companies in Australia.

This analysis focuses on the 20 biggest emitters within the Australian energy sector, which collectively account for 31 per cent of Australia's total scope 1 and 2 emissions. These are companies with primary activities that include electricity generation, electricity retailing or gas retailing, which reported the highest total scope 1 and 2 emissions in 2018–19 under Australia's National Greenhouse and Energy Reporting (NGER) scheme (Figure 2) (Clean Energy Regulator 2020). Other activities in the energy sector's value chain, including extraction and processing of oil, gas and coal, are covered in the Net Zero Momentum Tracker Resource sector report.

Collectively, these 20 companies are responsible for 71 per cent of total national electricity generation and account for 89 per cent of Australia's electricity sector scope 1 and 2 emissions (Australian Government 2020b, Australian Government 2020a). The companies assessed predominantly operate within Australia's National Electricity Market (NEM), a wholesale electricity market that delivers around 80 per cent of Australia's electricity consumption. The exceptions are Synergy, NewGen Kwinana, Bluewaters Power 1&2 and Territory Generation, which mainly operate in Western Australia and the Northern Territory and are not connected to the NEM.

Some energy supply companies have very low emissions because their business model already relies on the supply of renewable electricity. These companies play an important part in how the overall sector is transitioning. However, because they are not high-emitting companies, they fall outside the scope of this report and are not included in the analysis.

Out of the 20 companies analysed, 12 – ATCO, APT Pipelines, Bluewaters Power 1&2, C S Energy, CK William, Delta, NewGen Kwinana, NRG Gladstone Operating Services[1], OzGen, Stanwell, Territory Generation and TransAlta – are primarily involved in electricity generation and retailing.

The remaining eight companies – AGL, Arrow Energy, EnergyAustralia, ENGIE, Origin, Pioneer Sail, Snowy Hydro and Synergy – are also gas retailers. As such, scope 3 emissions – primarily from combustion of gas by customers – can represent a significant proportion of their total emissions. Only two companies report their scope 3 emissions, which account for 40 per cent of AGL's total emissions and 70 per cent of Origin's.

Evaluating each company's commitments against an Australian energy sector decarbonisation pathway.

This energy sector report analyses the emission reduction pledges, commitments and activities of the top 20 emitting energy generators and retailers to evaluate their alignment with the goal of net zero emissions by 2050. Due to the criticality of the sector's transition pace for Australia to align with the Paris Agreement, this analysis included an evaluation of each company's decarbonisation trajectory relative to Australian energy sector decarbonisation pathways. Each company's decarbonisation targets were assessed using ClimateWorks' Decarbonisation Futures scenarios. These scenarios indicate that for Australia to achieve emissions reductions in line with the Paris Agreement – limiting global temperature rise to well below 2 degrees Celsius and aiming for 1.5 degrees – by 2030 the electricity sector has reduced emissions by at least 64 per cent (2017 baseline), has achieved near zero emissions by 2040 and zero emissions by 2050. Across the scenarios, electricity generation from renewable sources increases from 21 per cent in 2020 to 70–77 per cent by 2030, leading to an emissions reduction of 64–74 per cent this decade. Emissions associated with gas use in buildings and industry in Australia decrease by 17–34 per cent by 2035 and by 50–71 per cent by 2050 relative to 2017 levels.

[1] NRG Gladstone Operating Services operates Gladstone Power Station, which is a joint venture between Rio Tinto Ltd (42%), NRG Energy Inc (37.5%), SLMA GPS Pty Ltd (8.5%), Ryowa II GPS Pty Ltd (7.1%) and YKK GPS (Queensland) Pty Ltd (4.75%).

***Figure 2**: Australian scope 1 & 2 emissions reported by energy utilities for 2018-19 (Source: ClimateWorks Australia; Data source: Clean Energy Regulator 2020)*

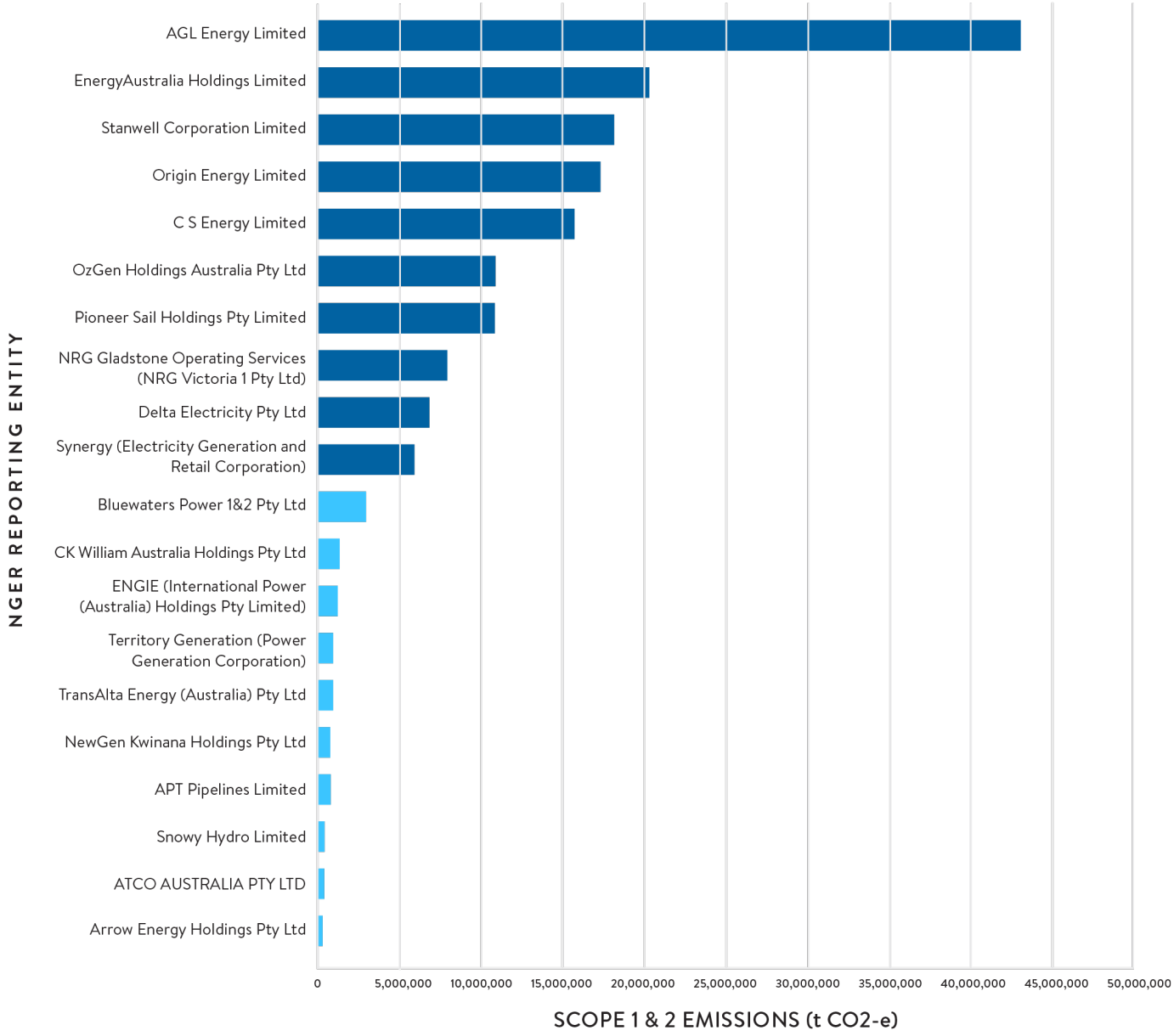


Table 1 summarises the assessment of each company's overall net zero by 2050 ambition based on analysis of commitments and activities that address direct and indirect (scope 1, 2 and 3) emissions from across their value chains.

Table 2 illustrates findings from an assessment of each company's scope 1 and 2 emissions reduction commitments and activities for six categories: energy conservation, fossil fuel retirement, renewable electricity generation, renewable electricity integration, electrification and fuel switching, and non-energy/offsets.

Table 3 provides a similar assessment with a focus on activities and initiatives that address scope 3 emissions under four categories: energy conservation, renewable electricity, electrification and fuel switching, and non-energy/offsets. Supporting details for Tables 1, 2 and 3 are provided in the appendix.

Some energy companies have net zero targets, but none are planning a sufficiently rapid decarbonisation in the short to medium term.

Overall, assessment of the 20 companies' emissions reduction activities and commitments against the proposed decarbonisation trajectory (Figure 3) finds that:

- None of the 20 companies considered have fully committed to net zero by 2050 for all of their scope 1, 2 and 3 emissions.
- One company – ENGIE, accounting for approximately one per cent of the Australian electricity sector's emissions and 1.5 per cent of electricity production – has an aligned interim target for a small proportion of its total emissions and is thus **partially aligned**.
- Fourteen companies – AGL, APT Pipelines, ATCO, C S Energy, CK William, Delta, EnergyAustralia, Origin, Pioneer Sail, Snowy Hydro, Stanwell, Synergy, Territory Generation and TransAlta, accounting for 79 per cent of the electricity sector's emissions and 60 per cent of electricity production – are conducting activities or have some commitments to reduce their emissions, but these are **not aligned**.
- The remaining five companies – Arrow Energy, Bluewaters Power 1&2, NewGen Kwinana, NRG Gladstone Operating Services and OzGen, accounting for 13 per cent of the electricity sector's emissions and 10 per cent of the electricity production – have **no disclosed emissions reduction targets or activities** for their scope 1, 2 or 3 emissions.

The assessment uses a detailed evaluation of decarbonisation targets against the Decarbonisation Futures trajectory. For the six companies with decarbonisation targets:

- One – ENGIE – has a group target to reduce its global scope 3 emissions from use of sold gas by 34 per cent by 2030 from a 2017 base year. These emissions account for 48 per cent of the group's total scope 3 emissions and 33 per cent of its total scope 1, 2 and 3 emissions. This target aligns with a modelled decarbonisation trajectory for Australia, hence this company was rated as partially aligned. ENGIE has also committed to reduce power generation scope 1 and 3 emissions by 52 per cent per kWh by 2030 from a 2017 base year. This target is not sufficient relative to the 67–77 per cent emissions intensity reduction achieved in modelled trajectories between 2017 and 2030 and is therefore not aligned with Paris climate goals.
- One company – TransAlta, a multinational power company operating gas fired plants in Western Australia – has a global target to reduce operational emissions by 60 per cent by 2030 relative to a 2015 baseline, and achieve net zero emissions by 2050. The company has not disclosed any plans to transition their Australian generation assets. Since the company do not have clear commitments for all their emissions, they have been rated as not aligned.
- Three companies – AGL, APT Pipelines[2] and EnergyAustralia, accounting for 36 per cent of Australia's electricity sector emissions and approximately 26 per cent of electricity production – aim to achieve net zero operational (scope 1 and 2) emissions by 2050, but none have set supporting interim targets. Their alignment with a pace of transition that supports a national Paris-aligned pathway is therefore unclear, hence these companies have been rated as not aligned. EnergyAustralia has committed to close its Yallourn coal-fired power station by 2028 which could reduce its operational emissions by 60 per cent. If no new emissions' sources are introduced, this reduction will be in line with a decarbonisation trajectory that supports a national Paris-aligned pathway.
- One company – Origin, accounting for nine per cent of the electricity sector emissions – has set interim emissions reduction targets for its scope 1, 2 and 3 emissions. In ClimateWorks' view, these are not enough for Australia to decarbonise in line with the Paris climate goals. Origin's 50 per cent emissions reduction target for scope 1 and 2 emissions is less than the 65 per cent emissions reduction achieved in modelled trajectories between 2017 and 2032. The company's 25 per cent scope 3 emissions reduction target is less than the 32 per cent emissions reduction achieved in modelled trajectories by 2030, from a 2017 base year. Origin has also indicated an aspiration to align its targets with a 1.5 degrees pathway with an aim to achieve net zero emissions by 2050.

[2]This assessment is based on APT Pipelines' energy generation operations and does not consider gas transmission and distribution activities.

This means three of the top five energy emitting companies – AGL, EnergyAustralia, Stanwell, Origin and C S Energy, accounting for 62 per cent of Australia's electricity generation emissions – have emissions reduction commitments, but none are on Paris-aligned pathways.

Two of the organisations assessed – Delta and OzGen's parent company, InterGen – objected to the Australian Energy Council's recent endorsement of an economy-wide net zero emissions by 2050 target for Australia indicating their reluctance to commit to this target (Mazengarb 2020b).

Initiatives to reduce scope 1 and 2 emissions are underway across the sector but more ambitious activities are needed.

Fifteen of the 20 companies analysed – AGL, ATCO, EnergyAustralia, Stanwell, Origin, C S Energy, CK William, Pioneer Sail, Delta, Synergy, CK Williams, ENGIE, TransAlta, APT Pipelines and Snowy Hydro – are undertaking activities to reduce scope 1 and 2 emissions. Actions include initiatives to increase electricity generation from renewables, enhance renewable energy integration, improve energy efficiency in power stations and retire coal-fired plants.

All 15 of these companies have implemented renewable energy generation to varying extents, with a number of large and medium wind and solar energy projects in operation or at proposal stages. Some examples include:

- Snowy Hydro has committed to buying over 1,000MW in long-term offtake contracts for wind and solar (Snowy Hydro 2020b).
- AGL has developed a 53MW and 102MW solar plant, has entered into a solar offtake agreement to procure up to 300MW of solar energy and operates wind generation assets with a total capacity of 1,562MW (AGL 2020b).
- EnergyAustralia has rights to over 800MW of solar and wind energy through power purchase agreements, along with part ownership of the 66MW Cathedral Rocks Wind Farm (EnergyAustralia 2020).
- ENGIE and Pioneer Sail have specific renewable capacity goals, with Pioneer Sail aiming to have 1,500MW of renewable energy capacity by 2025 and ENGIE group targeting 9,000MW of renewable capacity by 2021 (Alinta Energy 2020; ENGIE 2020a).

Seven companies – AGL, ENGIE, EnergyAustralia, Origin, Pioneer Sail, Snowy Hydro and Synergy – are undertaking activities to improve renewable energy integration. Integration of renewable sources into the energy mix can be supported by implementing pumped hydro, battery storage and virtual power plants (VPP). A VPP is a cloud-based central control system that aggregates large-scale and distributed generation, including consumer-level generation and storage, and relieves load on the grid during peak demand by optimising distribution of power from these sources based on supply and demand data. Examples include:

- Origin is planning to install a 700MW battery on the site of its Eraring coal-fired power station in New South Wales, promoted as Australia's largest battery project to date (Terzon & Hutchens 2021).
- Snowy Hydro aims to provide over 350,000MWh of storage to the NEM through its Snowy 2.0 project (Snowy Hydro 2020a).
- AGL has a goal to install 1,200MW of new battery storage and demand response capacity by 2024 (Mazengarb 2020a). Through its VPP program, AGL is encouraging renewables integration and electrification measures among its customers by providing behind-the-meter storage (Winter 2020). In collaboration with the NSW State Government, AEMO and ARENA, AGL is pioneering new financial incentives for customers to reduce energy use during peak demand (AGL 2020b).
- EnergyAustralia and Pioneer Sail also operate battery storage assets while, through its Simply Energy VPP project, ENGIE plans to virtually aggregate storage capacity from batteries installed in up to 1,200 households and 10 commercial businesses (ENGIE 2019).
- Synergy is also conducting a VPP trial with 10 schools, is collaborating in trials of community-scale battery storage and is testing peer-to-peer trading, which will enable owners of rooftop solar panels to sell energy to local consumers (Synergy 2020).

Plans for early closure of coal-fired power plants are emerging among those that operate these assets. Eleven of the 20 companies examined still operate coal-fired power stations in Australia, since ENGIE has closed or divested all Australian

coal-fired plants (ENGIE 2020d). Their plans to exit coal vary:

- AGL – the top emitting energy company in Australia accounting for 25 per cent of the country's electricity sector emissions – has committed to exit coal by 2050, noting it is 'not able to make unilateral commitments to closing power stations in advance of government policy'. AGL plans to retire its coal-fired Liddell plant in 2022–2023 (AGL 2021) despite federal government pressure to extend its life further.
- Origin has committed to exit coal by 2032.
- EnergyAustralia – accounting for 10 per cent of the electricity sector emissions – has recently committed to bring forward retirement of Yallourn, one of its coal-fired power plants, from 2032 to 2028.
- Accounting for 43 per cent of Australia's electricity sector's emissions, the remaining eight companies – Bluewaters Power 1&2, C S Energy, Delta, NRG Gladstone Operating Services, OzGen, Pioneer Sail, Stanwell and Synergy – have made no commitments to divest from their coal assets.

Companies assessed are planning to retain gas-powered generation as a component of future power generation, either as a transition fuel or to supply dispatchable power to manage supply intermittency or demand peaks. This is despite increasing consensus that increased gas usage in the Australian power sector is incompatible with Paris-aligned scenarios, and that gas can be phased out of Australia's electricity sector between 2040 and 2050 through deployment of renewables and storage (ClimateWorks 2020; Murphy & Karp 2021). In the context of likely coal-fired generation retirements in Australia, studies suggest that new gas powered generation would be less economical compared to wind and solar, with batteries to complement renewables being the more cost-effective option over the next decade (AEMO 2020; Wood & Dundas 2020).

- AGL's proposed 250MW gas-fired power station in Tomago, NSW, is framed by the company as 'consistent with [their] move to a renewable energy mix' (AGL 2020a, Macdonald-Smith 2020).
- None of the 14 companies assessed that use gas for electricity production – AGL, APT Pipelines, ATCO, CK William, EnergyAustralia, ENGIE, NewGen Kwinana, Origin, Pioneer Sail, Snowy Hydro, Stanwell, Synergy, TransAlta and Territory Generation – have committed to curtail this gas usage.

Other efforts to reduce scope 1 and 2 emissions include power station upgrades, with five companies – AGL, EnergyAustralia, ENGIE, Origin and Pioneer Sail – implementing initiatives to improve power plant efficiency. Origin's Real Time Optimisation project, a digital tool to optimise power plant performance, aims to avoid a total of 1 million tonnes of CO2-e by 2025 (Origin 2020).

AGL, EnergyAustralia and Origin also offer carbon neutral products by purchasing carbon offsets on behalf of their customers at either some or no cost (AGL 2020b; EnergyAustralia 2020; Origin 2020).

Efforts to address scope 3 are minimal among energy companies.

Relative to efforts to reduce scope 1 and 2 emissions, our analysis finds disclosure of and action to reduce scope 3 emissions to be limited. Of the companies assessed, two – Origin and ENGIE – have interim targets endorsed by the Science Based Targets initiative for their scope 3 emissions. As described previously, Origin's current scope 3 target is not aligned with a modelled trajectory that would support a national Paris-aligned pathway, but the company has an overarching aspiration to reach net zero by 2050 and plans to implement more ambitious interim targets (Science Based Targets initiative 2020; Origin 2020). While ENGIE's emissions intensity target for scope 1 and 3 emissions is not in line with the trajectory required for Australia to be Paris-aligned, its emissions reduction target for its use of sold products (including natural gas use by customers) is aligned with this pathway.

Although scope 3 emissions can represent a significant proportion of gas retailers' total emissions, only AGL and Origin, two of the top five emitters in the sector, report scope 3 emissions in Australia. Indirect scope 3 emissions represent 40 per cent of AGL's total emissions and 70 per cent of Origin's.

There is little indication among the gas retailers that they plan to transition away from this activity. The supply and use of gas sold to residential and commercial customers is a major source of scope 3 emissions for the energy sector. For the two

companies reporting scope 3 emissions, domestic gas supply to and usage by customers account for approximately 25 per cent of AGL's total scope 3 emissions and 37 per cent of Origin's.

Of the eight companies assessed that include gas retailing in their operations, four – AGL, EnergyAustralia, Origin and ENGIE – are implementing initiatives that address scope 3 emissions including investing in hydrogen and biofuels, and providing carbon neutral products for customers to reduce their carbon footprint. The ENGIE group has committed to producing 100 per cent green gas (including biogas and green hydrogen) by 2050 as a substitute for its imported natural gas (ENGIE 2020a). Three companies – AGL, EnergyAustralia and Origin – are offsetting emissions from gas usage through their carbon neutral schemes (AGL 2020b; EnergyAustralia 2020; Origin 2020). The remaining four gas retailers assessed – Arrow Energy, Pioneer Sail, Synergy and Snowy Hydro – have no initiatives to reduce scope 3 emissions.

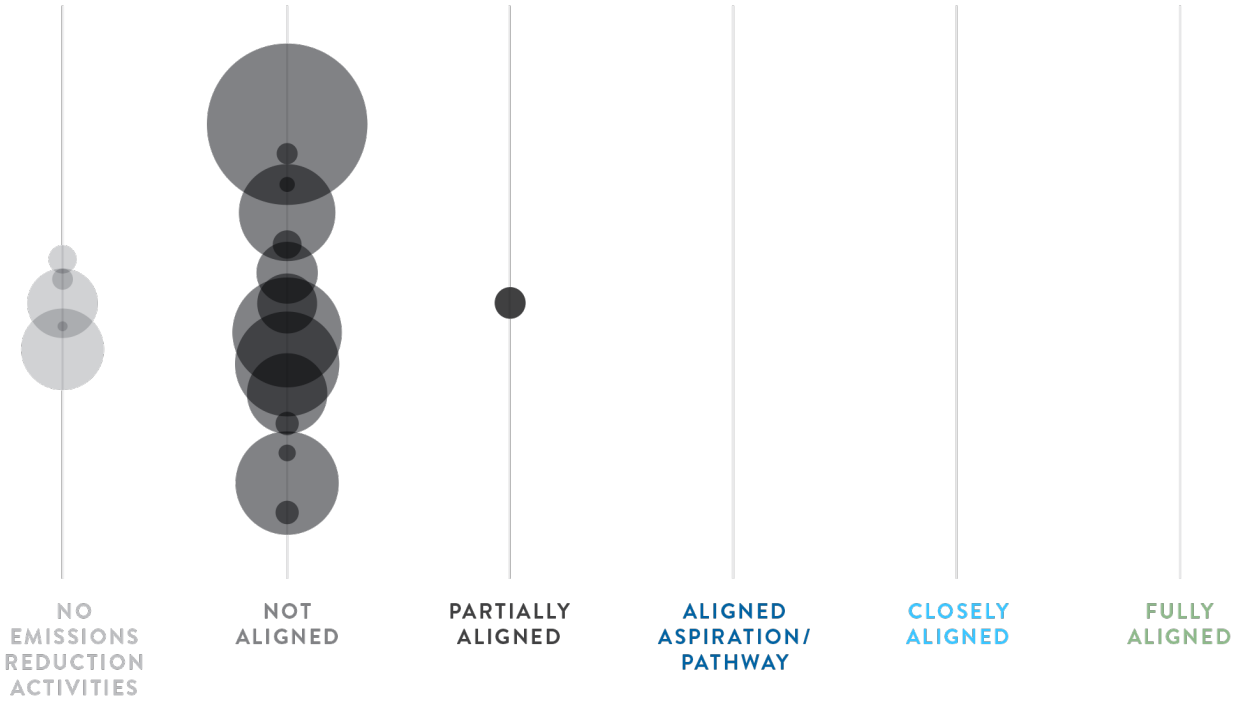
In Paris-aligned modelled trajectories, domestic gas consumption reduces substantially, with gas replaced by renewable electricity or other zero emissions fuels where possible (Climate Action Tracker 2020). Given that most gas retailers assessed are also electricity retailers[3], this presents an untapped opportunity for a smooth transition. An early shift away from gas retail offers these companies – including the sector's biggest emitters AGL, EnergyAustralia and Origin – an opportunity to sell more renewable electricity.

While scope 1 and 2 emissions can represent a significant proportion of electricity generators and retailers' total emissions, scope 3 emissions can still be material. None of the 12 companies analysed primarily involved in electricity generation and retailing – ATCO, APT Pipelines, Bluewaters Power 1&2, C S Energy, CK William, Delta, NewGen Kwinana, NRG Gladstone Operating Services[4], OzGen, Stanwell, Territory Generation and TransAlta – report or are undertaking initiatives to reduce these emissions.

[3] AGL has announced an intention to split its generation and retail interests into two separate businesses – subject to consultation with relevant stakeholders. Further details on the separation are expected by the end of June.

[4] NRG Gladstone Operating Services operates Gladstone Power Station, which is a joint venture between Rio Tinto Ltd (42%), NRG Energy Inc (37.5%), SLMA GPS Pty Ltd (8.5%), Ryowa II GPS Pty Ltd (7.1%) and YKK GPS (Queensland) Pty Ltd (4.75%).

Figure 3: *Distribution of energy companies assessed by net zero ambition – where the bubble size is proportional to their total scope 1 and 2 emissions reported under Australia's National Greenhouse and Energy Reporting (NGER) scheme in 2019-20.*



Fully aligned	Net zero by 2050 target for *all* emissions supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
Closely aligned	Net zero by 2050 target for a *significant proportion*[5] of emissions supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
Aligned aspiration/pathway	Aspiration or interim targets covering a *significant proportion* of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.
Partially aligned	Aspiration or targets covering a *small proportion* of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.
Not aligned	Undertaking some activities to reduce emissions but not in line with a trajectory for the sector to support a national Paris-aligned trajectory in Australia – or the alignment is unclear.
No emissions reduction targets or activities	No disclosed emissions reduction targets or commitments.

[5] For this analysis, 'significant' is considered to be at least 50 per cent of all direct and indirect emissions.

TABLE 1: ASSESSMENT OF NET ZERO AMBITION

The energy organisations listed are the 20 Australian companies that primarily generate electricity and retail energy (electricity and gas) that reported the highest scope 1 and 2 emissions in 2019-20 under Australia's National Greenhouse and Energy Reporting (NGER) scheme. The assessment of net zero ambition is informed by Table 6 in the appendix.

Net zero ambition	Scope 1 and 2 emissions (tCO_2-e)	Scope 3 emissions (tCO_2-e)	Main activities	Company
▲	1,606,084	Not reported	Electricity generation and retail, gas retail	ENGIE (International Power (Australia) Holdings Pty Limited)
•	42,532,737	26,300,000	Electricity generation and retail, gas retail	AGL Energy Limited
•	18,161,519	Not reported	Electricity generation and retail, gas retail	EnergyAustralia Holdings Limited
•	17,190,133	Not reported	Electricity generation and retail	Stanwell Corporation Limited
•	15,487,444	41,397,273	Electricity generation and retail, gas retail	Origin Energy Limited
•	13,327,141	Not reported	Electricity generation and retail	C S Energy Limited
•	11,712,231	Not reported	Electricity generation and retail, gas retail	Pioneer Sail Holdings Pty Limited
•	6,571,507	Not reported	Electricity generation and retail	Delta Electricity Pty Ltd
•	5,446,880	Not reported	Electricity generation and retail, gas retail	Synergy (Electricity Generation and Retail Corporation)
•	1,337,944	Not reported	Electricity generation	CK William Australia Holdings Pty Ltd

●	926,482	Not reported	Electricity generation	Territory Generation (Power Generation Corporation)

Net zero ambition	Scope 1 and 2 emissions (tCO_2-e)	Scope 3 emissions (tCO_2-e)	Main activities	Company
●	920,770	Not reported	Electricity generation	TransAlta Energy (Australia) Pty Ltd
●	813,102	Not reported	Electricity generation	APT Pipelines Limited
●	384,032	Not reported	Electricity generation and retail, gas retail	Snowy Hydro Limited
●	372,889	Not reported	Electricity generation	ATCO Australia Pty Ltd
○	10,854,511	Not reported	Electricity generation	OzGen Holdings Australia Pty Ltd
○	7,288,233	Not reported	Electricity generation	NRG Gladstone Operating Services (NRG Victoria 1 Pty Ltd)
○	4,342,894[6]	Not reported	Electricity generation	Bluewaters Power 1&2 Pty Ltd
○	664,813	Not reported	Electricity generation	NewGen Kwinana Holdings Pty Ltd
○	211,573	Not reported	Electricity generation and gas retail	Arrow Energy Holdings Pty Ltd

[6] Total reported emissions from Bluewaters Power 1 and Bluewaters Power 2 with each entity reporting 1,471,806 tCO2e and 1,435,544 tCO2e, respectively.

★	**Fully aligned**	The organisation has a target to achieve net zero by 2050 for all of its emissions, supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
☆	**Closely aligned**	The organisation has a target to achieve net zero by 2050 for a significant proportion of its emissions, supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
■	**Aligned aspiration/ pathway**	The organisation has expressed an aspiration or has set interim targets covering a significant proportion of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.
▲	**Partially aligned**	The organisation has expressed an aspiration or has set targets covering a small proportion of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.
●	**Not aligned**	The organisation has made a commitment, pledge or is undertaking activities that will reduce its emissions but not in line with a trajectory for the sector to support a national Paris-aligned trajectory in Australia, or the alignment is unclear due to insufficient information.
o	**No emissions reduction targets or activities**	The organisation has not disclosed any emissions reduction targets, commitments or activities.

TABLE 2: ASSESSMENT OF SCOPE 1 AND 2 EMISSIONS REDUCTION COMMITMENTS AND ACTIVITIES

This assessment of scope 1 and 2 emissions reduction activities and initiatives is informed by the pledges and commitments summarised in Table 5 (included in the appendix).

Company	Energy conservation	Renewable electricity			Electrification/ fuel switching	Non-energy/ offsets
		Fossil fuel retirement	Renewables integration	Renewables generation		
AGL Energy Limited	■	☆	☆	■	☆	■
APT Pipelines Limited	o	o	o	■	o	o
Arrow Energy Holdings Pty Ltd	o	o	o	o	o	o
ATCO Australia Pty Ltd	o	o	■	■	o	o
Bluewaters Power 1&2 Pty Ltd	o	o	o	o	o	o
C S Energy Limited	o	o	o	■	o	o
CK William Australia Holdings Pty Ltd	o	o	o	■	o	o
Delta Electricity Pty Ltd	o	o	o	■	o	o
EnergyAustralia Holdings Limited	■	☆	■	■	☆	■
ENGIE (International Power (Australia) Holdings Pty Limited)	■	☆	■	☆	o	o

Company	Energy conservation	Renewable electricity			Electrification/ fuel switching	Non-energy/ offsets
		Fossil fuel retirement	Renewables integration	Renewables generation		
NewGen Kwinana Holdings Pty Ltd	o	o	o	o	o	o
NRG Gladstone Operating Services (NRG Victoria 1 Pty Ltd)	o	o	o	o	o	o
Origin Energy Limited	■	☆	■	■	■	■
OzGen Holdings Australia Pty Ltd	o	o	o	o	o	o
Pioneer Sail Holdings Pty Limited	■	o	■	☆	o	o
Snowy Hydro Limited	o	o	☆	■	o	o
Stanwell Corporation Limited	o	o	o	■	o	o
Synergy (Electricity Generation and Retail Corporation)	o	o	■	■	o	o
Territory Generation (Power Generation Corporation)	■	o	o	o	o	o
TransAlta Energy (Australia) Pty Ltd	o	o	o	■	o	o

★ Specific target that aligns with net zero emissions by or before 2050. For example:

- Energy conservation: commitment equivalent to an energy efficiency/intensity target aligned with net zero by 2050
- Renewable electricity: commitment to use 100 per cent renewable electricity.
- Electrification or fuel switching: commitment to shift to 100 per cent electrification and/or non-emitting fuels
- Non-energy/offsets: commitment to abate all non-energy emissions and offset unavoidable emissions only.

☆ Activities to reduce emissions supported by a detailed strategy or target.

■ Activities without a detailed strategy or target that will reduce emissions.

o Generic expression of intent or no information.

TABLE 3: ASSESSMENT OF SCOPE 3 EMISSIONS REDUCTION COMMITMENTS AND ACTIVITIES

This assessment of scope 3 emissions reduction activities and initiatives is informed by the pledges and commitments summarised in Table 5 (included in the appendix).

Company	Energy conservation	Renewable electricity	Electrification/ fuel switching	Non-energy/ offsets
AGL Energy Limited	o	o	o	■
APT Pipelines Limited	o	o	o	o
Arrow Energy Holdings Pty Ltd	o	o	o	o
ATCO Australia Pty Ltd	o	o	o	o
Bluewaters Power 1&2 Pty Ltd	o	o	o	o
C S Energy Limited	o	o	o	o
CK William Australia Holdings Pty Ltd	o	o	o	o
Delta Electricity Pty Ltd	o	o	o	o
EnergyAustralia Holdings Limited	o	o	o	■
ENGIE (International Power (Australia) Holdings Pty Limited)	o	o	☆	o
NewGen Kwinana Holdings Pty Ltd	o	o	o	o
NRG Gladstone Operating Services (NRG Victoria 1 Pty Ltd)	o	o	o	o

Company	Energy conservation	Renewable electricity	Electrification/ fuel switching	Non-energy/ offsets
Origin Energy Limited	o	o	o	■
OzGen Holdings Australia Pty Ltd	o	o	o	o
Pioneer Sail Holdings Pty Limited	o	o	o	o
Territory Generation (Power Generation Corporation)	o	o	o	o
Snowy Hydro Limited	o	o	o	o
Stanwell Corporation Limited	o	o	o	o
Synergy (Electricity Generation and Retail Corporation)	o	o	o	o
TransAlta Energy (Australia) Pty Ltd	o	o	o	o

★ Specific target that aligns with net zero emissions by or before 2050. For example:

- Energy conservation: commitment equivalent to an energy efficiency/intensity target aligned with net zero by 2050
- Renewable electricity: commitment to use 100 per cent renewable electricity
- Electrification or fuel switching: commitment to shift to 100 per cent electrification and/or non-emitting fuels
- Non-energy/offsets: commitment to abate all non-energy emissions and offset unavoidable emissions only.

☆ Activities to reduce emissions supported by a detailed strategy or target.

■ Activities without a detailed strategy or target that will reduce emissions.

o Generic expression of intent or no information.

Next steps

Energy companies must align their commitments with a pathway that supports Paris-aligned decarbonisation in Australia.

Australia's transition to net zero emissions must be underpinned by rapid decarbonisation of its energy sector – access to zero emissions energy is essential for decarbonisation of other sectors, including heavy industry, manufacturing and transport. The pace of the energy sector's transition is therefore critical for Australia to decrease its emissions in line with the Paris climate goals (ClimateWorks 2020). ClimateWorks' research indicates that Australia's electricity sector can achieve an emissions reduction of at least 64 per cent by 2030 (relative to 2017 levels), near zero emissions by 2040 and, through deployment of renewable generation supported by new storage capabilities and demand management measures, can fully decarbonise by 2050. However, this is far from being achieved through current policies and actions.

Although progress is being made among Australia's energy generation and retail companies to reduce their emissions, the current level of ambition and pace of action is insufficient. None of those assessed have comprehensive commitments to achieve net zero by 2050 or earlier that cover the full scope of their emissions. Fourteen of the 20 companies evaluated, responsible for 79 per cent of Australia's electricity sector's emissions, are implementing emissions reductions activities and commitments but these do not align with a trajectory that supports Australia's ability to achieve the Paris climate goals. More ambitious commitments and actions, supporting a faster transition to renewables are therefore required.

Australian companies can shift from fossil fuels to renewable sources with proven green technologies.

There is a pressing need to retire coal-fired power plants, which are responsible for more than 80 per cent of electricity sector emissions reported under Australia's National Greenhouse and Energy Reporting (NGER) scheme (Clean Energy Regulator 2021; Australian Government 2020b).

An efficient transition to zero carbon electricity will enable Australia to capitalise on growing demand for clean energy and green commodities among its global trading partners, an increasing number of which are adopting net zero by 2050 targets and raising the ambition of their interim decarbonisation goals. Australia's abundant renewable energy and raw material resources, infrastructure and expertise mean it is well positioned to capitalise on these opportunities. The alternative could set Australia on an economically unsustainable trajectory, left behind in the wake of its international competitors.

Also key to this transition is a shift from gas to electricity, or zero emissions alternatives, where feasible. The role of gas in Australia's energy transition is contentious and efforts to shift away from this fuel are currently minimal.

Ongoing advances in renewable energy generation and storage technologies mean that a renewable electricity grid is increasingly perceived as a reliable and economically viable option, particularly in Australia where renewable resources are abundant (AEMO 2020; Graham et al. 2020).

Federal climate and energy policy and growing investor pressure could boost Australia's energy transition.

A national long-term energy transition strategy with emission reduction targets will be crucial to this transition. Such a strategy would enable power companies and electricity market operators to plan new renewable capacity and integration requirements, along with clear milestones for fossil-fuelled asset retirement. Private capital and public companies poised to invest in this transition also require these clear signals from policy makers.

Financial institutions are transitioning away from brown to green investments. Acknowledging the critical role of the sector's decarbonisation pace and assessing companies against this benchmark can further support the sector's transition.

In this transformative decade for addressing climate change, decarbonising energy generation and supply is a priority. By accelerating decarbonisation of Australia's energy sector, the country will be better positioned to manage climate risks and capitalise on the global transition to net zero emissions.

Case studies

ENGIE

ENGIE is a multinational energy and services company operating in over 70 countries. Its Australian subsidiary, International Power (Australia) Holdings Pty Limited, owns and operates three wind farms, with about 1,000MW of capacity, and three gas-fired generating plants (ENGIE 2020d). In 2020, the group's emissions reduction targets were approved by the Science Based Targets initiative (SBTi) as aligned with a 2 degree global warming scenario. These targets are to reduce the rate of emissions per kWh of energy production by 52 per cent between 2017 and 2030 and reduce the emissions linked to the use of the group's products sold in this period by 34 per cent (ENGIE 2020a). It is also prioritising SBTi-certified suppliers for all of its preferred supplier agreements.

In 2016, the company announced early closure of its only coal asset in Australia, Hazelwood power station and mine, which had the highest greenhouse gas emissions of any Australian power station when it shut down in 2017 (Whittaker & Asher 2020). To support its group target of 9GW of renewable capacity by 2021, ENGIE is constructing three new solar farms in Queensland and New South Wales with a combined capacity of 535MW (ENGIE 2020d). The Virtual Power Plant operated by its retail arm, Simply Energy, is set to deliver up to 1,200 Tesla Powerwall 2 batteries to households, representing 6MW of residential energy storage, with a further 2MW of demand response capacity deployed across 10 commercial businesses (ARENA 2020).

The company is carrying out a feasibility study for a green hydrogen plant in Western Australia's Pilbara region (ENGIE 2020c). In May 2021, it was awarded $42.5 million to produce green hydrogen for ammonia production as part of ARENA's Renewable Hydrogen Deployment Funding Round, aimed at fast-tracking commercial-scale deployment of renewable hydrogen in Australia (ENGIE 2020b).

EnergyAustralia

EnergyAustralia, which is owned by Hong Kong based CLP Group, is one of Australia's leading electricity generators and energy retailers. The organisation is responsible for about seven per cent of Australia's total electricity generation and is the second largest greenhouse gas emitter in Australia's electricity sector. It has a net zero emissions by 2050 target for its operational emissions.

The organisation has over 4,500MW in electricity generation capacity, including two coal-fired and four gas-fired power stations. In addition, it jointly owns the Cathedral Rocks wind farm in South Australia and has more than 800MW of solar and wind farm power purchase agreements (EnergyAustralia 2021). It also operates two battery storage facilities with a combined capacity of 55MW, equivalent to 80MWh of energy storage. As part of its emissions reduction strategy, it offers carbon neutral energy at no cost to customers and had offset over 1.1 million tonnes of carbon dioxide by mid-2019 under this scheme.

Although licensed to operate the Yallourn coal-fired power station until 2032, EnergyAustralia announced in March 2021 its intention to close this plant by mid-2028, four years ahead of schedule (EnergyAustralia 2021). The power station produces an average of 13 million tonnes of carbon dioxide equivalent per annum, and is the power station with the highest greenhouse gas emissions per megawatt hour of electricity generated in the country (Clean Energy Regulator 2020; Mazengarb & Parkinson, 2021). Based on the company's current asset portfolio and associated emissions profile, this closure could reduce the company's operational scope 1 emissions by 60 per cent, bringing it closer to its net zero target and more aligned with Australia's required decarbonisation trajectory to meet the Paris climate goals. The company has also announced a plan to build a four-hour utility-scale battery of 350MW capacity by the

end of 2026 in the Latrobe Valley in Victoria to help compensate for the Yallourn plant's removal from the grid.

EnergyAustralia has supported development of the recently approved Genex Kidston Pumped Hydro Energy Storage project through a long-term arrangement to buy the electricity generated. This facility will provide approximately 2,000 MWh of dispatchable power (ARENA 2021).

In early May 2021, EnergyAustralia announced a plan to build a new 'hybrid' gas powered plant in Illawarra, New South Wales, capable of running on both hydrogen and natural gas. The plant is due to be operational by 2023–24. EnergyAustralia plans to initially use green hydrogen for five per cent of the fuel consumed by the plant, and has committed to offset the plant's carbon emissions over its lifetime.

Resources

The following are relevant to energy companies seeking to align with net zero by 2050:

Methodologies

Science Based Targets (SBTi 2020)

The Science Based Targets initiative (SBTi) champions target setting based on commitments consistent with limiting global temperature rise to well below 2 degrees Celsius or 1.5 degrees Celsius above pre-industrial levels. In 2020, the initiative published guidance for electric utilities wishing to set 1.5 degree aligned targets.

Decarbonisation guides

Decarbonisation Futures (ClimateWorks 2020)

The Decarbonisation Futures report provides a guide for Australian government and business decision-makers on priority technologies, deployment pathways and benchmarks for achieving net zero emissions. It models scenarios limiting global temperature rise for both 1.5 degrees and 2 degrees. The report finds Australia has entered the transformational decade for addressing climate change and that this transition can happen before 2050 with strong action by every level of government, businesses and individuals to support technology development, demonstration and deployment.

Collaboration initiatives

The Clean Energy Council (Clean Energy Council 2020a)

The Clean Energy Council is the peak body for the clean energy industry in Australia, representing and working with over 900 businesses operating in renewable energy, energy storage and renewable hydrogen. It works with government and stakeholders to solve the technical, political and financial challenges faced by the industry to accelerate Australia's clean energy transformation.

The Australian Energy Council (Australian Energy Council 2020)

The Australian Energy Council represents 24 major electricity and downstream natural gas businesses operating in wholesale and retail energy markets. The Council supports its members in managing key issues impacting the energy sector. It has endorsed an economy-wide net zero emissions by 2050 target for Australia (Australia Energy Council 2020b).

The Australian Industry Energy Transitions Initiative (Australian Industry ETI 2020)

The Australian Industry Energy Transitions Initiative (ETI) facilitates industry collaboration to develop pathways and actions that will accelerate Australia's transition towards net zero supply chains in hard-to-abate industry sectors. APA Group, parent company of APT Pipelines, which is featured in this report, is one of the ETI industry partners. ClimateWorks Australia and Climate-KIC Australia are joint convenors of the initiative.

Australian Climate Roundtable (Australian Climate Roundtable 2021)

The Australian Climate Roundtable (ACR) is a forum that brings together leading organisations from the business, farming, investment, union, social welfare and environmental sectors. This includes the Australian Energy Council, which represents Australia's major electricity and downstream natural gas businesses operating in the competitive wholesale and retail energy markets. Since 2014, the ACR has sought and found common ground on responding to the challenge of climate change.

Appendix

COMPANIES AND DATA

The analysis focuses on the 20 energy companies in Australia which reported the highest total scope 1 and 2 emissions in 2018-19 under Australia's National Greenhouse and Energy Reporting (NGER) scheme (Clean Energy Regulator 2020). These organisations are mainly involved in electricity generation, electricity retailing or gas retailing.

Table 4 lists these 20 organisations and data sources consulted. Tables 5 summarises the information used to inform the analysis. Table 6 details the assessment of net zero by 2050 ambition and interim targets, where applicable, for each company. A summary of Australian states' net zero and renewable energy targets is presented in Table 7.

TABLE 4: ORGANISATIONS AND DATA CONSIDERED BY THE ANALYSIS

Company	Revenue (AU$ million)	Electricity production (MWh)	Climate Action 100+ focus company	Energy retail brands	Sources
AGL Energy Limited	$13,246	47,850,286	Yes	AGL	- Annual Report 2020 - Annual Report 2019 - AGL website
APT Pipelines Limited	N/A	2,990,191	No	NA	- Annual Report 2019 - Sustainability Report 2020 - APA website
Arrow Energy Holdings Pty Ltd	N/A	345,056	No	Arrow Energy	- Arrow Energy website
ATCO Australia Pty Ltd	$4,706	823,782	No	NA	- Annual Report 2019 - Sustainability Report 2019 - ATCO website
Bluewaters Power 1&2 Pty Ltd	N/A	3,515,400	No	NA	- Bluewaters website

Company	Revenue (AU$ million)	Electricity production (MWh)	Climate Action 100+ focus company	Energy retail brands	Sources
C S Energy Limited	$1,285	14,658,282	No	C S Energy	- Annual Report 2020 - C S Energy Website
CK William Australia Holdings Pty Ltd	N/A	2,962,676	No	NA	- EDL Energy website
Delta Electricity Pty Ltd	N/A	7,378,295	No	Delta	- Delta website
ENGIE (International Power (Australia) Holdings Pty Limited)	N/A	4,093,381	Yes	Simply Energy	- Annual Report 2020 -Engie website
EnergyAustralia Holdings Limited	$7,009	17,420,813	No	EnergyAustralia	- Energy Charter Disclosure 2019 & 2020 - EnergyAustralia Website - CLP Group website
NewGen Kwinana Holdings Pty Ltd	N/A	1,724,343	No	NA	- New Gen Power website
NRG Gladstone Operating Services (NRG Victoria 1 Pty Ltd)	N/A	7,602,367	Yes	NA	- NRG website
Origin Energy Limited	$14,724	19,068,393	Yes	Origin Energy	- Annual Report 2019 - Sustainability Report 2020 - Origin Energy Website - Origin Energy - Climate Change 2020
OzGen Holdings Australia Pty Ltd	N/A	12,493,644	No	NA	- Intergen website
Pioneer Sail Holdings Pty Ltd	$1,086	11,422,033	No	Alinta Energy	- Sustainability Report 2019/20 (Alinta Energy)

Company	Revenue (AU$ million)	Electricity production (MWh)	Climate Action 100+ focus company	Energy retail brands	Sources
Snowy Hydro Limited	$2,697	3,380,215	No	Red Energy, Lumo Energy	- Annual Report 2019 - Snowy Hydro website
Stanwell Corporation Limited	$3,665	20,078,305	No	Stanwell Corporation	- Annual Report 2019/20 - Stanwell Corporation website - Energy Charter Disclosure 2019/20
Synergy (Electricity Generation and Retail Corporation)	$2,990	6,404,590	No	Synergy	- Annual Report 2019 - Synergy website
Territory Generation (Power Generation Corporation)	$264.8	1,553,836	No	NA	- Annual Report 2018/19 - Territory Generation website
TransAlta Energy (Australia) Pty Ltd	$2,393	1,705,443	No	NA	- Annual Report 2020 - 2021 Sustainability Targets - Climate Change Performance 2021 - TransAlta website

TABLE 5: EMISSIONS-REDUCTION COMMITMENTS AND ACTIVITIES

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
AGL Energy Limited	Target of net zero emissions by 2050	- Commenced a $152 million upgrade and maintenance program at Bayswater power station - Closure of Liddell Power Station in 2022- 2023 - Assisted more than 100 customers by replacing outdated household appliances with energy efficient models - By 2050, close all existing coal-fired power stations in its portfolio and not build, finance, or acquire new conventional coal-fired power stations in Australia - Goal of installing 1,200MW of new battery storage and demand response capacity by 2024 - Announced plans to build a 200MW battery at Loy Yang A power station in Victoria, a 150MW and 50MW battery at Liddell power station and Broken Hill in New South Wales and a 250MW battery in Torrens Island in South Australia. - Operating multiple batteries, undertaking feasibility study of a hydro project - Operating a virtual power plant (VPP) and a demand response program - Trialling remote EV management during peak events - Operating multiple solar and wind farms - Proposed acquisition of Tilt and acquisition of two commercial solar businesses, Epho and Solgen Energy Group - Transition its fleet of 400 corporate vehicles to 100% electric by 2030 - Offering carbon neutral products, including carbon neutral electricity by offsetting emissions - Offering zero emission charging to EV customers	- Provides an energy efficiency guide to its customers - Looking to provide carbon neutral products, including gas supply, by offsetting emissions

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
APT Pipelines Limited	Net zero operational (scope 1 & 2) emissions by 2050	- Optimise the operational efficiency of assets - Operating over 470MW of renewable energy projects around Australia - Identify opportunities to offset emissions	No information
Arrow Energy Holdings Pty Ltd	No information	No information	No information
ATCO Australia Pty Ltd	No information	- Agreement to acquire the rights to develop the 325MW Central West Pumped Storage Hydro Project near Yetholme in Central West NSW. - Solar panels installed at Jandakot facility in Western Australia - Providing rooftop solar panels for customers	No information
Bluewaters Power 1&2 Pty Ltd	No information	No information	No information
C S Energy Limited	No information	- 200MW of renewable energy offtake arrangements - Moura Solar Farm (56MW) - Columboola Solar Farm (162MW)	No information

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
CK William Australia Holdings Pty Ltd	No information	- Multiple solar, wind and hybrid farms across Australia - 1.7MW solar farm at Rio Tinto Aluminium's (RTA) bauxite mine in Queensland. - A 3MW solar farm at the off-grid mine at Cannington Power Station - Agnew Hybrid Renewable Microgrid, a renewable energy microgrid - The Coober Pedy Hybrid Renewable Power Station - A 30MW wind farm at Cullerin Range Wind Farm in NSW - A 12MW wind farm at Wonthaggi Wind Farm in Victoria	No information
Delta Electricity Pty Ltd	No information	- Maintain and increase renewable biomass co-firing program at Vales Point power station along with a 45MW solar farm proposal and further potential expansions	No information
EnergyAustralia Holdings Limited	Goal to be carbon neutral by 2050	- Improving efficiency at power plants - A turbine upgrade project at Mount Piper Power Station which delivered an additional 30MW of generation capacity - Progressively phasing out coal-fired power - Retire Yallourn in mid-2028 and build new storage capacity through a 350MW, four-hour, utility-scale battery project that will be completed by 2026 - Large-scale battery storage sites with a combined capacity of 55MW, equivalent to 80MWh Gannawarra Energy Storage System (GESS) and Battery Energy Storage System (BESS) - Plans to build a four-hour utility-scale battery of 350MW capacity by 2026 in the Latrobe Valley - Rights to more than 800MW of solar and wind farm power purchase agreements, and part ownership of the Cathedral Rocks wind farm	- Offering carbon neutral products, including carbon neutral gas, by offsetting emissions

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
		- Commitment to EV100 (as part of parent company, CLP Group) - Offering carbon neutral products, including carbon neutral electricity, by offsetting emissions	
ENGIE (International Power (Australia) Holdings Pty Limited)	- Reduce power generation GHG emissions from scope 1 and scope 3 by 52% per kWh by 2030 from a 2017 base year - Reduce absolute scope 3 emissions from use of sold products 34% by 2030 from a 2017 base year	- Energy efficiency projects for customers - Divested from all high carbon, emissions intensive generation facilities in the Asia Pacific region - Simply Energy Virtual Power Plant (VPP) project to deliver up to 1200 Tesla Powerwall 2 batteries to Adelaide households, representing 6MW of residential energy storage, while a further 2MW of demand response capacity to be deployed across 10 commercial businesses - 9GW of Renewable energy capacity to group's portfolio by 2021	- Commitment to produce 100% green gas by 2050

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
NewGen Kwinana Holdings Pty Ltd	No information	No information	No information
NRG Gladstone Operating Services (NRG Victoria 1 Pty Ltd)	No information	No information	No information
Origin Energy Limited	- Update current targets to a 1.5 degrees pathway with an aim to achieve net-zero emissions by 2050 - Reduce Scope 1 and Scope 2 emissions on an equity share basis by 50% by 2032 (2017 baseline), also reducing Scope 3 emissions on an equity share basis by 25% by 2032 - Targeting reducing Scope 1 emissions by 10% on average, over the next three financial years to	- Real Time Optimisation (RTO) project at Eraring, a digital tool to optimise power plant performance, aimed to avoid ~1 million tonnes of CO2-e by 2025 - Exit coal-fired generation by 2032 - Progressing plans for a battery at Eraring Power Station in NSW, with an overall capacity of up to 700MW. - Renewable Energy target of more than 25% generation capacity by 2020 - Committed to transitioning all 600 of passenger and light commercial vehicles to electric vehicles by 2030. - A member of EV100 - Offering carbon neutral products, including carbon neutral electricity by offsetting emissions	- Offering carbon neutral products, including carbon neutral gas by offsetting emissions

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
	FY2023, compared to FY2017		
OzGen Holdings Australia Pty Ltd	No information	No information	No information
Pioneer Sail Holdings Pty Limited	No information	- Reduction of emissions intensity by 5% in next 5 years - Multiple energy efficiency projects at power stations - Commissioned 35MW (11.4MWh) lithium ion battery at Newman power station in the Pilbara region - Renewable generation capacity target of 1000MW by 2020 and 1500MW by 2025	No information

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
Snowy Hydro Limited	No information	- Snowy 2.0 will provide on-demand energy and large-scale storage - Committed to buying over 1,000MW of new renewable energy	No information
Stanwell Corporation Limited	No information	- Completed a series of low demand response trials at Stanwell Power Station and Tarong power stations - Long-term 348MW offtake agreement with Clarke Creek Wind Farm - Investigating biomass for co-firing at either Tarong or Stanwell power station	No information
Synergy (Electricity Generation and Retail Corporation)	No information	- Delivering a new Energy Storage Trial called PowerBank at Meadow Springs and Falcon - Schools VPP pilot programs - A peer to peer (P2P) energy trading trial developed by Curtin University in partnership with Synergy, Western Power and Power Ledger across a trading platform operated by Power Ledger	No information
Territory Generation (Power Generation Corporation)	No information	- Upgrades to improve operational efficiency at Owen Springs and Tennant Creek power stations - Solar panels at Owen Springs Power Station to charge electric vehicles on site	No information

Company	Emissions reduction target	Operational activities	Upstream and downstream activities
TransAlta Energy (Australia) Pty Ltd	Company-wide target to achieve carbon neutrality by 2050 Corporate goal to reduce GHG emissions by 60 per cent by 2030 over 2015 levels	- Evaluation of renewable energy supply under the extended PPA between BHP and Southern Cross Energy, including an 18.5MW solar photovoltaic farm, supported by a battery energy storage system and a 17MW waste heat steam turbine system at the Kalgoorlie Smelter	No information

ASSESSMENT OF EMISSIONS-REDUCTION AMBITION

Table 6 details the assessment of emissions reduction ambition for each of the energy companies considered by the analysis. This is informed by the assessment of each company's emissions reduction activities that address scope 1 and 2 operational emissions (Table 2) and scope 3 value chain emissions (Table 3), in addition to the pledges and commitments summarised in Table 5.

This assessment is based on the following criteria:

Net zero by/before 2050 target?	Indicates whether a company has an overarching target to be net zero by or before 2050 (Yes/No/Aspiration/Partial). 'Aspiration' in this case indicates that a company has expressed a looser aspiration to achieve the net zero goal. 'Partial' means a company has a net zero target covering a proportion of its total scope 1, 2 and 3 emissions.
Interim emissions reduction commitments	Indicates whether a company has defined an interim emissions reduction target over a period against a baseline year (Target) or no information can be found regarding an emissions reduction target (No).
Emissions trajectory alignment	Indicates whether a company's emissions reduction commitments are aligned with a trajectory for the sector to support a national Paris-aligned trajectory in Australia (Aligned/Not aligned/Partial). 'Partial' indicates the emissions reductions commitments' trajectory of a company is aligned for a proportion of its total emissions.
Emissions reductions activities? - Scope 1 and 2	Indicates whether a company is undertaking activities that will reduce its scope 1 and 2 emissions (Yes/No)
Emissions reductions activities? - Scope 3	Indicates whether a company is undertaking activities that will reduce its scope 3 emissions (Yes/No).

Based on the above criteria, each organisation's emissions reduction ambition was assessed as follows:

★	Fully aligned net zero target	The organisation has a target to achieve net zero by 2050 for all of its emissions, supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
☆	Closely aligned net zero target	The organisation has a target to achieve net zero by 2050 for a significant proportion of its emissions, supported by a strategy and interim targets aligned with a sector trajectory that supports a Paris-aligned decarbonisation trajectory for Australia.
■	Aligned aspiration/pathway	The organisation has expressed an aspiration or has set interim targets covering a significant proportion of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.

▲	Partially aligned net zero target	The organisation has expressed an aspiration or has set interim targets covering a small proportion of total emissions aligned with a sector trajectory that supports a Paris-aligned trajectory for Australia.
•	Not aligned	The organisation has made a commitment, pledge or is undertaking activities that will reduce its emissions but not in line with a trajectory for the sector to support a national Paris-aligned trajectory in Australia, or the alignment is unclear due to insufficient information.
o	No emissions reduction targets or activities	The organisation has not disclosed any emissions reduction targets, commitments or activities.

TABLE 6: ASSESSMENT OF EMISSIONS-REDUCTION AMBITION

Company	Net zero ambition	Net zero by/before 2050 target?	Interim emissions reduction commitments	Emissions trajectory alignment	Emissions reductions activities?	
					Scope 1 & 2	Scope 3
ENGIE (International Power (Australia) Holdings Pty Limited)	▲	No	Target	Partial	Yes	Yes
AGL Energy Limited	●	Partial	No	-	Yes	Yes
APT Pipelines Limited	●	Partial	No	-	Yes	No
ATCO Australia Pty Ltd	●	No	No	-	No	Yes
C S Energy Limited	●	No	No	-	Yes	Yes

Company	Net zero ambition	Net zero by/before 2050 target?	Interim emissions reduction commitments	Emissions trajectory alignment	Emissions reductions activities?	
					Scope 1 & 2	Scope 3
CK William Australia Holdings Pty Ltd	●	No	No	-	Yes	No
Delta Electricity Pty Ltd	●	No	No	-	Yes	No
EnergyAustralia Holdings Limited	●	Partial	No	-	Yes	Yes
Origin Energy	●	Aspiration	Target	Not aligned	Yes	Yes
Pioneer Sail Holdings Pty Ltd	●	No	No	-	Yes	No
Snowy Hydro Limited	●	No	No	-	Yes	No

Company	Net zero ambition	Net zero by/before 2050 target?	Interim emissions reduction commitments	Emissions trajectory alignment	Emissions reductions activities?	
					Scope 1 & 2	Scope 3
Stanwell Corporation Limited	●	No	No	-	Yes	Yes
Synergy (Electricity Generation and Retail Corporation)	●	No	No	-	Yes	No
Territory Generation (Power Generation Corporation)	●	No	No	-	Yes	No
TransAlta Energy (Australia) Pty Ltd	●	Partial[7]	No	-	Yes	No
Arrow Energy Holdings Pty Ltd	o	No	No	-	No	No

[7] The scope has not been disclosed and has been assumed to be operational (scope 1 and 2) emissions only - consistent with TransAlta's interim 2030 target.

Company	Net zero ambition	Net zero by/before 2050 target?	Interim emissions reduction commitments	Emissions trajectory alignment	Emissions reductions activities?	
					Scope 1 & 2	Scope 3
Bluewaters Power 1&2 Pty Ltd	o	No	No	-	No	No
NewGen Kwinana Holdings Pty Ltd	o	No	No	-	No	No
NRG Gladstone Operating Services (NRG Victoria 1 Pty Ltd)	o	No	No	-	No	No
OzGen Holdings Australia Pty Ltd	o	No	No	-	No	No

TABLE 7: STATE NET ZERO AND RENEWABLE ENERGY TARGETS

States	Net zero targets	Renewable energy targets
Queensland	Net Zero Emissions by 2050	50% renewable energy share of state electricity consumption by 2030
New South Wales	Net Zero Emissions by 2050	12GW of new renewable energy capacity, with an additional 2 gigawatts of storage capacity by 2030
Australian Capital Territory	Net Zero Emissions by 2050	100% renewable energy by 2020
Victoria	Net Zero Emissions by 2050	50% renewable energy share of state electricity generation by 2030
Tasmania	Net Zero Emissions by 2050	200% renewable energy by 2040
South Australia	Net Zero Emissions by 2050	100% net renewable energy by 2030
Western Australia	Net Zero Emissions by 2050	NA
Northern Territory	Net Zero Emissions by 2050	50% renewable energy share of state electricity consumption by 2030

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Reaching net zero emissions is a core action of the Paris Agreement goal to limit global warming to well below 2 degrees Celsius and strive for 1.5 degrees. Many major global companies have incorporated this goal into their business strategies. In Australia, businesses and governments are doing the same, but there is no easily accessible place to assess these commitments, making them difficult to track.

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