

THE ECONOMIC IMPACT OF THE ALP'S **POWERING** **AUSTRALIA PLAN**

Summary of modelling results, December 2021

RepuTex
ENERGY

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BACKGROUND

The Australian Labor Party (ALP) has committed to adopt a target of net zero emissions by 2050. To reduce greenhouse gas (GHG) emissions, create jobs and grow the economy, the ALP has developed the Powering Australia Plan, underpinned by tailored policy measures for three key sectors of the economy: Electricity, Industry & Carbon Farming, and Transport.

RepuTex has been engaged by the ALP to analyse the GHG emissions and economic impacts of the Powering Australia Plan. Specifically, analysis considers the individual and aggregate impact of sectoral policy settings against the following parameters:

- GHG emissions reductions relative to a reference year (2005);
- Employment (direct and indirect jobs created);
- The total value of direct and indirect investment for each measure; and
- The impact of relevant policies on retail and wholesale electricity prices.

Analysis in this report is summarised for each policy setting, along with the aggregated impact of all policy settings collectively.

ABOUT REPUTEX

RepuTex is the leading provider of price information, analysis and advisory services for the Australian carbon and electricity commodity markets.

Established in 1999, our market data and forecasts have been at the forefront of energy and climate thinking for over two decades, with a history of providing trusted forward-looking intelligence to key trading and strategy decision makers.

We have over 150 subscription and advisory customers across Australia and Asia, among them the most active traders and market participants, including high emitting companies, large energy users, project developers, investment funds, physical traders, and state and federal policymakers.

RepuTex is based in Melbourne, with a team of analysts with backgrounds in energy commodities, policy and regulation, mathematics and economic modelling. The company is a winner of the China Light and Power-Australia China Business Award for energy and climate research across Asia-Pacific.

For more, please visit www.reputex.com

1.

Executive Summary

Emissions and economic impacts of the ALP's Powering Australia Plan

EXECUTIVE SUMMARY

Setting Australia on a net-zero emissions pathway

The Federal Government has set a target to reach net-zero emissions by 2050. Under the Paris Agreement, parties must submit emissions reduction commitments, known as Nationally Determined Contributions (NDCs), with targets expected to be scaled up every five years to build momentum towards global carbon neutrality.

In 2015, the Commonwealth adopted a target to reduce GHG emissions by 26% to 28% below 2005 levels by 2030. In 2021, the current target was re-affirmed, despite calls from industry and the international community for Australia to increase the ambition of its 2030 commitment.

Commonwealth projections indicate that Australian national emissions will be 439 Million tonnes (Mt) CO₂e in 2030, a 30% reduction on 2005 levels (referred to as our Reference Case or baseline). Under a 'high technology sensitivity' emissions are projected to reach 388 Mt CO₂e in 2030, a 35% reduction on 2005 levels in Paris budget accounting terms (calculating the cumulative emissions budget for the period 2021 to 2030), however, little detail has been disclosed on the settings underpinning this sensitivity.

Accounting for new measures described in this document, the ALP's Powering Australia Plan is projected to achieve a 43% reduction on 2005 levels by 2030 with emissions falling to 351 Mt in 2030 in Paris budget accounting terms.

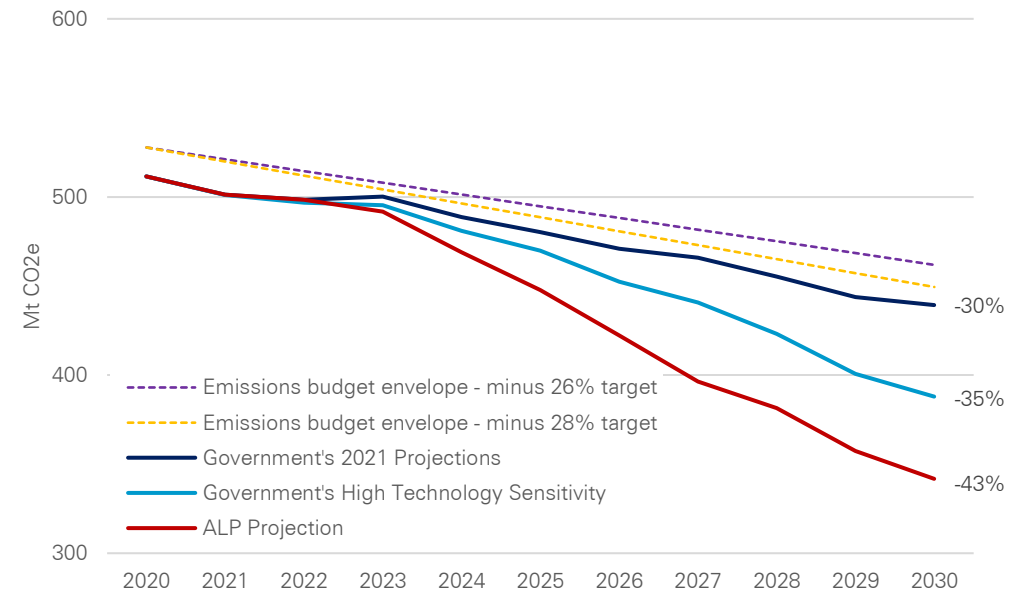
Policy is projected to set Australia on a net-zero pathway by 2030, reaching net-zero emissions by 2050 in line with the Paris Agreement.

Total investment of \$75.8 billion is calculated by 2030, equivalent to 3% of Gross Domestic Product (GDP) in 2030, with the Plan leveraging \$2.13 in private investment for every public dollar spent.

Figure 1: Summary of all policy benefits

Policy benefit	Summary
Emissions reductions	<ul style="list-style-type: none"> 440 Mt emissions reductions between 2023-30 National emissions forecast to fall to 43% below 2005 levels by 2030. Renewable energy penetration to grow to 82% by 2030 (versus 68% under BAU)
Investment	\$24 billion in public investment, driving \$76 billion in total investment.
Jobs created	604,000 direct and indirect jobs created by 2030 relative to a business-as-usual scenario.
Electricity prices	Annual average retail bills are projected to be \$275 lower by 2025 (-18%) and \$378 by 2030 (-26%).

Figure 2: Emissions by scenario (% on 2005 levels in Paris accounting terms)

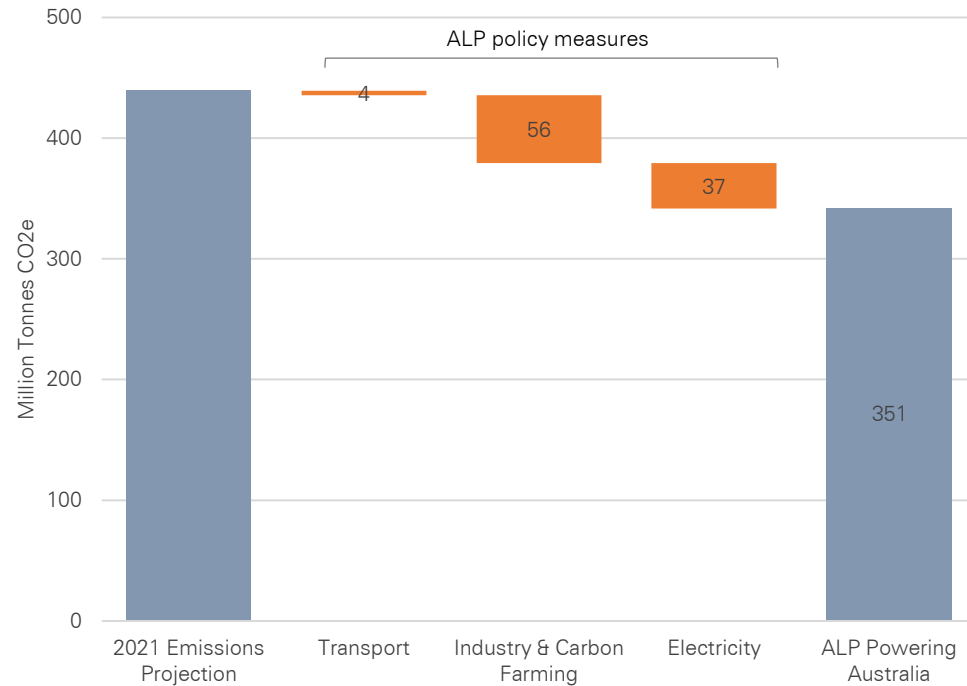


Source: RepuTex Energy, 2021

Targeted policies for the Electricity, Industry & Carbon Farming and Transport sectors

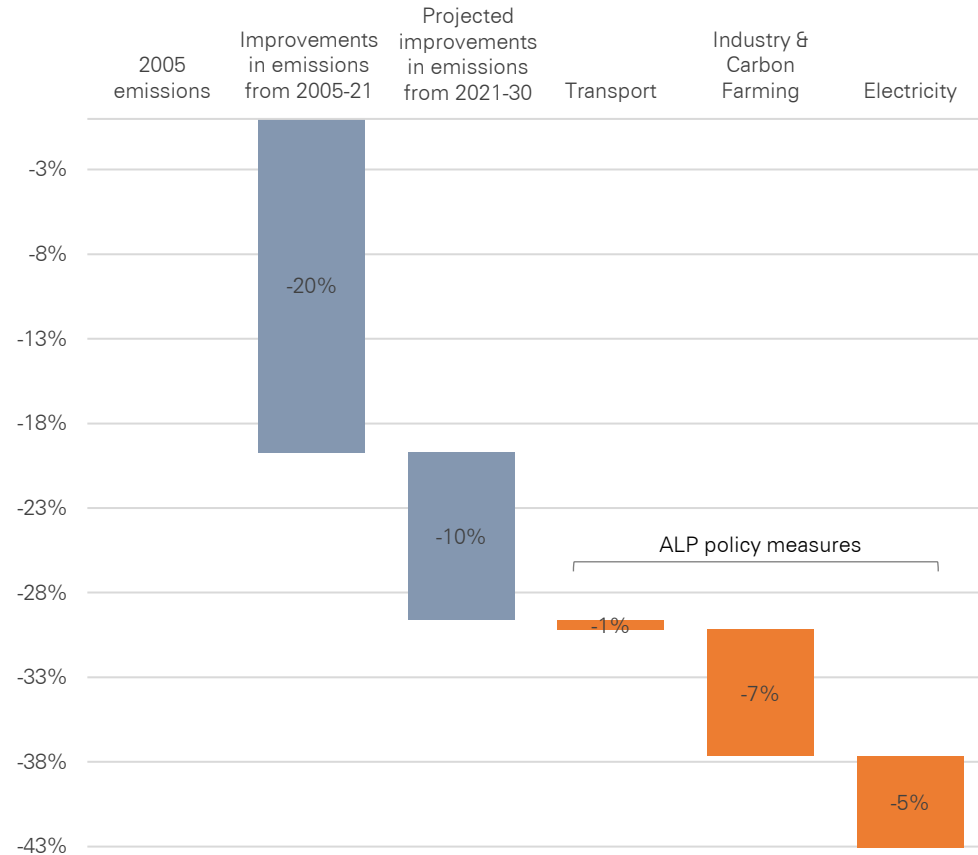
The Electricity, Industry & Carbon Farming, and Transport sectors represented 79% of national emissions in 2020-21. Tailored policy measures are therefore able to help these industries reach net-zero emissions, and capitalise on clean economy opportunities to drive growth and support job creation.

Figure 3: Absolute emissions reductions by sector – in 2030 (point-in-time)



Source: RepuTex Energy, 2021

Figure 4: Percentage emissions reductions from 2005 levels (Paris budget accounting)



Note: Analysis applies the Commonwealth's 2021 emissions projections as a Reference Case for business-as-usual emissions to 2030 (denoted in grey). Refer to Appendix A for further detail.

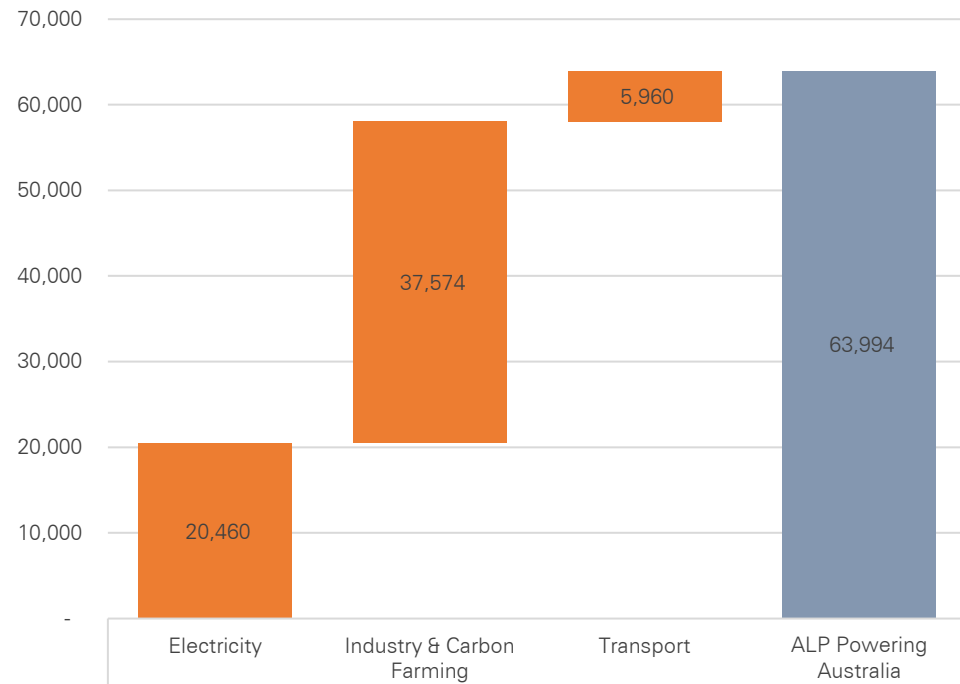
Source: RepuTex Energy, 2021

Investing in renewable energy will create jobs

Industry investment unlocked by the ALP’s Powering Australia Plan is projected to create 604,000 jobs by 2030 relative to a business-as-usual scenario without the ALP’s Powering Australia Plan.

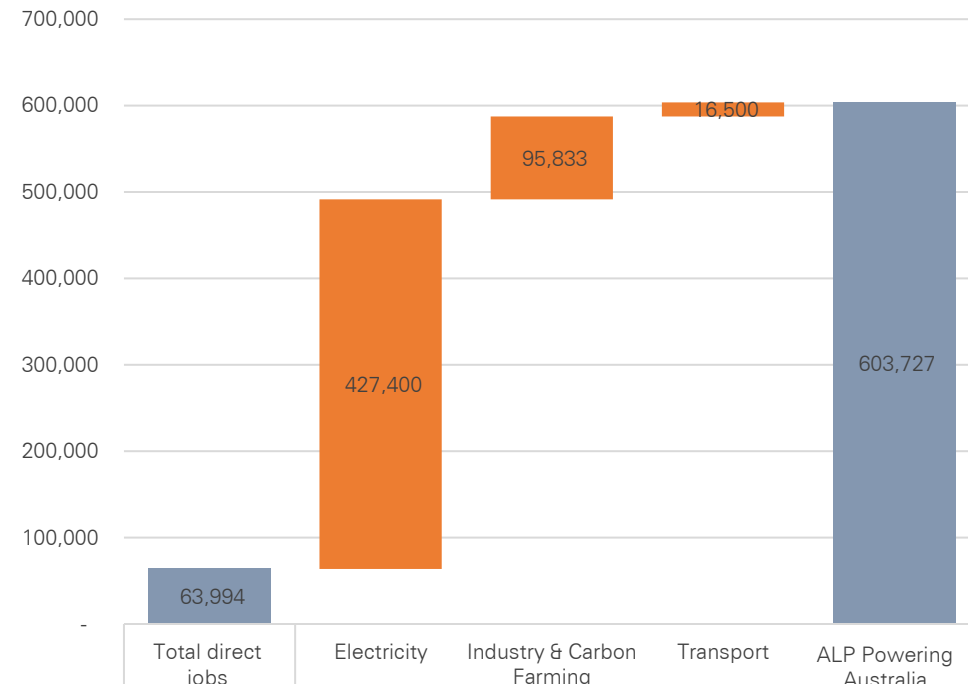
Jobs attributed to the decarbonisation of the Electricity sector are estimated to contribute 74% of total job creation, followed by Industry & Carbon Farming (22%), and the Transport sector (4%). Notably, more than 5 out of 6 jobs are expected to be created in regional areas.

Figure 5: Forecast job creation by sector – direct jobs by 2030



Source: RepuTex Energy, 2021

Figure 6: Forecast job creation by sector – indirect and total jobs by 2030



Source: RepuTex Energy, 2021

Supporting corporate commitments to net zero emissions via the Safeguard Mechanism

The Government’s Safeguard Mechanism applies to facilities that emit more than 100,000 tonnes of CO₂e per year across a range of sectors, including mining, oil and gas extraction, manufacturing, transport, and waste.

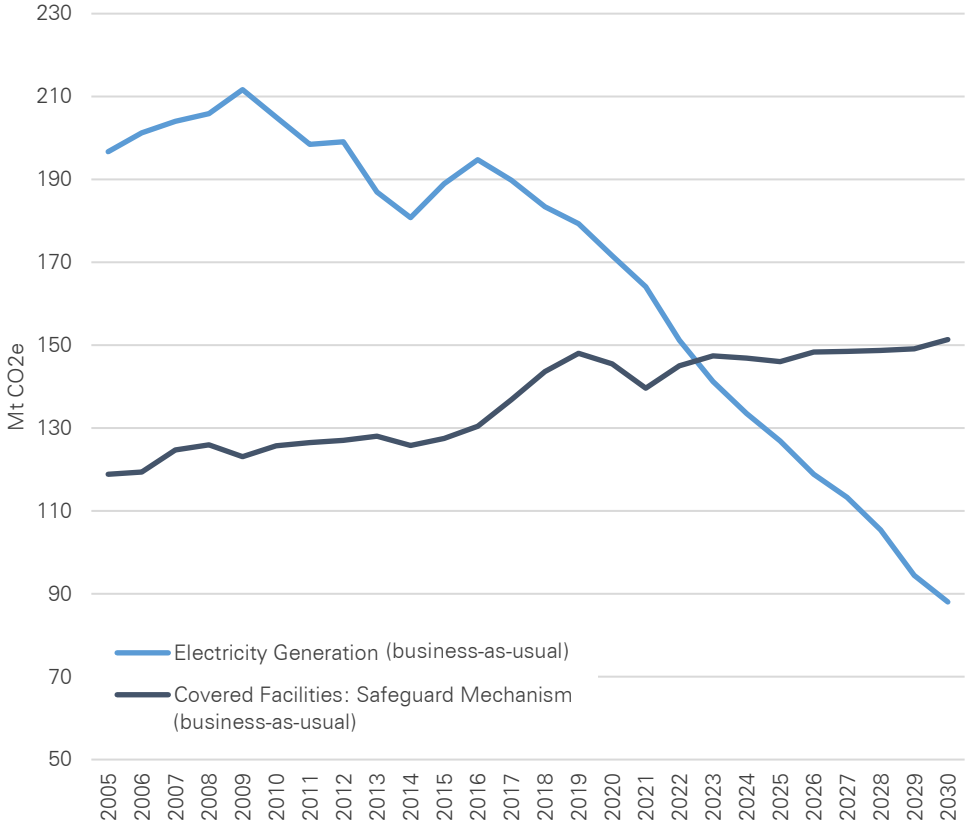
Adoption of the Business Council of Australia’s (BCA) recommendation to improve the Safeguard Mechanism, with “emission baselines reduced predictably and gradually over time” for currently covered facilities, represents a considerable opportunity to align federal policy with corporate commitments to reach net-zero, while creating a transparent signal for private sector investment in least-cost emissions reductions. This investment may be in the form of internal abatement, or external offsets from Australia’s carbon farming sector, with industry given the flexibility to discover low-cost abatement opportunities and invest in long-term emissions reduction technologies.

Emissions covered by the Safeguard Mechanism have grown 7% since its commencement in July 2016, rising to 140 Mt of CO₂e in 2020-21 to be 17% above 2005 levels, or just over one-quarter (28%) of national emissions.

Under current policy, covered emissions are projected to grow to 151 Mt by 2030 to be 27% above 2005 levels (34% of national emissions). In parallel, business-as-usual electricity emissions are projected to fall to 88 Mt by 2030, or 55% below 2005 levels. Emissions from facilities covered by the Safeguard Mechanism are therefore projected to overtake the electricity sector as Australia’s largest emitting policy segment in the early 2020s.

Improvements to the Safeguard Mechanism are projected to deliver 213 Mt of GHG emissions reductions by 2030. Investment in industry abatement is estimated to create 1,600 jobs by 2030, with 5 out of 6 of these jobs to be created in regional areas (83%).

Figure 7: Electricity sector vs. Safeguard facility emissions (business as usual)



Source: Reputex Energy, 2021

Modernising the grid and supporting reliability

The ALP proposes to develop a Rewiring the Nation Corporation (RNC) to invest \$20 billion toward the modernisation of the electricity grid. A centrally coordinated process and low-cost financing for new electricity infrastructure is expected to improve the ability of new capacity to connect to the grid and deliver renewable energy at least cost.

Substantial transmission investment will be required to accommodate more than 50 GW of new large-scale renewable energy calculated by AEMO to be required in the National Electricity Market (NEM) by 2042.

The Rewiring the Nation policy is designed to bring forward the construction of high voltage infrastructure by lowering financial and planning barriers to unlock the commercial development of large-scale renewable energy resources. This will support new Renewable Energy Zone development, with renewable energy capacity projected to grow to 26 GW by 2030, or 82% of all NEM generation, up from 68% under the Reference Case. Increased renewable energy penetration is projected to result in 180 Mt of abatement between 2023-30, with no impact on scheduled generator retirements.

Renewable energy to drive lower electricity prices

Although new high voltage transmission lines take several years to develop, access to an abundant supply of low-cost renewable electricity under the ALP’s Rewiring the Nation policy is forecast to result in lower electricity prices, with annual average NEM wholesale prices forecast to reduce by 18% (\$11 MWh) by 2025 from today’s levels (\$62 MWh), and 26% (\$16 MWh) by 2030.

Residential customers are estimated to save \$50/MWh by 2025 and \$69/MWh by 2030, with an annual electricity bill for an average household projected to be \$275 lower by 2025 (-18%) and \$378 lower by 2030 (-26%).

Small to medium enterprises (SMEs) are estimated to save \$63/MWh by 2030, and industrial customers \$38/MWh by 2030, supporting electricity intensive industries and the growth of the clean economy.

Figure 8: Forecast penetration of renewable energy in the NEM

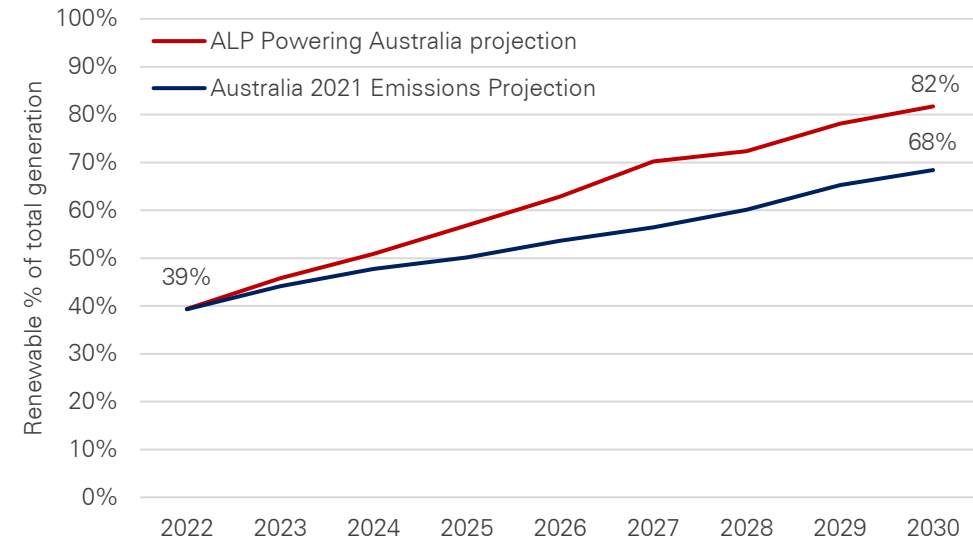


Figure 9: Electricity price savings by customer with Rewiring the Nation

	Price reduction from today (% and \$)	
	in 2025	in 2030
Wholesale price	-18% (\$11/MWh)	-26%(\$16/MWh)
Residential	-18% (\$50/MWh)	-26% (\$69/MWh)
SMEs	-18% (\$46/MWh)	-26% (\$63/MWh)
Industrial	-18% (\$27/MWh)	-26% (\$38/MWh)
Residential bill saving	-18% (\$275)	-26% (\$378)

Source: RepuTex Energy, 2021

2.

Electricity sector

Emissions and economic impacts of the ALP's Powering Australia Plan

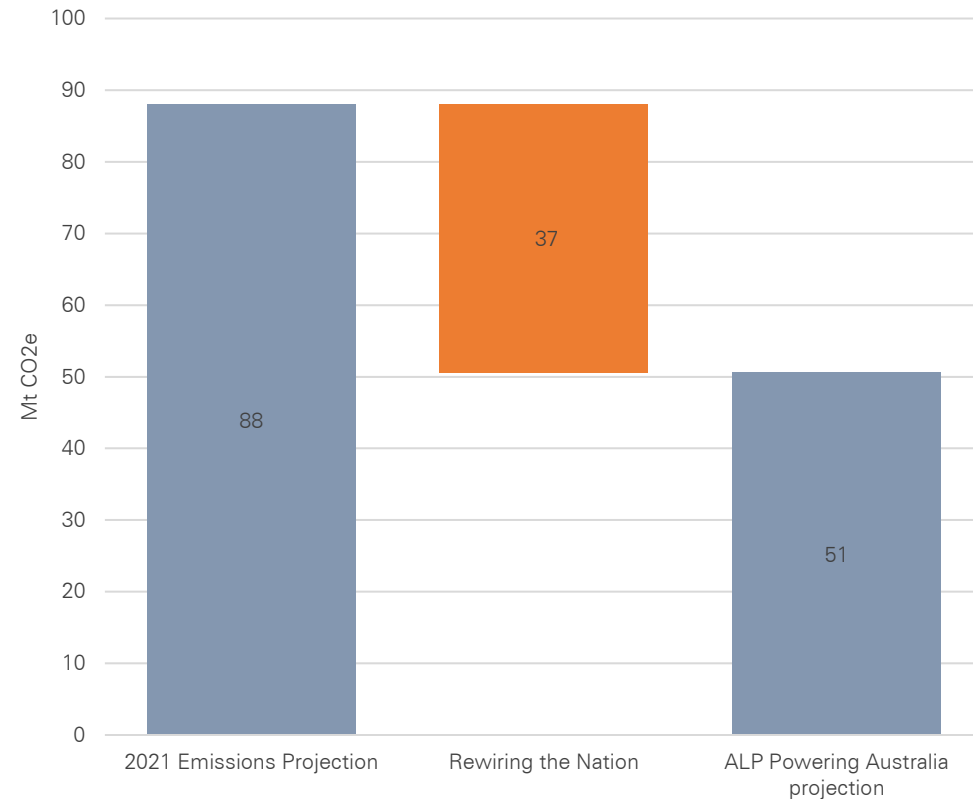
ELECTRICITY POLICY MEASURES

Analysis in this section considers the GHG emissions and economic impacts of policy settings for the electricity sector against the following parameters: GHG emissions reductions relative to a reference year; employment (direct and indirect jobs created); the total value of direct and indirect investment for each measure; and the impact on retail and wholesale electricity prices.

The Powering Australia Plan includes the following policy measures for the electricity sector:

Policy measure	Description
Rewiring the Nation	The ALP will establish a public Rewiring the Nation Corporation and invest \$20 billion to modernise Australia's electricity grid.
Power to the People	The ALP will invest \$200 million to install 400 community batteries around Australia, providing battery storage for up to 100,000 households.
Solar Banks	The ALP will commit \$100 million for the development of shared 'solar banks' to provide access to the benefits of rooftop solar for people who rent, live in an apartment, or cannot afford upfront installation costs.
Public sector emissions	The ALP will commit to reduce Australian Public Service emissions to net-zero by 2030.

Figure 10: Emissions reductions from electricity policy measures in 2030



Source: RepuTex Energy, 2021

REWIRING THE NATION

Policy benefit	Summary
Emissions reductions	<ul style="list-style-type: none"> 180 Mt emissions reduction between 2023-30 37 Mt emissions reduction in 2030, electricity sector reaching 76% below 2005 levels
Investment	\$20 billion direct investment unlocking \$58 billion of private co-financing.
Jobs created	13,500 direct jobs building transmission infrastructure; 116,170 indirect jobs (manufacturing, constructing, operating and maintaining electricity infrastructure); 306,000 jobs from increased trade and domestic benefits of low-cost renewable electricity production

Policy background

The ALP proposes to develop a Rewiring the Nation Corporation (RNC) to invest \$20 billion toward the modernisation of the electricity grid. A centrally coordinated process and low-cost financing for new electricity infrastructure is expected to improve the ability of new capacity to connect to the grid and deliver renewable energy at least cost.

Substantial transmission investment will be required to accommodate the more than 50 GW of new large-scale renewable energy calculated by AEMO to be required in the NEM by 2042. The Rewiring the Nation policy is designed to bring forward the construction of high voltage infrastructure by lowering financial and planning barriers to unlock the development of large renewable energy resources. This is projected to support new Renewable Energy Zone development - primarily in NSW (New England REZ network expansion reinforcing Sydney, Newcastle, and Wollongong) and Victoria (South West and Western REZ network expansion) - with renewable capacity projected to grow to 26GW by 2030. This is calculated to increase overall renewable penetration to 82% of all NEM generation, up from 68% under the modelled Reference Case.

The RNC is forecast to bring forward the construction of more high voltage infrastructure needed to unlock large scale renewable energy resources as outlined in AEMO’s Integrated System Plan (ISP). The RNC is assumed to have a mandate to recover its costs (financial and operational) but is not modelled to generate a direct net positive return (unlike the NBN and the CEFC); rather it is predicted to support a more affordable transmission network for all electricity users, while recovering its relatively low costs.

Funding, underwriting or other financial support to get major transmission and interconnector projects off the ground, are assumed to be in addition to priority projects identified by AEMO’s 2020 ISP. Specifically, the RNC is projected to bring forward projects in Central NSW, Central to Southern Queensland, KerangLink, Gippsland, Gladstone Grid section, Marinus 1, Murray River, Northern West NSW, Southwest Victoria, and Western Victoria.

Figure 11: Modelled timing of transmission projects.

Modelled transmission project	Reference case	Rewiring the Nation
Central NSW	2026-27 to 2032-33	2026 to 2031
Central to Southern Queensland	2034	2030
KerangLink	2036	2027
Gippsland	2029	2025
Gladstone Grid section	2036	2030
Marinus 1	2029	2028
Murray River	2025	2024
Northern West NSW	2033	2030
QNI medium and Large	2032-33 to 2035-36	2031 to 2035
Southwest Victoria	2048	2028
Western Victoria.	2047	2025

Note: Indicative timing reflects our assumed Central Case timeline, with Rewiring the Nation assumed to bring forward the above noted projects to meet new capacity as described. Refer also to Appendix A.

Source: AEMO, Central used for Reference Case – 2020 ISP.

Transmission investment will create jobs and unlock renewable energy capacity

The RNC is projected to both lower the overall cost of financing for transmission providers and reduce additional costs necessary for private sector investment. Aligning the states with an independent national planning body is anticipated to accelerate delivery of AEMO's ISP to ensure that electricity infrastructure is available when it is needed, lowering energy system costs for REZs to be built in regions which minimise congestion, and provide a more optimal mix of infrastructure, labour, and renewable resources.

Direct job creation accounts for jobs related to the construction of transmission lines. Total direct, indirect jobs (associated with manufacturing and renewable capacity new lines will enable) and induced jobs (associated with economic growth unlocked by clean, low-cost electricity) are forecast to grow to over 435,000 by 2030, an average of 20,000 jobs per GW of transmission capacity.

Delivering large-scale investment in transmission is expected to support the development of 13,500 direct jobs attributed to the construction of the transmission infrastructure, and another 87,400 indirect construction jobs for the build-out of the accessible REZs. Indirect jobs, including new renewable generation capacity, operations and maintenance (O&M) jobs, and the acquisition and manufacturing of materials are estimated to total 116,170.

Significantly more jobs could be created should the broader economy have access to clean, low-priced electricity. This is anticipated to create a further 306,000 induced jobs, underpinned by competitive advantages attributed to access to abundant, cheap electricity. Competitively priced energy is therefore able to support higher economic growth associated with increased mining, new manufacturing jobs, and a renewable-fuelled energy export sector.

Figure 12: Job creation attributed to Rewiring the Nation by 2030

	Direct	Indirect	Induced	Total
Transmission Construction	13,500	24,400	-	37,900
REZ Construction	-	87,400	-	87,400
REZ O&M	-	4,370	-	4,370
Economic development induced via low power price	-	-	306,000	306,000
Total job creation	13,500	116,170	306,000	435,670

Source: RepuTex Energy, 2021

Increased renewable energy penetration is forecast to translate into lower electricity prices

The increased penetration of renewables in the grid is forecast to result in 37 Mt of emissions reductions in 2030 with electricity sector emissions reaching 74 per cent below 2005 levels. In cumulative terms the policy is forecast to result in 180 Mt of GHG emissions reductions between 2023 and 2030, with no impact on scheduled generator retirements.

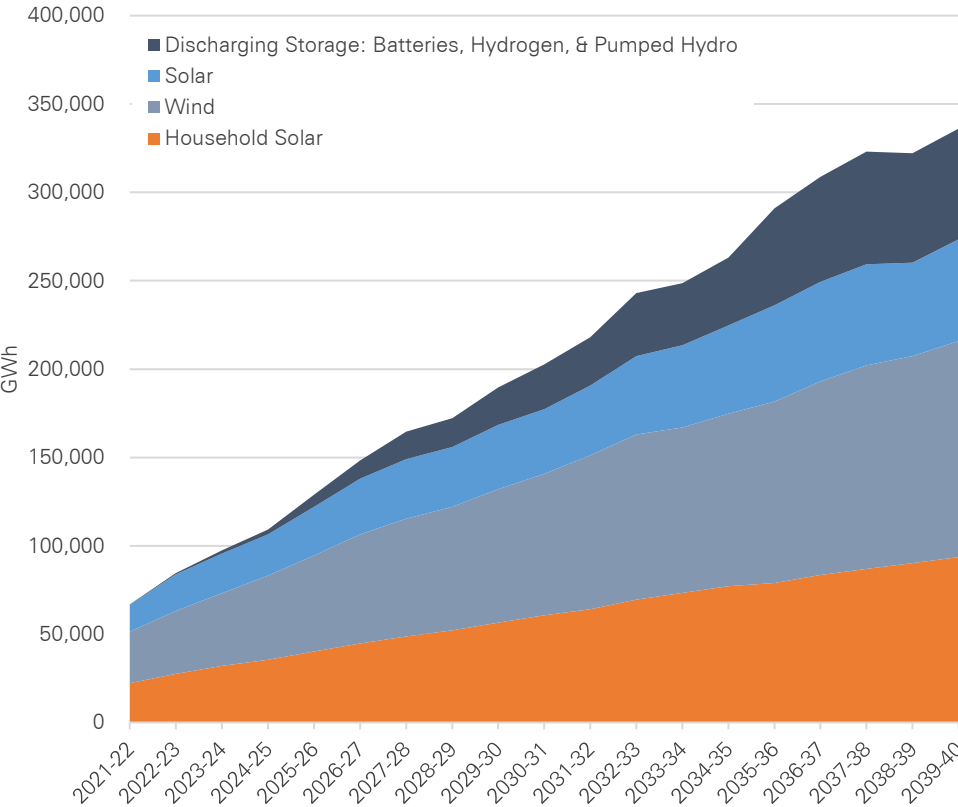
Emissions reductions are attributed to the increased penetration of renewables as described, with generator retirements assumed to occur in line with announced and expected closure dates published by AEMO. Coal fired generators are therefore assumed to remain available to provide capacity, with no retirements modelled to be brought forward. Market reforms such as the Energy Security Board’s (ESB) post-2025 plan are projected to ensure reliability and security are maintained. In addition, increased “meshing” of the NEM is likely to lead to a more resilient network, with less points of failure, and improved diversity in line with differing weather patterns to power load centres.

Although new high voltage transmission lines take several years to develop, access to an abundant supply of low-cost renewable electricity under the ALP’s Rewiring the Nation policy is forecast to result in lower electricity prices (Figure 9), with annual average NEM wholesale prices forecast to reduce by 18% (\$11 MWh) by 2025 from today’s levels (\$62 MWh), and 26% (\$16 MWh) by 2030.

Residential customers are estimated to save \$69/MWh by 2030, with an annual electricity bill for an average household projected to be \$378 lower by 2030.

Small to medium enterprises (SMEs) are estimated to save \$63/MWh by 2030, and industrial customers \$38/MWh by 2030, supporting electricity intensive industries and the growth of the clean economy.

Figure 13: Forecast NEM renewable energy generation 2022-40 with RTN



Source: RepuTex Energy, 2021

POWER TO THE PEOPLE: COMMUNITY BATTERIES

Policy benefit	Summary
Emissions reductions	<ul style="list-style-type: none"> 1.1 Mt CO₂e between 2022-2050 86 kt CO₂e in 2030
Investment	\$200 million in public funding over 4 years, delivering 400 community batteries.
Jobs created	2,500 jobs created from installing community-scale grid systems and battery storage.

Policy background

The ALP will commit to reducing household electricity bills, and emissions, by investing \$200 million over four years in community batteries. This funding would be delivered through a capped, standalone grants program. To encourage participation by communities and network providers, and reduce consumer costs, the Commonwealth would meet the full capital cost of each battery, with operating and related costs met over time by networks, retailers and consumers.

Compared to solar households with battery storage, solar households without battery storage pay more for electricity and produce greater emissions due to increased reliance on the grid. Batteries also contribute community-wide benefits by reducing peak demand and helping to stabilise the grid. The major barrier to battery storage uptake is the upfront cost, with household installed batteries typically costing \$8,000-\$15,000 (on top of solar costs). The development of community storage systems can therefore reduce total capital, installation and maintenance costs, while enabling the community to more efficiently store and share excess generation.

A KPMG feasibility study undertaken for Ausgrid found that community batteries of 500kWh, supporting up to 250 households, are most feasible. Both the KPMG study and a separate ANU cost-benefit analysis suggest that batteries of this

size currently have capital costs of around \$500,000 (\$1,000/kWh), with ANU analysis also suggesting battery operating costs of \$8,000 a year (\$16/kWh).

A \$200 million commitment by the ALP could therefore be expected to deliver at least 400 community batteries, benefitting up to 100,000 households, with these numbers likely to grow if battery costs continue to fall.

Community-scale energy storage projects will reduce costs, create jobs and support remote areas

An AlphaBeta study for Climate Council found that community-scale energy storage and generation projects are anticipated to create 12.4 jobs for every \$1 million of public funding. Most jobs created require specialised skills including construction, utility, engineering, and scientific services.

- Based on the above assumptions, modelling indicates the potential creation of around 2,500 jobs attributed to the installation of community-scale grid systems and battery storage.
- Given the flexibility of scale, this initiative has the capability to benefit communities in need - including remote areas and those affected by natural disasters such as bushfires, floods and storms - with the capacity to create jobs in these regions. The program may also support regions that suffer from fringe-of-grid reliability problems, and/or locations where it is uneconomic to upgrade and maintain extended grid connections.
- Community storage is also able to improve the value of rooftop solar production by distributing and storing electricity locally, where and when it is needed. This avoids expensive grid charges and household batteries, which are less efficient and may only be needed for a limited number of hours.
- Community storage is also able to unlock new community energy ownership models that seek to assist groups (such as communities, households or businesses) access clean energy technologies, set up a community energy retailer, or scale-up generation and storage capabilities.

SHARED SOLAR BANKS

Policy benefit	Summary
Emissions reductions	<ul style="list-style-type: none"> 448 kt emissions reduction between 2022-30 810 kt emissions reduction between 2022-50 100 kt CO2e in 2030
Investment	\$100 million direct investment
Jobs created	200 direct jobs

Policy background

While the take-up of rooftop solar has been strong in Australia, 35 per cent of the population is estimated to be 'locked out' of accessing solar benefits because they rent, live in an apartment, have a shaded roof, and/or are unable to afford the upfront costs of installation. Shared solar arrays ('solar banks') can provide access to the benefits of rooftop solar, regardless of the barriers that individuals may face. Supporting wider access to rooftop solar is calculated to allow scale via new business models, unlocking private-sector investment, and providing more vulnerable households with opportunities to reduce their power bills. The benefits of solar banks may be structured in two ways (or combined):

- Community-owned model – provides an incentive for apartment dwellers, renters, and small businesses to invest in an upfront solar bank 'share' to gain electricity savings over time without requiring a suitable rooftop.
- Social benefit model – provides charities and low-income households with access to a solar bank lease model in order to lower their energy bills by paying for their solar plots over time, without the initial capital cost.

In exchange for their owned/leased solar shares participants receive discounts on their electricity bills via a retailer. Solar banks may be owned by community cooperatives, which would enter into energy agreements with developers and retailers on behalf of participants. Alternative ownership models could also be utilised, such as government ownership on behalf of public housing residents, or distributor/retailer/developer ownership.

A \$100 million investment could support 25,000 households to participate in a solar banks scheme

A 2018 University of Technology (UTS) report found that shared solar banks were both feasible and desirable in Australia. In line with this study, and more recent information, we assume a solar bank of 1 MW, supporting around 300 households, with an average capital cost of \$1.8 million per MW and average operation, maintenance and overhead costs of \$58,000 per year.

Consistent with the ALP's Buy Australian Plan and Rewiring the Nation, projects are assumed to use local content and labour to the greatest extent possible. As a result, Solar Banks are projected to grow the emerging mid-scale solar construction sector in regional Australia, enabling contractors and businesses to share in the renewable energy boom already underway in the large, utility-scale construction, and the small, residential scale installation sectors.

Solar banks are most likely to be built in regional areas where there is space for medium solar arrays (2-3 hectares), however, physical co-location is not necessary for urban/suburban participants to share in a solar bank. The construction, installation and maintenance of new solar arrays is expected to result in 192 construction jobs, 8 full-time equivalent (FTE) ongoing operation and maintenance jobs, and 8 Australian FTE manufacturing jobs.

We apply total investment of \$100 million over four years to support around 25,000 households to participate in a solar banks scheme. This would fund 50 per cent of the capital costs of each solar bank (a Commonwealth contribution of \$900,000, assuming a likely solar bank of 1MW), and an additional \$250,000 per solar bank for feasibility and development costs. The remaining 50% of capital costs, as well as operation, maintenance and overhead costs, are anticipated to be met by solar bank projects – either owners or lessees.

With average 'shares' of 3.4 kW per household, this is calculated to total 85 MW of solar power, which could consist of around 85 large 1-MW arrays. The additional renewable energy generation from these banks is estimated to abate 448,000 tonnes between 2022-30, or 810,000 tonnes between 2022-50.

AUSTRALIAN PUBLIC SERVICE (APS)

Policy benefit	Summary
Emissions reductions	<ul style="list-style-type: none">▪ Net-zero emissions by 2030▪ 430 kt CO₂e abated in 2030▪ 6.4 Mt emissions reductions between 2023-50

Policy background

In 2011-12, the most recent Energy Use in the Australian Government's Operations report, Australian Government activities were estimated to generate 2.84 Mt of CO₂e. Of this, almost 1.16 million tonnes were from non-Defence (public service) agencies. If the Commonwealth were a company, it would therefore rank inside Australia's top 50 emitters (excluding Defence), with reducing these emissions making a quantifiable contribution to decarbonising the Australian economy.

In the absence of updated information, government activity is assumed to be similar today, apart from electricity emissions, for which steady improvements in emissions intensity (for grid connected facilities) have resulted in lower emissions for the same volume of electricity use. Current emissions from Australian public service operations are therefore estimated to be approximately 0.75 Mt per annum excluding Defence, Border Force and other agencies.

This analysis assumes a net-zero emissions reduction target for public sector emissions by 2030 (excluding Defence, etc.), reducing around 0.2 million tonnes of CO₂e emissions a year. The target would be achieved by a combination of demand reduction, renewable supply, and offset purchases, such as:

- Energy efficiency retrofits for buildings, including consideration of stronger energy intensity targets and overall performance standards (e.g., more than 4.5 NABERS stars);
- A low-emissions vehicle target for the Commonwealth fleet of 75% of new purchases and leases of passenger vehicles by 2025;

- Entering into Electricity Power Purchase Agreements (PPAs) for low-carbon electricity following the conclusion of current contracts; and
- The use of carbon offsets (Australian Carbon Credit Units) to offset residual emissions.

The Commonwealth's largest source of emissions, electricity consumption, is expected to be the most straightforward to abate via the procurement of renewable energy equivalent to the Commonwealth's electricity usage. This may be done via a combination of installation of on-site, small-scale renewable generation (likely solar PV); and PPAs with renewable generators, including underwriting new renewable projects where possible. Where on-site generation or PPAs are not practical (e.g., due to higher costs and/or small agency size) an allowance may be made for GreenPower purchases.

Bulk procurement across agencies is anticipated to achieve wholesale rates for electricity not otherwise available under virtual, sleeved, or retail PPAs, while directly stimulating large-scale renewable energy construction and renewable generation infrastructure. Energy efficiency is also an important lever for reducing energy and abatement costs, supporting local job creation, while electrification of facility heating and passenger transport are similarly important measures to reduce GHG emissions and create jobs.

Commonwealth PPAs can support new renewable energy capacity and job creation

Based on 2011-12 data, it is estimated that the Australian Public Service's annual electricity consumption is currently 982 GWh p.a.. Assuming 18-19% of APS electricity is already derived from renewable sources via the Large-scale Renewable Energy Target, achieving 100% renewable energy purchasing is modelled to require 236 MW. Renewable energy proponents are assumed to transfer LGCs created by projects to the Australian Public Service to support renewable energy claims.

Commonwealth PPAs are assumed to support new projects, resulting in the construction of new renewable capacity. This is expected to occur over a 3-year

build timeline, with PPAs modelled to be 25-30% solar and 70-75% wind based on the cost of firming and the required shape of electricity deliveries.

Improving the efficiency of energy use in government buildings will also support cost savings. Energy efficiency investments have significant economic multiplier effects, with studies by the United States Department of Energy estimating that each dollar invested in energy efficiency generates US\$2.32 (A\$3.15) in economic activity, or US\$0.84 (A\$1.14) more than an equivalent expenditure in petroleum and gas. While some jobs created require specialised skills, including construction services, a substantial portion consist of administrative work (e.g., program management, energy audits).

Illustrative jobs created include:

- Electricians and electricity supply workers for the replacement and installation of electrical equipment (e.g., lighting, ventilation motors);
- Administrative workers for management of projects; (e.g., to monitor and collect data, and budget funds); and
- Building construction workers for the renovation of building stock and installation of building materials (e.g., insulation, window tinting, etc).

The transition of Commonwealth emissions to net-zero by 2030 is modelled to result in 426 kt CO₂e abatement in 2030 in the form of both internal emissions reductions (365 kt) and external offsets (60.7 kt) where there is still uncertainty about the quantity of emissions that can be avoided by 2030.

3.

Industry & carbon farming

Emissions and economic impacts of the ALP's Powering Australia Plan

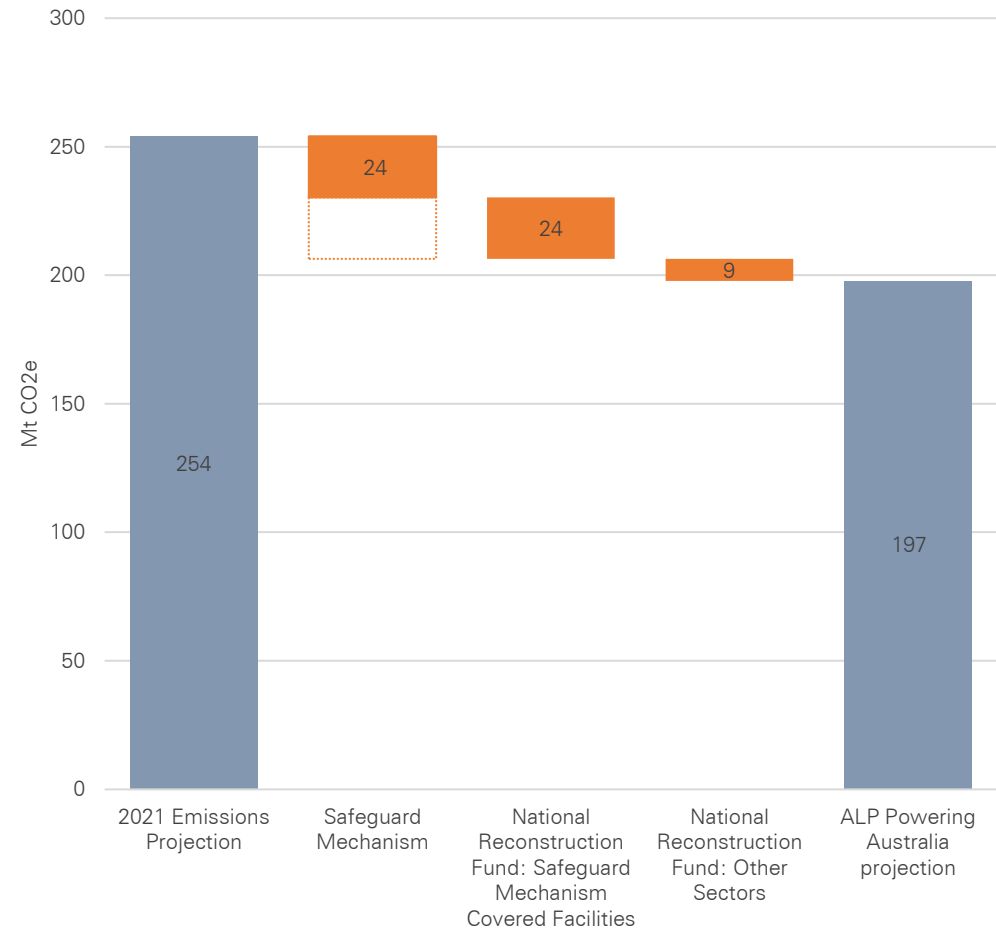
INDUSTRY POLICY MEASURES

Analysis in this section considers the GHG emissions and economic impacts of policy settings for the industry & carbon farming sector against the following parameters: GHG emissions reductions relative to a reference year; employment (direct and indirect jobs created); and the total value of direct and indirect investment for each measure.

The Powering Australia Plan includes the following policy measures for the industry & carbon farming sector:

Policy measure	Description
Safeguard Mechanism	The ALP will adopt the Business Council of Australia’s recommendation to improve the Safeguard Mechanism in line with existing scheme coverage, with “emission baselines reduced predictably and gradually over time” to “support international competitiveness and economic growth”. The framework will support private investment in emissions reductions and carbon farming consistent with industry commitments to net zero by 2050.
National Reconstruction Fund	The ALP will give priority to regional industry under the \$15 billion National Reconstruction Fund and allocate up to \$3 billion to new energy industries.
New Energy Apprenticeships	The ALP will invest \$100 million to train 10,000 New Energy Apprentices in the jobs of the future and \$10 million for a New Energy Skills Program.

Figure 14: Emissions reductions from industry & carbon farming sector policies in 2030



Note: Dashed box denotes investment made by the NRF to support the take-up of low emissions technologies by Safeguard Mechanism covered facilities (such as modernising steel and aluminium manufacturing; hydrogen electrolysers and fuel switching, packaging solutions for waste reduction, etc). Refer to pages 23 and 25.

Source: Reputex Energy, 2021

SAFEGUARD MECHANISM

Policy benefit	Summary
Emissions reductions	<ul style="list-style-type: none"> 48 Mt CO₂e abatement in 2030 (24 Mt via NRF financing); 213 Mt emissions reductions between 2023-30 (with NRF financing). Net covered industrial emissions reach 13% below 2005 levels by 2030
Investment	\$1.68 billion to 2030, annual average of \$209m
Jobs created	1,600 direct jobs p.a. by 2030, and 4,200 indirect and induced jobs by 2030.

Policy background

Established by the Government in 2016, the Safeguard Mechanism extends to Australia’s largest emitting facilities (emitting over 100,000 tonnes of CO₂e per year) across a range of industry sectors, including metals, mining, oil and gas extraction, manufacturing, transport, and waste. 215 facilities are covered by the scheme (excluding the electricity sector), responsible for 28 per cent of national emissions in 2020-21, or 140 million tonnes of CO₂e.

Emissions covered by the Safeguard Mechanism have grown 7% since the scheme’s commencement in July 2016, to 17% above 2005 levels in 2020-21. Commonwealth figures (2021 projections) indicate that emissions from covered facilities will grow to 151 Mt by 2030, or 27% above 2005 levels.

By 2030, industrial emissions covered by the Safeguard Mechanism are projected to grow to over one-third of national emissions (34%) under current policy. Over the same period, business-as-usual emissions from Australia’s largest emitting sector, the electricity sector, are projected to fall from 172 Mt (34% of national emissions) to 88 Mt (20%). Industrial facilities covered by the Safeguard Mechanism will therefore overtake the electricity sector as Australia’s largest emitting policy segment in the early 2020s.

Figure 15: National emissions by key policy segment (business as usual)

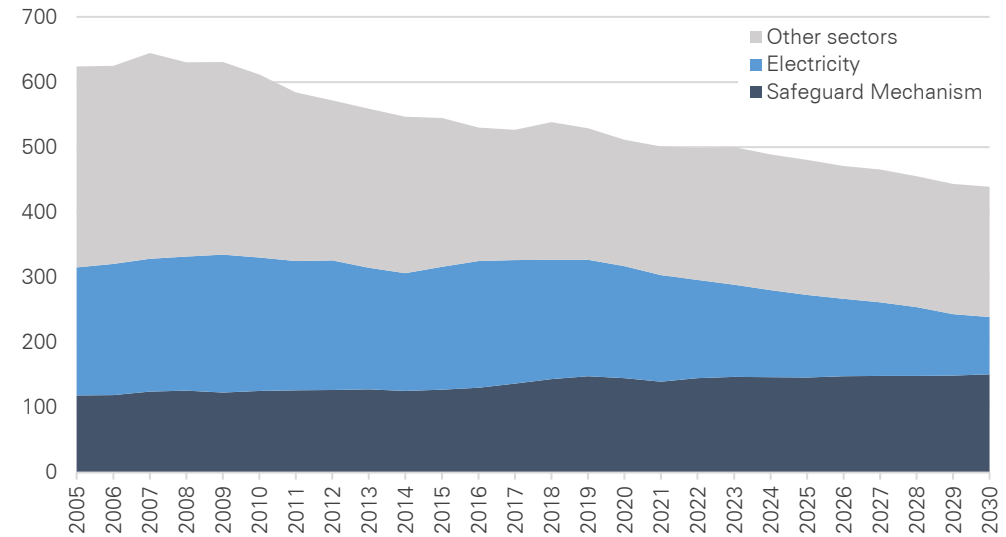
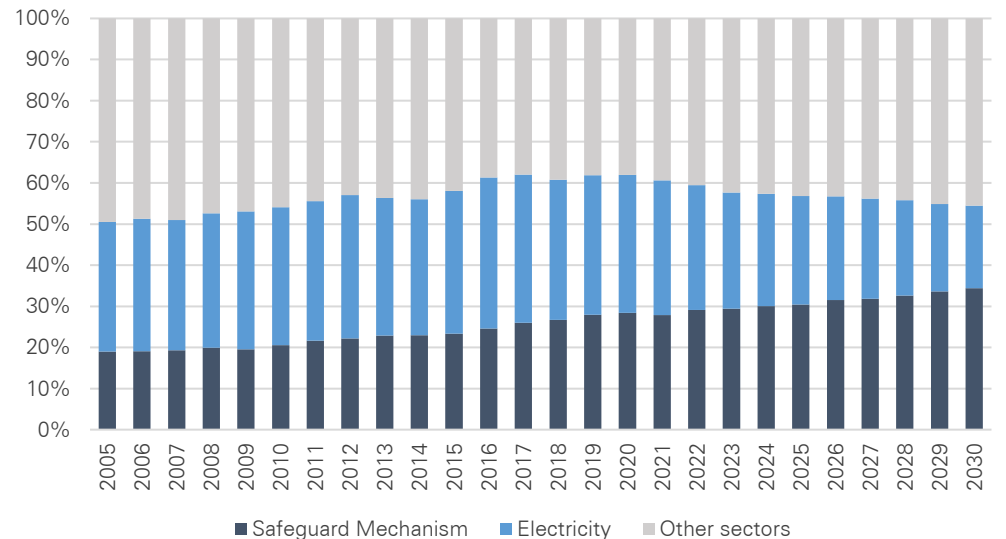


Figure 16: Percentage national emissions by key policy segment (business as usual)



Source: RepuTex Energy, 2021

Changes to the Safeguard Mechanism

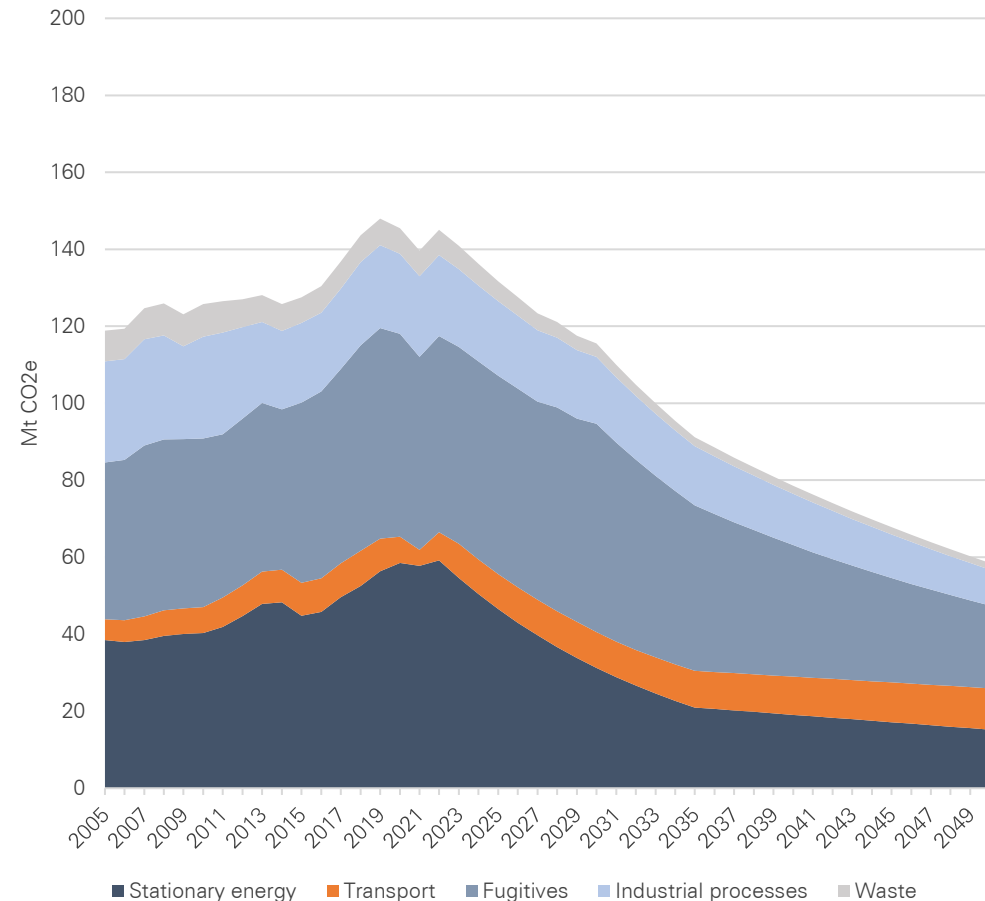
In October 2021, the Business Council of Australia (BCA) proposed that changes be made to the Safeguard Mechanism to provide a stronger signal for industry to invest in low-emissions technologies. Specifically, the BCA proposed that emissions baselines be reduced “predictably and gradually over time” to “support international competitiveness and economic growth”.

Improvements to the Government’s Safeguard Mechanism therefore represent an opportunity to align federal policy with corporate commitments to reach net-zero emissions, while capitalising on clean economy opportunities to drive growth and support job creation.

For the purposes of this analysis, we model the following settings:

- The current eligibility threshold for the Safeguard Mechanism is maintained at 100,000 tCO₂ per annum (excluding electricity), with BAU emissions covering 28% of national emissions in 2020-21, growing to 34% by 2030.
- The scheme is modelled to commence in 2023-24, with emissions baselines for covered facilities set to decline in line with an aggregate annual emissions baseline reduction of 5 Mt, reaching net-zero by 2050. DISER and the CER would advise Government on each facility’s share of the overall trajectory, based on available and emerging technologies in each sector, and the need for tailored treatment for Emissions Intensive Trade Exposed (EITE) industries.
- In line with Commonwealth policy, tradable Safeguard Mechanism Credits (SMCs) are issued where an entity “beats” its emissions baseline, while facilities are required to surrender credits equivalent to their “above-baseline” reported emissions.
- Liable entities may meet their obligations for “above-baseline” emissions by surrendering SMCs and/or Australian Carbon Credit Units (ACCUs). Tailored treatment is assumed to be provided to EITEs based on a comparative impact principle, informed by industry consultation and DISER/ CER advice.

Figure 17: Safeguard Mechanism pathway under ALP policy (mature technology).



Source: Reputex Energy, 2021

Policy impact and implementation

With the alignment of federal policy to corporate commitments to reach net-zero emissions by 2050, each covered facility is modelled to contribute to Australia's net-zero target by becoming accountable for a proportion of their emissions in each given year. Changes to the Safeguard Mechanism will therefore embed a transparent net-zero target into the economy (for covered sectors), providing a gradual and predictable signal to guide long-term planning and capital investment decisions in low-emissions technologies.

To meet their obligations under the Safeguard Mechanism, we model the deployment of demonstrated and mature low emissions technologies by industry, supported by low-cost financing under the National Reconstruction Fund (NRF). This is anticipated to lower financial barriers, and accelerate uptake of emissions reduction activities by industry, while helping to shift abatement investment from the purchase of offsets toward emissions reductions.

Industry investment in emissions reductions is modelled on a sector-by-sector basis, accounting for changing global demand in both traditional and new export industries. For example, consistent with the Government's assumptions, fossil fuel sectors are assumed to face declining global demand for their products (refer to 'Reference case emissions assumptions' in Appendix A). These traditional export sectors may utilise internal opportunities to reduce emissions - such as energy efficiency, renewable energy, the deployment of carbon capture and storage and other industry specific technologies and processes, such as Ventilation Air Methane (VAM) oxidation - but may be less likely to invest in abatement projects that are calculated to have low internal rates of return, negative net-present values, or long-payback times (without public financing support). These sectors may therefore utilise the least-cost combination of internal abatement opportunities (supported by the NRF) and external offsets to meet their annual emissions reduction obligations.

Other sectors of the economy are anticipated to make more transformational investments in low-emissions technologies as they transition to net-zero

emissions, largely via the use of energy efficiency, fuel switching, and industry specific technologies and processes, such as green steelmaking.

For example, most manufacturing industries (such as ammonia & urea, cement, and chemicals) and mining & minerals processing (e.g., iron ore, gold, alumina) are well positioned to transform their operations via energy efficiency improvements, electrification, low-carbon fuels, and new processes to eliminate direct GHG emissions. The Safeguard Mechanism will therefore guide the pace of investment in least-cost emissions reduction technologies by these sectors, either where mature technology exists today, or as demonstrated technologies are more widely utilised. Other hard-to-abate sectors may instead seek to reduce their emissions via the least-cost combination of internal emissions reductions and external offsets, such as industrial SMCs or ACCUs, with credits surrendered equivalent to "above-baseline" reported emissions. This is modelled to result in local co-benefits for the carbon farming industry (such as regional job creation, community and environmental benefits), described below.

Residual GHG emissions are assumed to be offset utilising external ACCU offsets, or alternatively, may be reduced by emerging and future technologies, as these technologies become cost-competitive over the course of the decade.

Modelling results

Actions to reduce direct GHG emissions and procure external carbon offsets are modelled to translate into a range of benefits for job creation and investment in the carbon farming industry, described below.

Emissions reductions and investment

- Improvements to the Safeguard Mechanism, supported by NRF financing, are projected to deliver 213 Mt of abatement between 2023-30.
- Industry is forecast to invest \$1.68 billion between 2023-30, an annual average of \$209 million, supported by an additional \$3 billion in financing under the NRF to accelerate the uptake of low emissions activities.

- Approximately 40 Mt or 19% of all abatement is projected to be in the form of domestic offsets derived from the Australian carbon farming industry, subject to the uptake and timeline of NRF financing. Private sector demand is therefore projected to grow investment in the local carbon farming industry, with public-sector demand under the Emissions Reduction Fund assumed to be retained via the ALP's Powering the Regions Fund (refer to Appendix A).

Regional investment and job creation in the carbon farming industry

- The development of a long-term source of demand for Australian carbon offsets will provide significant regional benefits beyond GHG emissions abatement, including investment and job creation, along with co-benefits to biodiversity, landscape protection, and water quality.
- In direct employment terms, private sector investment in carbon farming activities is forecast to support approximately 1,000 jobs by 2030. Notably, 5 out of 6 jobs are expected to be created in regional areas (83%).
- Jobs attributed to reforestation plantings are expected to be the largest source of new job creation, reflecting the largest investment in that activity, followed by rangeland regeneration, soil carbon, and savannah burning.
- Drawing on traditional Indigenous knowledge, savanna fire management methods are expected to create the largest number of jobs per dollar invested, with 12 jobs per million dollars (jobs/\$m), followed by reforestation plantings and soil carbon (10 jobs/\$m), and forest regeneration and rangeland protection (9 jobs/\$m).
- Abatement from carbon farming is expected to generate permanent job creation, such as Indigenous rangers, carbon foresters, land managers, stockmen and tree planting contractors, along with induced employment, such as service and tourism industries in regional areas.

Job creation from direct industry abatement

- Abatement from electrification, fuel switching, and other investment that modernises the capital stock and technology in the economy, makes up around 767 jobs per annum, or 48% of all jobs created by improvements to the Safeguard Mechanism policy.
- Although classified as indirect jobs for the purpose of this Safeguard Mechanism analysis, jobs associated with renewable energy project development are also expected to be supported under this policy lever, attributed to increased electrification and increased clean energy capacity additions to meet increased electricity demand.
- Energy efficiency improvements are modelled to create 533 jobs in 2030, or 33% of all jobs. Energy efficiency involves numerous process improvements and small & large equipment upgrades.
- Electrification relevant to covered facilities typically reduces the direct combustion of gas in agriculture & forestry, heavy- & light-manufacturing, and mining & extraction facilities.
- Fuel switching typically involves biomass, biogas or liquid biofuels as viable options in cases where electrification is impractical - e.g., remote locations distant from electricity grid connections. Other industry abatement built into this scenario comprise opportunities associated with timber buildings, bio-coke substitution, N₂O elimination, centralised gas distribution networks, volatile air methane oxidation, green aluminium, and carbon capture and storage (CCS) for industrial non-energy emissions.

NATIONAL RECONSTRUCTION FUND

Policy benefit	At \$3 billion invested
Emissions reductions	33 Mt of abatement in 2030 (24 Mt in support of the Safeguard Mechanism)
Investment	Up to \$3 billion of \$15 billion fund (20%)
Jobs created	34,000 direct jobs attributed to green manufacturing

Policy background

To support the deployment of low emissions technologies by industry, the National Reconstruction Fund will act as a financing vehicle to drive investment in projects that build prosperity, broaden the industrial base and boost regional economic development. The Fund would operate on similar terms to the Clean Energy Finance Corporation, providing investment through a combination of loans, equity, co-investment and guarantees; and would be administered on the basis that it will achieve a return to cover its borrowing costs, with an expected positive underlying cash impact. The Fund would invest in a diverse range of sectors; however, this analysis focuses on opportunities from renewables and other low emissions technologies critical to reaching net-zero emissions. This may include strategic industries - such as manufacturing components for wind turbines, production of batteries and livestock management activities to reduce enteric methane emissions - along with the deployment of low emissions technologies by industries covered by the Safeguard Mechanism, such as modernising steel and aluminium manufacturing, hydrogen electrolyzers and fuel switching, and innovative packaging solutions for waste reduction.

Modelling results

Of the \$15 billion NRF, we calculate \$3 billion (20%) is deployed to support the uptake of clean energy and green technologies. These include:

- **Agricultural methane reduction:** targeting the abatement of methane emissions from agriculture, including anti-methanogenic treatments, composting of mature, natural grassland management, and the application of nitrification inhibitors to animal waste. This is expected to lead to a reduction in GHG emissions of almost 9 Mt a year by 2030, supporting 70 jobs.
- **Clean energy component manufacturing:** Including battery and wind turbine manufacturing is modelled to support 9,000 and 6,800 direct jobs respectively by 2030.
- **Critical manufacturing:** According to WWF (2020), \$520 million for energy efficiency, fuel switching, and renewable generation is required to transition Australian manufacturing to cheaper and cleaner energy sources to protect 914,000 jobs. We project that this will also create 6,290 more jobs, while reducing emissions by more than 7 Mt a year by 2030.
- **Hydrogen electrolyzers and fuel switching:** opportunities for clean hydrogen processing and substitution for fossil fuel combustion, mainly in the energy and manufacturing sectors, is projected to reduce emissions by 5 Mt per annum and create 986 jobs by 2030.
- **Waste reduction:** including composting, innovative packaging solutions and plastic recycling is modelled to reduce emissions by 2 Mt per annum by 2030 while supporting the creation of 3,390 jobs.
- **Green metals: steel, alumina and aluminium:** Enormous opportunities exist to develop green steel manufacturing hubs across Australia using abundant and low-cost renewable energy resources, and green hydrogen. We conservatively model these hubs to benefit from \$1.31 billion in financing, developing and scaling up Hydrogen Breakthrough Ironmaking Technology (HYBRIT) to transition from traditional blast furnaces. This is forecast to reduce emissions by more than 4 Mt per year by 2030. Like steel, alumina and aluminium production is highly energy- and carbon-intensive. Funding support for reliable and affordable firm renewable electricity is therefore a key enabler for competitive green metals production in Australia, delivering emissions reductions of almost 5 Mt per year by 2030.

NEW ENERGY APPRENTICESHIPS AND \$10M SKILLS PACKAGE

Policy benefit	Summary
Investment	\$100 Million
Jobs created	10,000 new apprentices

Policy background

To encourage apprentices to train in the new energy industry, the ALP proposes to invest \$100 million to support 10,000 New Energy Apprenticeships. Apprentices who choose to train in new energy industries will receive up to \$10,000, with \$2,000 on commencement and \$2,000 a year for up to four years, including on successful completion. Examples of eligible industries include rooftop solar installation and maintenance, large-scale renewable projects, energy efficiency upgrades to homes and businesses, green hydrogen, renewable manufacturing, and relevant agricultural activities. 10,000 New Energy Apprenticeships will be available over four years (2,500 commencements a year from 2022-23).

Modelling results

The future energy system will require significant shifts in employment and skills to ensure that businesses can recruit workers with relevant experience, and that existing training systems meet industry needs.

Energy efficiency, generation and transmission construction roles are expected to support widespread employment; however, recent studies indicate a shortage in technical skills for some applications. Incentive payments are therefore expected to encourage apprentices to take on the occupations required to support the new energy economy.

For example, recent reports commissioned by AEMO and Infrastructure Australia indicate that the delivery of new transmission projects may be impacted by a shortage of technical skills. These reports raise concern that Australia has not engaged in large transmission projects for many years, with the rapid growth and peakiness of the employment profile for transmission construction creating a higher risk of skill shortages, particularly given the training lead time required for a typical role in high voltage transmission.

As employment demand in the new energy sector grows over time, labour and skill shortages may therefore become a significant factor for the build out of renewable generation, particularly in regions with tight labour markets. Key risks for shortages and constraints are expected to impact both larger occupational groups (such as electricians, construction managers, electrical and grid engineers), and more specialised jobs (such as line workers for transmission construction or crane operators for wind power construction).

In addition, scenarios for the larger uptake of renewable energy, mass electrification, and growth in renewable hydrogen for heavy industry, transport fuels and export could translate into higher demand for labour, and expected skills shortages, beyond current forecast expectations.

Skill development such as the training of apprenticeships can therefore play a key role in supporting future labour demand, and reducing the risks and costs for host employers, with potential for a future workforce to move across sectors with shared core skillsets (such as energy efficiency, renewable energy, renewable hydrogen, transport fuels, etc) to meet Australia's expected pipeline of new energy projects over the upcoming decades.

4.

Transport

Emissions and economic impacts of the ALP's Powering Australia Plan

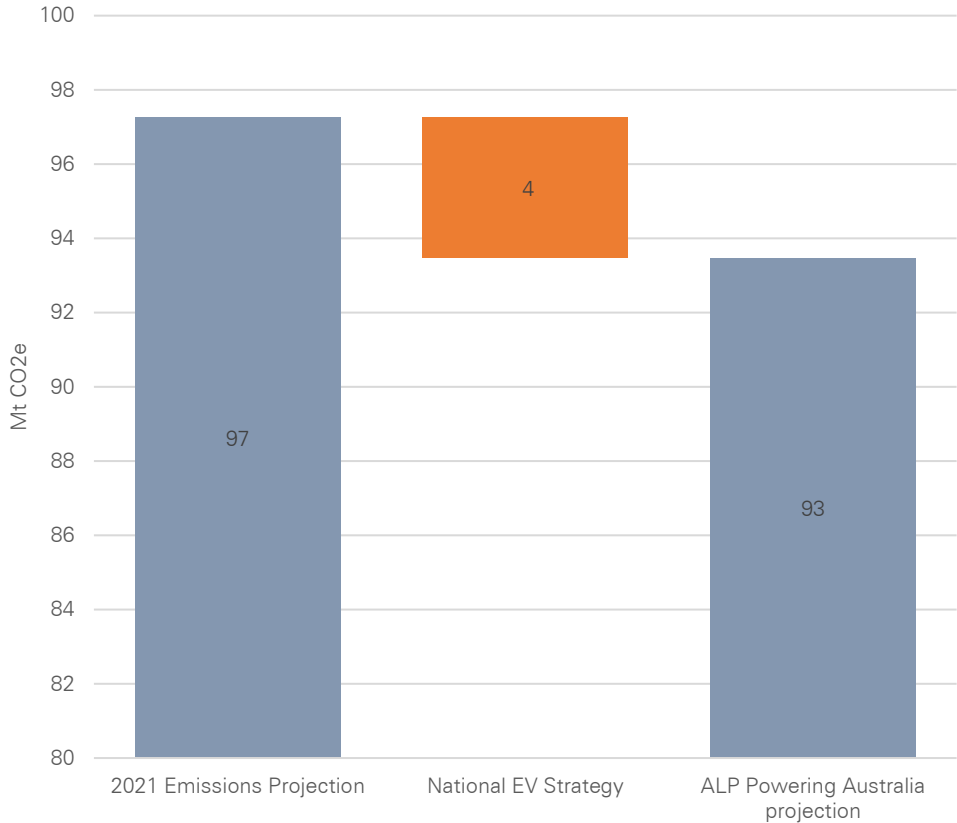
TRANSPORT POLICY MEASURES

Analysis in this section considers the emissions and economic impacts of transport sector policy settings against the following parameters: emissions reductions relative to a reference year; employment (direct and indirect jobs created); and the value of direct and indirect investment for each measure.

The Powering Australia Plan includes the following policy measures for the transport sector:

Policy measure	Description
Electric car discount	The ALP will develop a National Electric Vehicle Strategy, including investment of \$251 million for an Electric Car Discount, removing inefficient taxes from low-emissions vehicles.
Electric vehicle charging infrastructure	The ALP will improve electric vehicle charging infrastructure by requiring Commonwealth-funded road upgrades to incorporate charging infrastructure where appropriate and review the National Construction Code.
Real-world emissions testing program	The ALP proposes to commit \$14 million over four years to establish a real-world emissions testing program in Australia.

Figure 18: Emissions reductions from transport sector policies in 2030



Source: RepuTex Energy, 2021

NATIONAL ELECTRIC VEHICLE STRATEGY

Policy benefit	Summary
Emissions reductions	<ul style="list-style-type: none"> 68 Mt emissions reduction between 2022-35 Transport emissions reduced by 4 Mt in 2030
Charging infrastructure	Deployed in over 100,000 businesses, 3.8 million households, and 1,800 new public access fast charging stations. Enabled for up to 99% of the population (over 24 million people)
Electric Vehicles	Create an environment for 3.8 million EVs on the road by 2030
Jobs created	5,960 new jobs created

Policy background

Australia lags the world on the take up of electric vehicles (EVs). In 2020, just 6,900 of around 920,000 new cars sold in Australia were electric (0.75%), well below the global average of 4.2%, and behind key markets such as China (6.2%), the United Kingdom and European Union (11%), and global leader Norway (54%). In total, there are less than 35,000 registered EVs on Australian roads, of more than 15 million light vehicles (0.2%).

The low penetration of EVs is despite growing consumer enthusiasm, with a 2021 survey of consumer attitudes suggesting that most Australians (54%) would consider buying an EV as their next car (Electric Vehicle Council).

Despite this, EVs remain expensive in Australia. The upfront cost of an EV currently exceeds the cost of internal combustion engine (ICE) equivalents and is a significant barrier to accelerating EV sales. There are currently no EVs in Australia priced below \$40,000, and just five EV models priced below \$60,000.

Comparably, there are twenty-six models available for under A\$60,000 in the UK, including eight models that are cheaper than Australia’s lowest cost EV.

The major barriers to EV take up in Australia include:

- High upfront costs, which make it difficult for consumers to prioritise EV purchases over traditional ICE vehicles, with 50% of survey respondents indicating that high purchase costs discourage them from buying an EV.
- Consumers also express concern over ‘range anxiety’ due to lack of publicly available charging infrastructure. Although many EV sales will be paired with home charging infrastructure, non-home charging infrastructure is critical to allow EVs to grow their fleet penetration by the middle of the decade.

Policy impact and implementation

To make EVs more affordable, increase take up and reduce GHG emissions, the ALP proposes to commit to:

- Exempt EVs (including battery electric, plug-in hybrid electric, and hydrogen fuel cells) below the luxury car tax threshold for fuel efficient vehicles from fringe benefits tax (FBT), where EVs are provided through employment arrangements, and remove the 5% import tariff (where it is still paid); and
- Support these incentives with commitments, including:
 - Work with states and territories to ensure that federally-funded infrastructure projects incorporate EV charging facilities wherever possible
 - All relevant properties which the Commonwealth owns, or leases, will be fitted with appropriate charging infrastructure;
 - Implementation of an EV target for the Commonwealth fleet;
 - Review of the National Construction Code to consider charging infrastructure or electrical connections for future infrastructure.

Modelling results

Electric car discount

- Vehicles that employers provide to employees for private use are subject to FBT, at a rate of 47 per cent – equivalent to the top marginal tax rate, including the Medicare Levy. Of the eleven EVs under the luxury car tax threshold for fuel efficient vehicles, six are subject to the 5% import tariff.
- Assuming that EVs sold for less than the Luxury Car Tax threshold (LCT) are eligible for the electric car discount (e.g. EVs sold for less than \$79,659 (indexed) are eligible for FBT and tariff exemptions), modelling indicates that the discount will encourage the import, supply, and sale of more affordable EVs, and reduce the fiscal impact of the exemptions.
- The tariff exemption is modelled to save over \$2,000 on models in the \$50,000 range, while FBT exemption will result in savings of up to:
 - » \$8,700 on a \$50,000 model (such as a Nissan Leaf);
 - » \$10,600 on a \$60,000 model (such as a Hyundai Kona); and
 - » \$12,000 on a \$70,000 model (such as a Tesla Model 3).
- Employment will be created via sales, charging infrastructure development, and opportunities to develop new manufacturing jobs specialising in batteries, EV components or charging infrastructure technologies. 5,960 new jobs are modelled to be created, associated with 2.15 million more EVs on the road in 2030 than under Government projections. 16,500 indirect jobs are forecast to be created attributed to the manufacture and installation of necessary charging infrastructure.
- EV sales are expected to increase by 600,000 vehicles (208%) above Government projections in 2030, raising the EV share from 29 per cent to 89 per cent of new car sales in 2030, with EVs making up 15 per cent of all vehicles on Australian roads by 2030.

EV Target for Commonwealth Fleet

- EVs present an opportunity to reduce fleet GHG emissions and operating costs due to the higher efficiency of the electric motor, lower number of moving parts and the absence of tailpipe emissions.
- While non-plug-in hybrids are prevalent in the Australian market, the range of full electric and plug-in hybrid variants currently available is limited, and only a couple of fuel cell vehicles are available via special order. The transition of the Australian government fleet to electric is therefore likely to stimulate uptake of EVs and facilitate the introduction of new EV models to Australia.
- Department of Finance reports show the government fleet consists of >5,000 passenger and >5,000 commercial vehicles in 2018, however, only 0.1% of the current fleet is EV's. Replacing 750 ICE passenger vehicles, and 750 ICE commercial vehicles a year is modelled to achieve the Commonwealth low-emissions vehicle target of 75% of new purchases and leases of passenger vehicles by 2025.
- This is calculated to avoid an additional 2,700 tonnes of CO2e per year given Commonwealth electricity procurement, which is assumed to transition to 100% renewable energy.
- At 1,500 vehicles a year, the Commonwealth fleet is large enough to underpin the introduction of 3-7 new EV models each year. There are currently 31 electric vehicle models for sale in Australia, or 58 electric vehicle models in the Australian market by the end of 2022 (EVC 2021). A portion of the commercial vehicle fleet procurement may also be targeted to Australian vehicle manufactures, supporting ongoing jobs in manufacturing and increasing the sophistication of the local EV supply chain.
- Other benefits include opportunities to re-sell EVs into the secondary market at a lower price point after end of service (2-3 years), while old EV batteries may also be repurposed as storage devices in industrial or residential settings, providing an avenue for affordable storage options.

5.

Appendix A

Methodology statement and assumptions

METHODOLOGY STATEMENT

In determining the GHG emissions reductions and economic impacts of the ALP's Powering Australia Plan, we utilise our in-house Australian Energy and Emissions Market (A-EEM) model, and our Marginal Abatement Cost (MAC) sub-model, to identify potential emissions reduction and offset opportunities across the identified sectors (Electricity, Industry & Carbon Farming and Transport). GHG abatement volumes and sector-specific variables (physical measures and \$ investment) are then applied to calculate job creation, drawing on employment multipliers derived from economic input-output models.

The steps for undertaking this analysis are summarised below and described in more detail in the following sections:

1. Development of a business-as-usual baseline (Reference Case) for sub-sector GHG emissions from 2022-30, aligned with Australia's national emissions projections (October 2021, DISER).
2. Identification of technical emissions abatement activities in the three identified sectors (Electricity, Industry & Carbon Farming and Transport), drawing on demonstrated and mature technological opportunities.
3. Development of an alternative emissions projection from 2022-30, with individual ALP policy levers integrated and scaled in line with assumed dollars invested. Abatement potential is defined as the annual reduction between the reference case emissions baseline and projected emissions after the implementation of specific activities in a given year.
4. Job creation stemming from the implementation of specific abatement activities is calculated based on employment multipliers and sector-specific variables (physical measures and \$ investment).
5. GHG emissions abatement, investment and job creation resulting from each policy measure are aggregated by sector to derive outcomes of the policy framework and calculate overall emissions reductions in Paris accounting terms (an emissions budget for the period 2021 to 2030).

Reference case (emissions baseline) assumptions

In line with Australia's emissions projections (October 2021, DISER), the Reference Case baseline reflects current state and federal policy, including:

- The Large-scale Renewable Energy Target (LRET) and the Small-scale Renewable Energy Scheme (SRES);
- State renewable energy targets in Queensland, Victoria, Tasmania and the Northern Territory;
- The NSW Electricity Infrastructure Road Map;
- Energy efficiency measures at the state and federal level;
- The Emissions Reduction Fund (DISER accounts for contract delivery schedules and outcomes up to the 12th ERF auction held in April 2021).

In addition, DISER emissions projections account for changing global demand for traditional export sectors, as described by the latest commodity and metal manufacturing forecasts published in the Office of the Chief Economist's Resources and Energy Quarterly. For example, the Office of the Chief Economist's forecasts account for longer-term pressure and declines in thermal coal export demand attributed to net-zero emissions targets and tighter emissions policies in Australia's key export markets (China by 2060, the EU by 2050, Japan by 2050, Taiwan by 2050, and South Korea by 2050), along with projected declines in domestic brown coal generation. Similarly, LNG demand in Japan, South Korea and Taiwan is predicted by the Office of the Chief Economist to slow as countries pursue net-zero targets, and swing to renewables generation. Positive transition impacts are also considered, such as the impact of global electric vehicle policy on demand for lithium production, and opportunities for green steel.

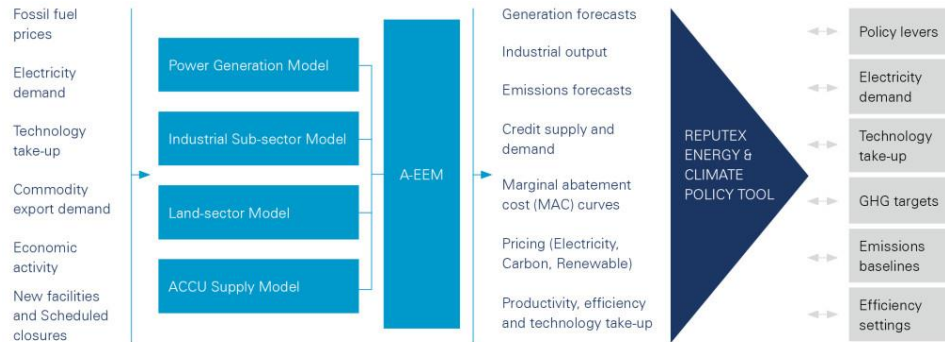
Modelling herein therefore accounts for changing global demand for both traditional and new export sectors in line with the Commonwealth's emissions reference case (DISER), with sectoral investment attributed to ALP policy measures overlaid as described. For more detail, refer to the Office of the Chief Economist's latest [Resources and Energy Quarterly](#) publication.

Analysis of sectoral emissions reduction potential

In identifying emissions reduction opportunities across the Electricity, Industry & Carbon Farming and Transport sectors we utilise our Australian MAC model, contained within our broader A-EEM framework. A-EEM is comprised of three sub-sector models for the power, industrial, and land-use sectors, producing supply-demand and price outputs for the Australian market, including:

- GHG emissions projections;
- Energy generation, consumption, and pricing projections;
- Supply and demand for carbon credits; and
- Marginal abatement cost (MAC) curves.

Figure A1: RepuTex Australian Energy and Emissions Model (A-EEM) schematic



To identify emissions reduction and offset opportunities across the modelled sectors we utilise our MAC sub-model to depict the emissions reduction potential of different activities relative to the reference case, for a specified year (2030). Opportunities are combined to form an abatement curve, with abatement potential defined as the annual reduction between the emissions baseline and emissions after the activity has been implemented.

Analysis assumes the deployment of demonstrated and mature technology opportunities (such as the uptake of renewable energy and storage, energy efficiency, electrification, bio-sequestration, industrial carbon capture and

storage, and electric vehicles; along with demonstrated substitutes for high-temperature heat) on a sector-by-sector basis, limited only by the effectiveness of policy to finance and/or incentivise their uptake by industry.

Residual GHG emissions are assumed to be offset utilising external ACCU offsets, supporting local co-benefits. These emissions may alternatively be reduced by internal abatement measures as emerging technologies become cost-competitive over time (not considered here).

Technology investment decisions by industry

Industry investment in emissions reductions is modelled on a sector-by-sector basis, accounting for changing global demand in both traditional and new export industries. For example, traditional export sectors may utilise internal opportunities to reduce emissions - such as energy efficiency, renewable energy, the deployment of carbon capture and storage and other industry specific technologies and processes, such as Ventilation Air Methane (VAM) oxidation - but may be less likely to invest in abatement projects that are calculated to have low internal rates of return, negative net-present values, or long-payback times (without public financing support). These sectors may therefore utilise the least-cost combination of internal abatement opportunities (supported by NRF financing) and external offsets to meet their annual emissions reduction obligations.

Other sectors of the economy may make more transformational investments in low-emissions technologies as they transition to net-zero emissions, largely via the use of energy efficiency, fuel switching, and industry specific technologies and processes, such as green steelmaking to eliminate all direct GHG emissions. For example, most manufacturing industries (such as ammonia & urea, cement, and chemicals) and mining & minerals processing (e.g., iron ore, gold, and alumina) are well positioned to transform their operations via energy efficiency improvements, electrification, low-carbon fuels, and new processes to eliminate direct GHG emissions. The Safeguard Mechanism will therefore guide the pace of investment in least-cost emissions reduction technologies by these sectors, either where mature technology exists today, or as demonstrated technologies are more widely utilised.

Internal abatement versus carbon offsets

Industry decision making between investment in internal GHG emissions abatement and external offsets is underpinned by an assumed abatement price rising from \$16.94/t CO₂e in 2021 (the average price of abatement at the 13th ERF auction in October 2021). In line with Commonwealth modelling of Australia's long-term emissions reduction plan (October 2021), the abatement price is assumed to rise to no more than \$24/t to 2050.

Private sector demand for ACCUs is assumed to be additional to current public sector investment under the Emissions Reduction Fund, with public sector demand assumed to be retained via the ALP's Powering the Regions Fund.

Industry is assumed to utilise the least-cost combination of internal abatement opportunities (supported by the NRF and other measures) and external offsets either in the form of SMCs or ACCUs, with credits surrendered equivalent to "above-baseline" reported emissions. The optimised Safeguard Mechanism framework is therefore modelled to provide a long-term planning signal for industry to allocate investment in least-cost emissions reductions, accounting for each sector's individual decarbonisation opportunities (drawing on demonstrated and mature technology) as described.

Above-baseline, residual emissions are assumed to be offset utilising carbon credits which, in the case of the carbon farming industry, support local co-benefits such as environmental benefits, economic regional job creation, and community social benefits. Residual emissions may alternatively be reduced by internal abatement measures as emerging and future technologies become cost-competitive.

Long-term ACCU supply is modelled to scale up to meet forecast scenarios for higher demand in line with our long-run ACCU supply curve, with increased demand matched by increased supply at various price points.

Calculation of job creation

Job creation stemming from the implementation of specific abatement activities, both internal and external, is calculated based on employment multipliers and sector specific variables (physical measures and \$ investment).

Employment multipliers are identified from a range of referenced primary and secondary sources for different activity types. Multipliers draw on economic input-output models to evaluate the direct and indirect job creation benefits, and are calibrated by RepuTex to current Australian projects. For example, transmission construction multipliers are adapted from five studies (Duan 2018, Lantz 2011, MISO 2015, Swenson 2018, WIRES 2011), with specifications calibrated to align with announced Australian projects, such as KerangLink and Project EnergyConnect, as described.

Multipliers may be aligned with varying inputs relevant to each sector, such as installed capacity of renewable energy generation or per \$ of investment, in line with modelled emissions reductions.

Job creation is calculated by definitions of direct, indirect and induced employment, as described:

- Direct jobs: employment created within the specific industry (for example construction, operations and O&M jobs for renewable energy projects or network developments).
- Indirect jobs: employment created to support the industry (such as manufacture or supply of component parts, transporting materials, and purchasing goods and services by the labour force).
- Induced jobs: employment created in unrelated sectors as a result of change within the industry (such as avoided warming damages to the economy and trade and domestic benefits of low-cost renewable electricity).

Job creation may reflect the number of construction jobs associated with building infrastructure or ongoing full time equivalent (FTE) employees in the industry. Job-years are based on the number of labour-years typically required to construct or install the designated technology infrastructure.

Electricity sector

In producing electricity generation sector analysis, we utilise our proprietary National Electricity Market Renewable Energy Simulator (NEMRES), which calculates annual generation and transmission expansion decisions in each region of the National Electricity Market (NEM). Scenarios depicted cover two potential pathways for the development of the NEM:

- **Central case:** The currently projected transition of the energy industry, reflecting existing state and federal policy, present technology trajectories, current gas prices, central energy consumption and economic growth.
- **Alternative case:** Building on the Central case with the addition of the Rewriting the Nation policy, unlocking the infrastructure required to support the increased development of least-cost renewable energy.

For the purposes of this analysis, we apply the following settings:

- **Emissions abatement:** GHG emissions abatement is assumed to be the difference in CO₂e emissions between variable renewable energy (VRE) and dispatchable sources of generation that would have been necessarily dispatched had VRE generation technologies not been available.
- **Capacity additions:** New capacity financially committed as of October 2021 is assumed to be built as announced. Beyond this, new capacity is added from publicly announced projects and capacity expansion attributed to current policy and/or new incentives. Under the Central Case, 21.8 GW of new large-scale renewable energy capacity is calculated to be added to the NEM by 2030, growing to 38.5 GW by 2040. Under the Alternative Case, this is projected to grow to 25.6 GW by 2030, and 47.5 GW by 2040, as network developments are brought forward to access more cost-effective electricity generation resources over the long-term.
- **Generator retirements:** Generator retirements are assumed to occur in line with announced and expected closure dates published by AEMO. No retirements are therefore modelled to be brought forward.

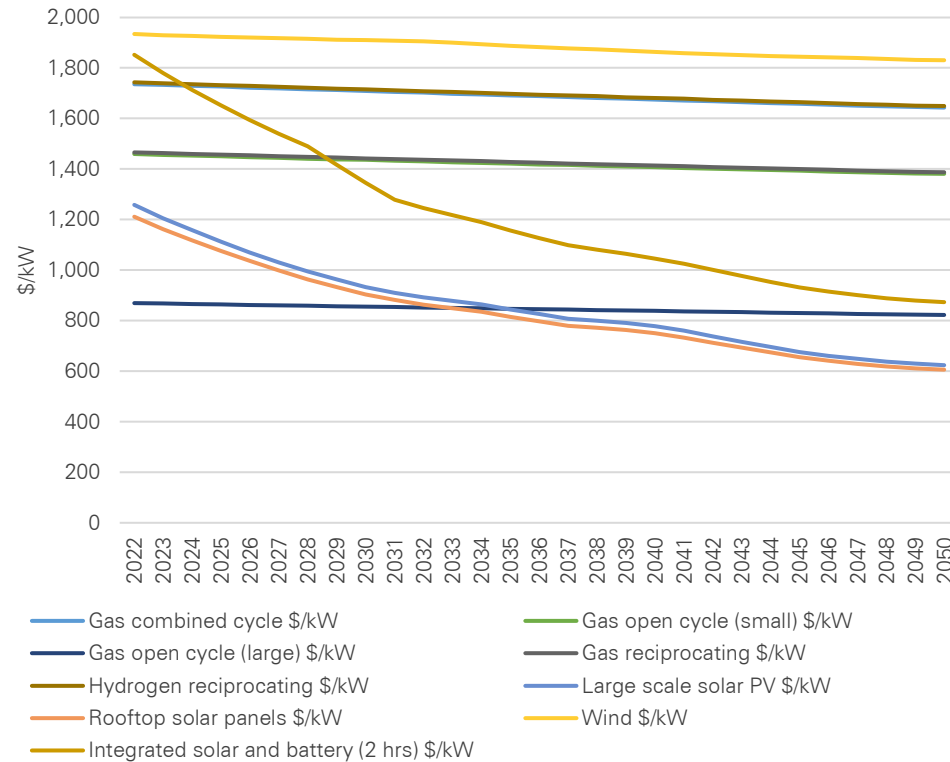
- **Snowy 2.0:** First power from the government’s proposed 2 GW Snowy 2.0 pumped hydro project is assumed to be in 2025, followed by progressive commissioning of its six generating units.
- **Reliability:** In our capacity expansion model, each region is required to have a minimum level of firm capacity available to meet forecast maximum demand events. Firm capacity may be shared across interconnected regions based on interconnector capabilities and typical coincident available capacities in neighbouring regions.
- **Network assumptions:** New network developments are assumed to be undertaken to address network strength as new capacity comes online. Under the Central Case, this occurs in a business-as-usual way, with actions implemented in stages to match AEMO’s Central 2020 ISP scenario. Rewiring the Nation is assumed to coordinate, finance, and optimise the development of infrastructure required to support the development of least-cost energy, with development brought forward in line with the below indicative timeline:

Modelled transmission project	Reference case	Rewiring the Nation
Central NSW	2026-27 to 2032-33	2026 to 2031
Central to Southern Queensland	2034	2030
KerangLink	2036	2027
Gippsland	2029	2025
Gladstone Grid section	2036	2030
Marinus 1	2029	2028
Murray River	2025	2024
Northern West NSW	2033	2030
QNI medium and Large	2032-33 to 2035-36	2031 to 2035
Southwest Victoria	2048	2028
Western Victoria.	2047	2025

Large-scale Build Costs

Utility scale energy storage and solar technologies – e.g., Large scale solar PV, Rooftop solar panels, and Integrated solar and battery (2 hrs) are assumed to experience rapid capital cost declines over the next decade to become the least expensive clean generators built on a \$ per kW basis.

Figure A3: Large-scale build costs for wind and solar

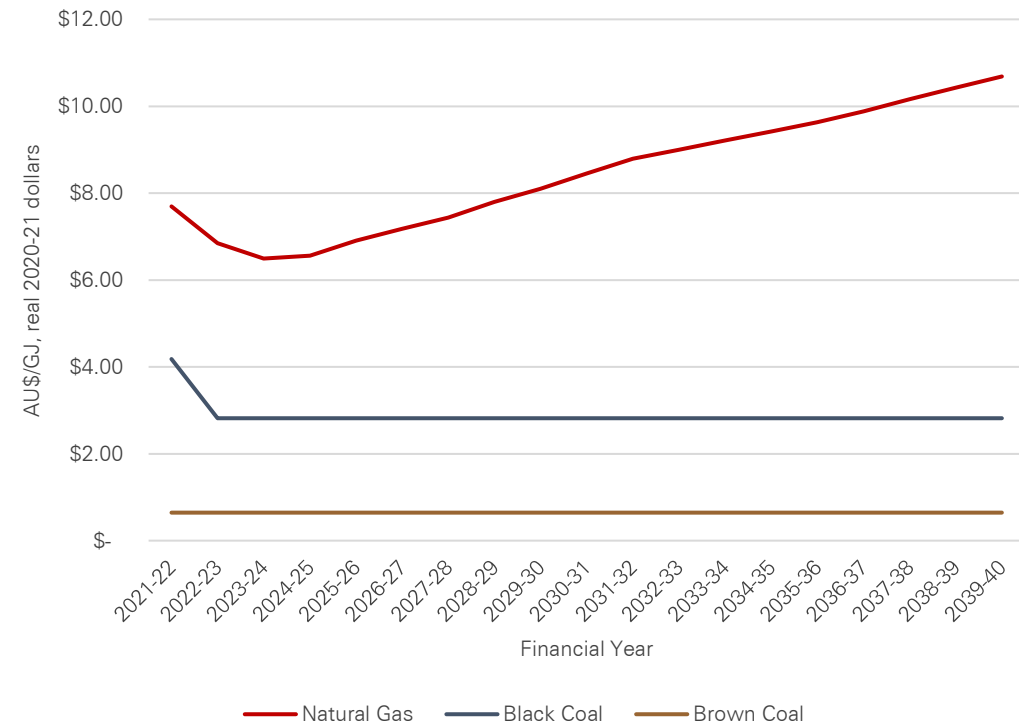


Source: GenCost 2020-21 (Graham 2020).

Coal and gas prices

Black coal has a higher energy content than brown coal and is influenced by thermal coal export markets to countries like China and Japan. Gas prices are also influenced by the forecast east coast supply-demand balance and international LNG and oil price forecasts. Our gas price forecast reflects changing dynamics in Australia’s gas markets.

Figure A4: Annual Average Fuel Price for Electricity Generation in NEM (\$/gigajoule)



Source: Australian Electricity Outlook (AEO), RepuTex, October 2021

6.

Appendix B

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