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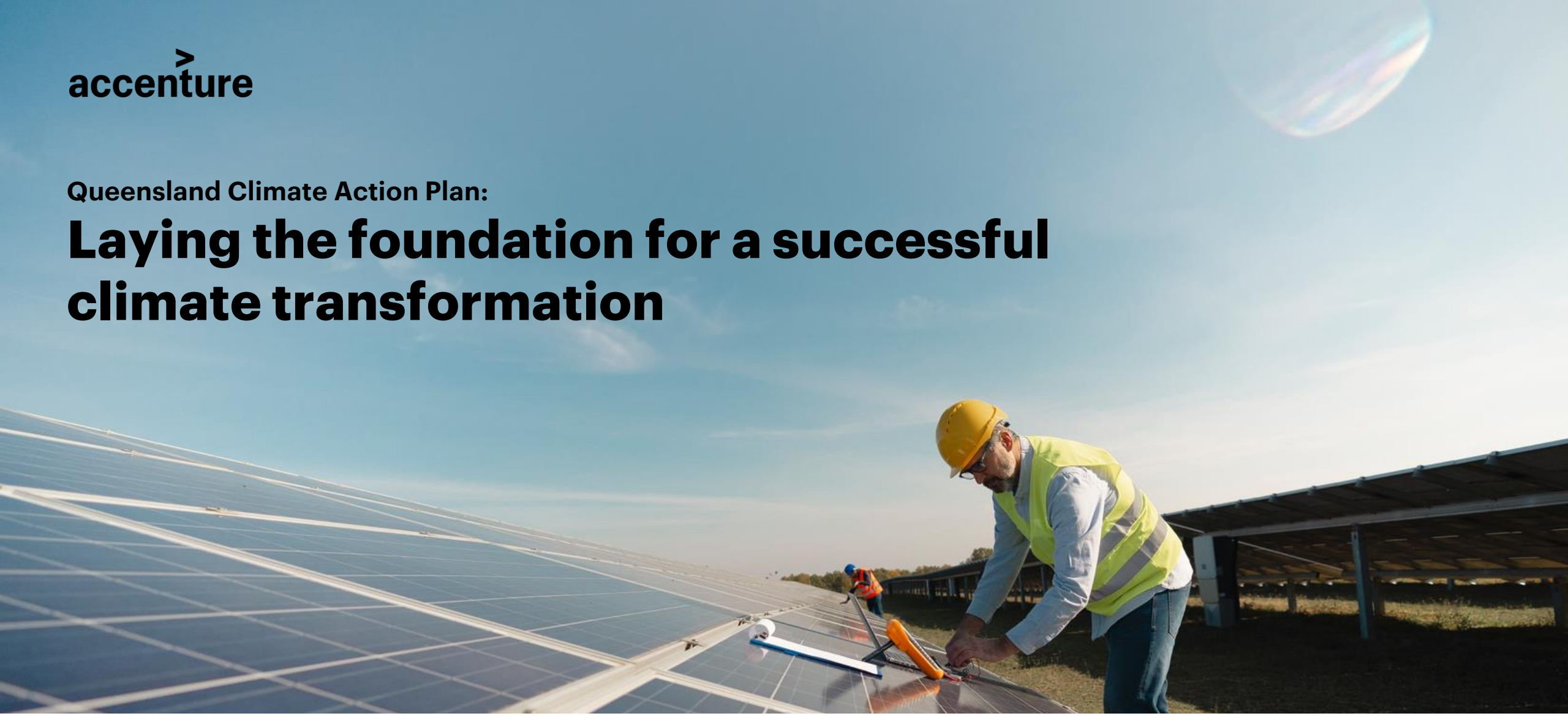
Queensland Climate Action Plan:

Laying the foundation for a successful climate transformation



Commissioned by

ACF WWF Queensland Conservation

August 2022

Acknowledgement of country

Accenture and the commissioning organisations respectfully acknowledge Australia's Aboriginal and Torres Strait Islander people as the Traditional Owners of Australia and pay respect to their Elders past, present and emerging.

About ACF

The Australian Conservation Foundation is Australia's national environment organisation. We are 700,000 people who speak out for the air we breathe, the water we drink, and the places and wildlife we love. We are proudly independent, non-partisan and funded by donations from our community.

About Queensland Conservation Council

Queensland Conservation Council is the leading independent voice for the environment in Queensland. Our vision is a healthy environment and a safe climate for all, and we will achieve this through uniting people in a powerful movement for nature and climate justice. QCC brings together Queenslanders who care about our natural environment and climate change. By working together, we can make our voices heard and create a better future for our environment, our communities and our kids. We act as the peak body for Queensland's environmental movement, representing over 50 community environment groups across the state. We have been working to protect, conserve and sustain Queensland's environment since 1969.

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WWF-Australia is part of the world's leading conservation network. WWF has been working since 1978 to stop the degradation of the earth's natural environment and to build a future in which humans live in harmony with nature. At every level, we collaborate with people around the world to develop and deliver innovative solutions that protect communities, wildlife, and the places in which they live. Since 2019, WWF has been advocating for Australia to become a world leading renewable energy export nation through its Renewables Nation program.

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Executive summary

1

Queensland has one of the highest rates of per capita carbon emissions in the world

- In 2020, Queensland's emissions were over 159 $MtCO_2$-e, which **per capita is one of the highest in the world** and on par with other fossil fuels intensive jurisdictions, such as Western Australia or Alberta in Canada.
- Queensland is **the highest emitting jurisdiction in Australia**, with its industries producing 32% of the country's total emissions. Most Queensland's industries emit above the state's share of GDP and population.
- **Queensland's energy and land use sectors are particularly high emission sectors**. Due to ongoing high rates of land clearing, land use accounts for 8% of total emissions. In comparison, the land sector in every other state is a net carbon sink.
- **Queensland's economy is highly reliant on coal,** which creates long-term economic, social and environmental risks. Only 19% of Queensland's electricity mix is generated by renewables (compared to ~30% in Victoria).

2

Queensland is not currently moving quickly enough to reduce its emissions

- **Queensland has current targets of** 50% renewable energy by 2030 and 30% emissions reduction below 2005 levels by 2030. However, these targets **are not aligned with the Paris Agreement's 1.5-degree goal and fall short of other jurisdictions** such as the ACT, Victoria and South Australia, where targets are more ambitious and written into legislation.
- Queensland's current policies now cover many of the critical elements of a climate strategy, such as renewable energy and transport, and efforts have accelerated since 2017, but **progress could be faster.** Some material sources of emissions, such as coal mine methane, cattle methane, and deforestation, are largely unaddressed by current policies.

3

Queensland could reduce emissions to ~50% below 2020 levels and ~60% below 2005 levels[1], create a ~87,000-person workforce and establish **3 new industries** by 2030[2] **through a package of policies focused on making the most of Queensland's abundant renewable energy and land assets**

- Queensland has a natural advantage with an abundance of sun and wind. Solar and wind are already growing, contributing 16% and 3% towards Queensland's electricity generation so far this year, respectively.
- Queensland could significantly lift its climate ambitions and create new jobs and industries by **focusing on 3 key areas:**
  - *Repower Queensland with clean energy*
  - *Lay the foundation of a gigaton-scale land carbon industry of 100 million hectares of forest and woodland*
  - *Accelerate clean exports industry development*

Notes: 1. 60% figure (reduction to 79 Mt from 2005's 197Mt) covers actions taken since the 2005 baseline to 2020 (reduction of 38Mt) and the policies in this report (reduction of 80Mt) 2. These policies provide an ambitious broad direction for Queensland's climate policy. They are aligned with the AEMO ISP Hydrogen Superpower scenario. They draw on best practice research from Australia and internationally. Further bottom-up analysis will be required to validate assumptions.
Source: Accenture analysis

Three key focus areas can radically reduce Queensland's emissions and create thousands of new jobs

Repower Queensland with clean energy
Decarbonise the electricity sector, the largest source of emissions, and create the backbone for a clean and sustainable economy

Lay the foundation for a gigaton-scale land carbon industry
Reverse emissions from land clearing and create an industry that protects biodiversity and delivers other co-benefits

Accelerate clean exports
Develop new clean energy export industries in hydrogen, batteries, and low-methane beef, and reduce methane emissions from coal mines, creating thousands of new jobs

Creating a greener, cleaner and more resilient Queensland

Source: Accenture analysis

Eight policies across three focus areas could create ~87,000 jobs[1], reduce CO_2-e emissions by ~50% below 2020 levels and ~60% below 2005 levels by 2030[2], and create three new industries

★ *New industries*

Clean energy: ~53,000 jobs

1	*Build 25 GW of new renewable capacity by 2030*	~27,000 jobs	
2	*Build 5 GW of storage and gradually phase out coal power*	~11,000 jobs	
3	*Accelerate rooftop solar installation and consider electrifying gas connections*[3]	~15,000 jobs	

~60 Mt CO_2-e in reduced emissions

Land carbon: ~10,000 jobs

★ 4	*Reset the Land Restoration Fund*	~10,000 jobs	

~15 Mt CO_2-e in reduced emissions

Clean exports: ~24,000 jobs

★ 5	*Underwrite 6 GW of green hydrogen*	~20,000 jobs	H_2
★ 6	*Develop a battery industry for domestic and international markets*	~3,000 jobs	
7	*Tighten coal mine methane regulation*	~1,000 jobs	
8	*Explore policies to curb methane from cattle*[1]		

~5 Mt CO_2-e in reduced emissions
(not counting No.5 and No. 8[2])

Note: 1. Workforce number includes both operational and construction jobs, as well as both direct and indirect jobs created between now and 2030. it is hard to estimate the job creation impact of the policy on abating methane emissions from cattle in its current iteration, hence the number was omitted from the total for this policy package. 2. Emission reduction figure does not include abatement potential of policy on underwriting green hydrogen and abating methane emissions from cattle. See subsequent slides for more detail. 60% figure (reduction to 79 Mt from 2005's 197Mt) covers actions taken since the 2005 baseline to 2020 (reduction of 38Mt) and the policies in this report (reduction of 80Mt).3. Electrifying gas connections has not been included in investment, emission reduction or job creation numbers for this policy. Source: Accenture analysis

Queensland has one of the highest rates of per capita carbon emissions in the world

Queensland has one of the world's highest per capita carbon emissions

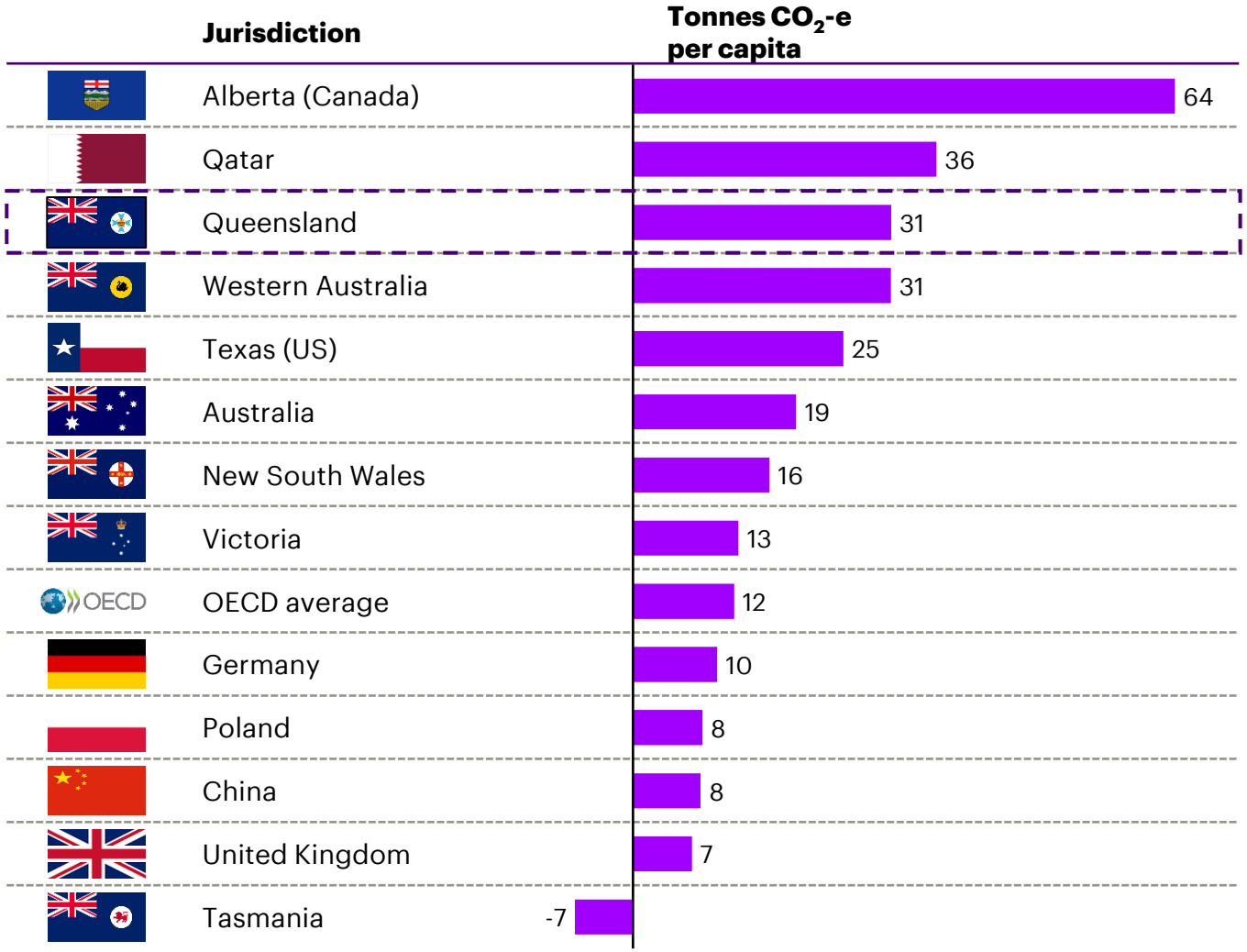
Queensland's total emissions have significantly increased since the 1990s due to increases in population and economic activity, and higher electricity demand for industrial use. In 2020, Queensland's total emissions reached 159.2 $MtCO_2$-e, driven primarily by electricity generation but with notable contributions from a range of other sectors, from transport to agriculture. Queensland's per capita emissions are significantly higher than the Australian average and are over 2.5 times the OECD average.

Western Australia also has very high per capita emissions primarily due to the energy, mining and manufacturing industries. Tasmania is the leader among Australian jurisdictions in terms of emission reduction – according to 2018 data, Tasmanian emissions have declined to -7 Mt CO_2-e, mostly due to significant reduction in native forest harvesting.

Jurisdictions such as Qatar, Alberta (Canada) and Texas (United States) that have similarly high levels of per capita emissions to Queensland rely heavily on fossil fuels, crude oil production and energy intensive manufacturing.

Figure 1: Queensland's per capita emissions compared to other jurisdictions

2020 (or most recent data available), CO_2-e emissions per capita (t CO_2-e) incl. LULUCF



Source: Department of Industry, Science and Resources (2022), Australian Bureau of Statistics (2022), Climate Watch Data (2022), Alberta Government (2022), Texas Demographic Center (2019), The World Bank (2022)

Source: Department of Industry, Science and Resources (2022); Total Annual Greenhouse Gas Emissions (2021); Canada Energy Regulator (2022) The Dirty Fight Over Canadian Tar Sands Oil (2015); Climate Analytics (2022); Texas Climate Concerns (2019); Accenture analysis

Queensland's largest emissions are from electricity generation, but other sources such as transport and agriculture also contribute

Queensland's 2020 total emissions reached 159.2 Mt CO_2-e. Electricity generation (39%), transport (14%), and agriculture (13%) comprise two thirds of Queensland's 2020 CO_2-e emissions. Queensland's eight coal fired power stations account for 94% of the emissions associated with electricity generation. There are eight coal-fired power plants in Queensland with a total capacity of more than 8 GW.

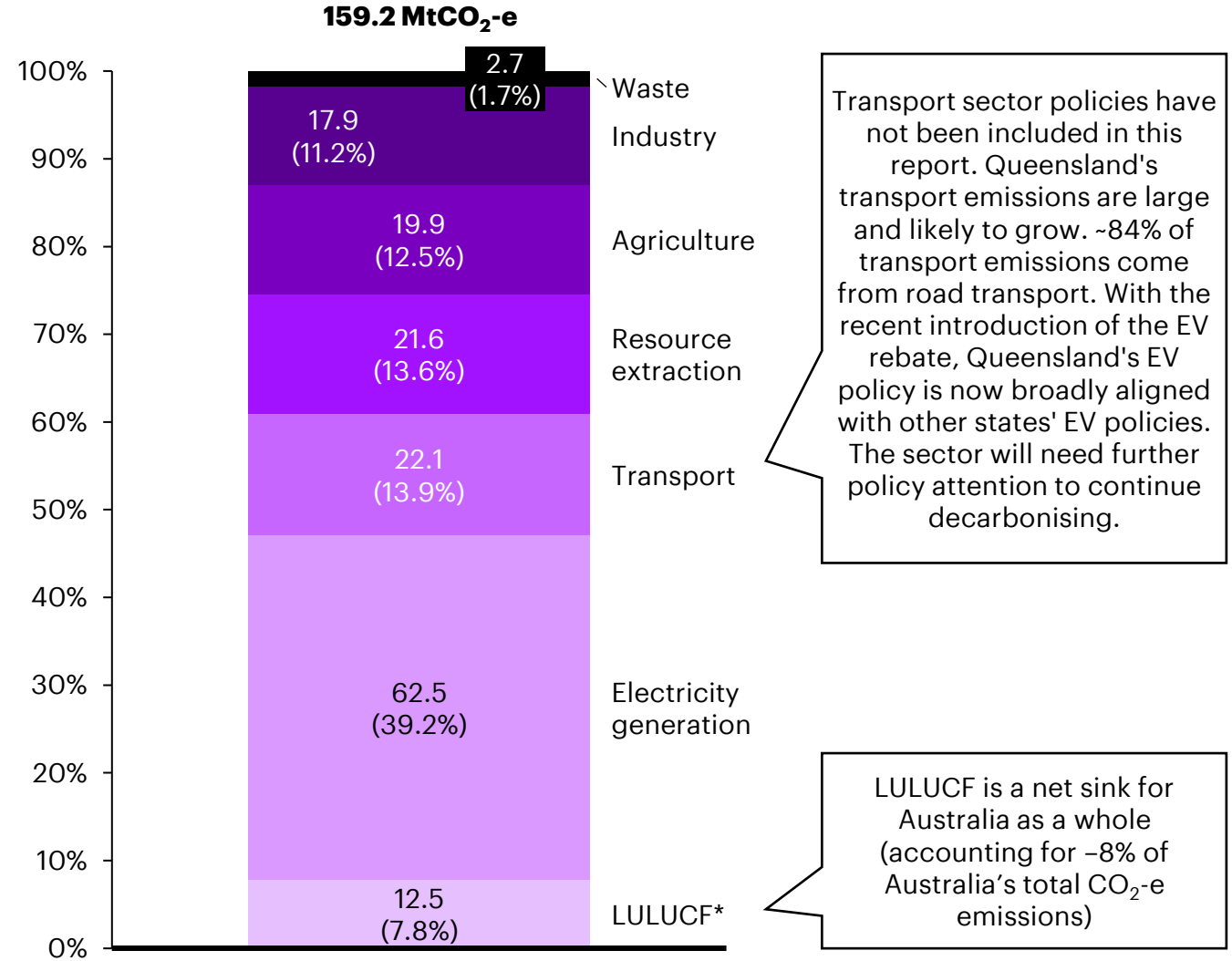
Road usage accounts for most of Queensland's transport emissions (~84%), while agricultural emissions are dominated by methane emissions from cattle (~79%). As a result of historically excessive land clearing and insufficient policy support for re-forestation, the land use, land-use change and forestry (LULUCF) sector in Queensland accounts for 10% of total emissions. This is a very high number compared to other states and territories.

Due to its reliance on resources, ecotourism and agriculture, Queensland's economy is more vulnerable to negative climate impacts than any other jurisdiction. Queensland has already borne 60% of the total economic costs of extreme weather in Australia in the decade from 2007 to 2016. The 2022 floods cost Queensland AU$2.5 billion in damaged infrastructure, with AU$1 billion of lost economic activity. In the future, Queensland is expected to incur the largest increase in costs related to natural disasters of any jurisdiction, with an additional AU$64 billion in estimated costs.

Source: A Supercharged Climate (2022) DISER; Department of Industry, Science and Resources (2022); Deloitte; Climate Council; Accenture analysis

Figure 2: Share of each sector in Queensland's emissions

2020, Mt CO_2-e and %



Note: *LULUCF is Land Use, Land-Use Change and Forestry
Source: Department of Industry, Science and Resources (2022), Accenture analysis

In most sectors – notably land use, resource extraction and electricity – Queensland's emissions intensity exceeds the national average

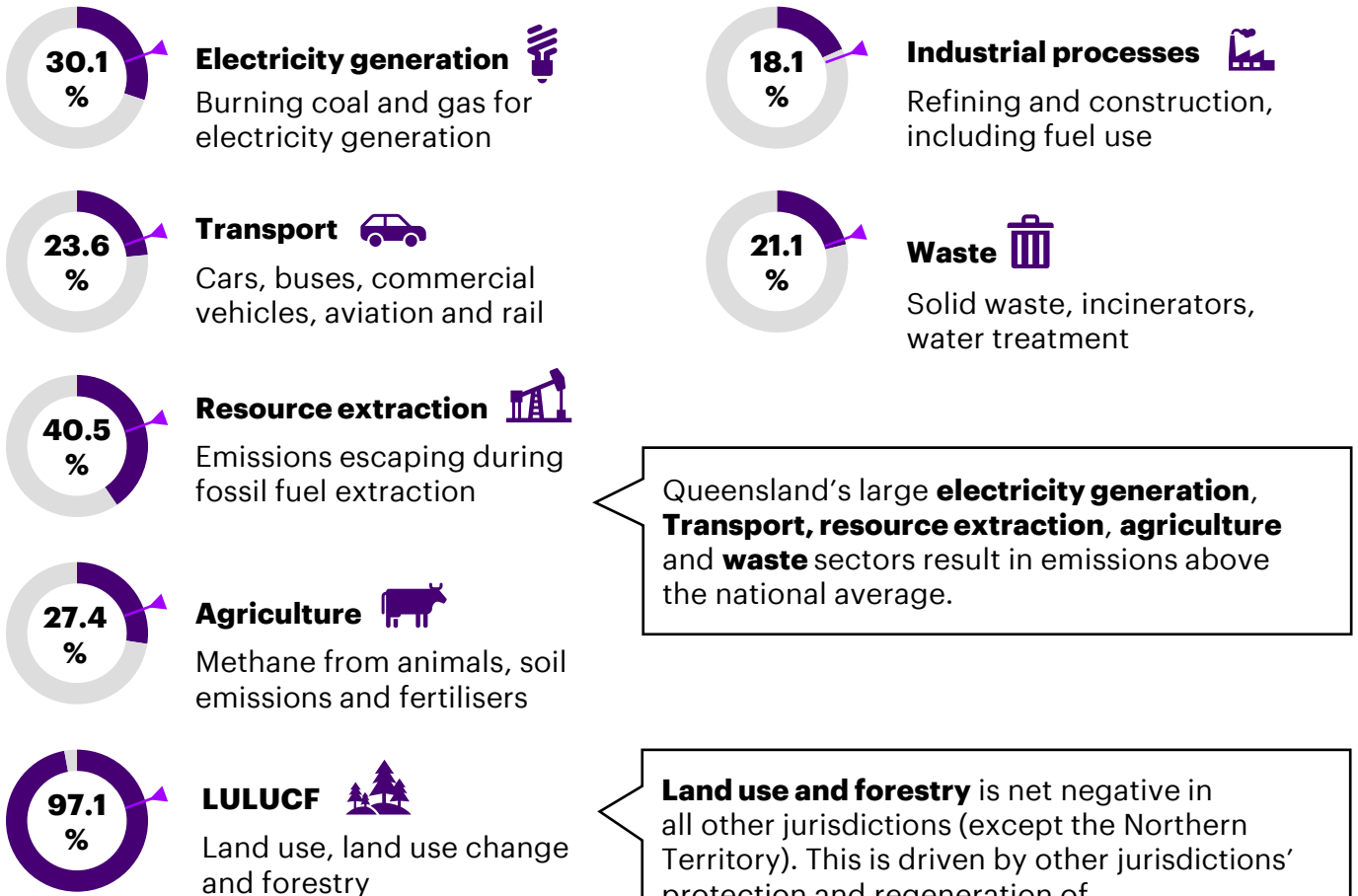
Although Queensland only has about 20% of Australia's population and produces roughly the same percentage of national GDP, it is the highest emitting jurisdiction in the country. Queensland accounts for around 32% of Australia's total C02-e emissions.

Between 2005 and 2018, the State experienced a 93% increase in total fugitive emissions, due to the growing production of coal and gas. Furthermore, 2018 saw Queensland become the largest contributor of agriculture emissions (28%) among all states and territories in Australia.

Modelling from ClimateWorks Australia indicates that if substantial action is not taken, Queensland's emissions could increase by 31% in 2050.

Figure 3: Queensland emissions as share of national total by sector

2020, % of Australia's emissions by sector; Queensland's approximate GDP and population (~ 20% share) is marked with



Source: Department of Industry, Science and Resources (2022), Accenture analysis

Source: Pathways To A Clean Growth Economy (2020); State Of The Environment (2020); Agriculture Sector Greenhouse Gas Emissions (2020); Queensland Climate Transition Strategy; Accenture analysis

Although 19% of Queensland's electricity comes from renewables, its electricity supply is highly reliant on coal, which creates risks

In 2021, Queensland's electricity generation consisted of a fuel mix of approximately 71% coal, 19% renewables, and 10% others such as gas and petroleum.

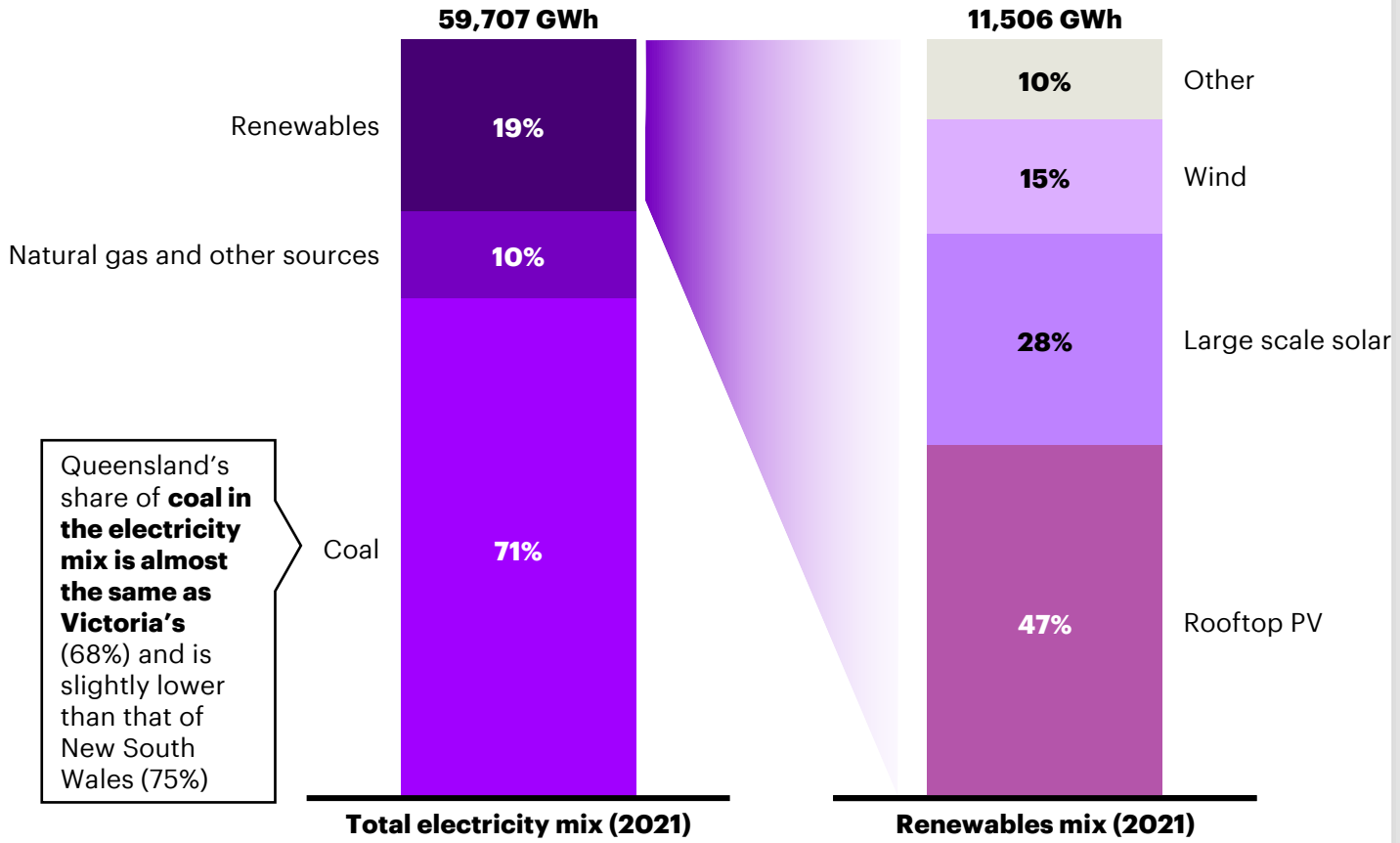
The share of renewables at 19% is around two-thirds of Australia's average of 28% and is the lowest among Australian states and territories. Victoria's share stands at 30%, the share for New South Wales is 21%, and South Australia leads other jurisdictions with 60% of its electricity from renewable sources.

In New South Wales and Victoria, coal also holds a majority share in the electricity mix – at ~75% for New South Wales and ~68% for Victoria - while having next to no presence in the fuel mixes of South Australia, Tasmania and the Northern Territory. Renewables represent 30% of Victoria's mix and 21% of the mix for New South Wales. 24% of Australia's renewable jobs are in Queensland, compared to 30% in New South Wales.

Figure 4: Current electricity mix in Queensland by generation

2021, Electricity generation (GWh per year)[1]

While Queensland sources 19% of electricity from renewables, South Australia sources ~60%, Victoria ~30% and New South Wales ~21%



Note: 1. Electricity generation from electricity on the open market, behind-the-meter is not included. Source: AEMO (2022), Queensland Government (2022), Clean Energy Council; Accenture analysis

Source: CBAM Update (2022); Energy.gov.au (2022); Resources and Energy Quarterly (2022); Parliament of Victoria; Clean Energy Council; Accenture analysis

Queensland has an opportunity to become a clean energy powerhouse

Compared to the rest of Australia, Queensland has a natural advantage with an abundance of solar and wind energy

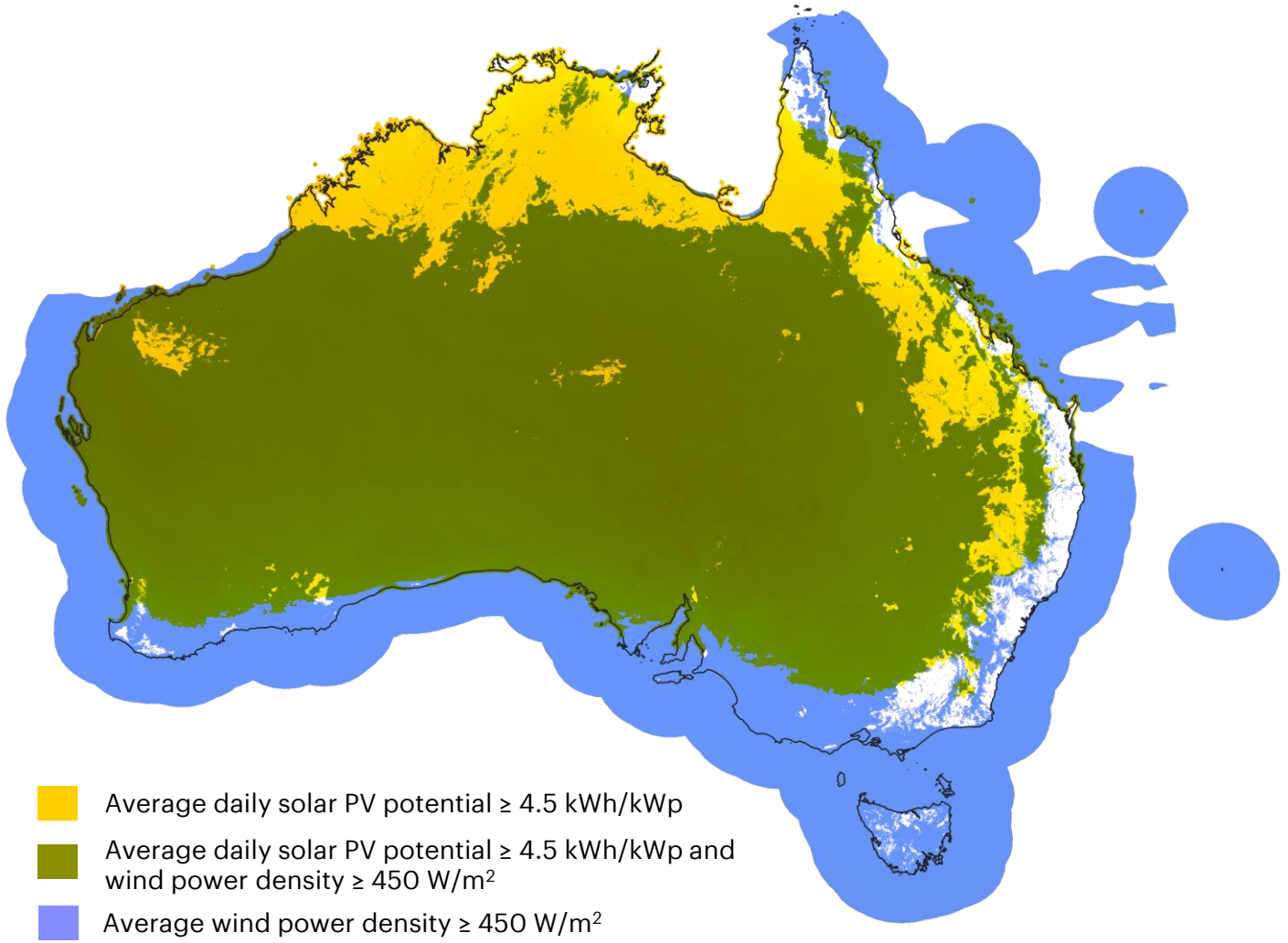
Queensland has an abundance of clean energy sources, primarily solar and wind, compared to other states and territories in Australia. The relative strength of clean energy sources in Queensland offers an opportunity to use these resources to reduce Queensland's own carbon emissions and create new low-carbon industries for long-lasting job creation.

Queensland residents are capitalising on the significant potential of solar energy. Queensland has the highest penetration of rooftop PV in Australia: 39.6% of households have solar, compared to an average uptake of 30% in Australia.

Small scale PV systems installed across the state collectively represent more than 4.45 GW of capacity. By Q3 2021, Queensland had installed over 19,000 rooftop solar PVs (the highest out of any State and Territory). One of Australia's largest wind farms, the 453 MW Coopers Gap wind farm, is also located in Queensland and came online in 2021.

Figure 5: High solar and wind power potential across Australia[1,2]

kWh/kWp, W/m2



Source: 1. Global Wind Atlas 2. Global Solar Atlas

Source: Solar Citizens (2020); Queensland Audit Office (2021); Solarquotes (2022), Australian Energy Council (2021); Clean Energy Council; Clean Energy Council; Accenture analysis

Queensland's Climate Action Plan sets a 30% emissions reduction target by 2030, but it is not aligned to the Paris Agreement's 1.5-degree goal

Queensland's climate targets are:
- 50% renewable energy target by 2030
- 30% emissions reduction below 2005 levels by 2030
- Zero net emissions by 2050.

In 2020, each Australian state and territory set a goal to achieve net zero emissions by 2050 or earlier. While these goals were developed without being aligned to Paris Agreement's 1.5-degree goal, they represent a key step in Australian climate policy.

Like other states, Queensland is not on track for a science-based emissions reduction pathway. New independent analysis has found that Queensland's cumulative emissions under current targets would reach 2.9 Gt CO_2-e by 2050 - almost triple the emissions budget available to limit the temperature rise to 1.5 degrees. Queensland's 2030 targets are much less ambitious than those of Victoria (45–50% from 2005 levels) and New South Wales (50% from 2005 levels). Victoria's Climate Change Act 2017 outlines five-yearly interim emission reduction targets, while New South Wales Climate Change Policy Framework aims to halve emissions by 2030 compared to 2005 levels. Unlike Victoria, ACT and South Australia, Queensland's emission targets are not underpinned by legislation.

As Australia's trading partners are regularly increasing the ambition of their climate targets, pressure will mount on Australian states and territories to commit to regularly ratchet up their targets. While few countries' targets are aligned to the Paris Agreement's 1.5-degree goal (the UK and Norway are notable exceptions), Australia and Queensland are a particularly long way away from a Paris-aligned target.

Source: Pathways To A Clean Growth Economy (2020); ClimateWorks (2021); Climate Analytics; Climate Resource; Accenture analysis

Figure 6: Renewable energy and emission reduction targets of Australian states and territories

States and territories	2030 renewable energy target	2030 emissions reduction target (2005 baseline*)	Net zero target	
			Legislated target	Year
Australia	-	43%	No	2050
South Australia	100%	50%	Yes****	2050
Victoria	50%	28-33% by 2025 45-50% by 2030**	Yes	2050
New South Wales	60%	50%	No	2050
Tasmania	100%	Net zero achieved in 2015	Yes	2030
ACT	100%***	50-60% by 2025 (1990 baseline) 65-75% by 2030 90-95% by 2040**	Yes	2045
Queensland	**50%**	**30%**	**No**	**2050**
Northern Territory	50%	Will set interim targets by mid-2022	No	2050
Western Australia	-	-	No	2050

*Note: *Unless stated otherwise **Interim targets are legislated ***Achieved in 2020 ****South Australia did not legislate a net zero target by 2050 but rather a 60% reduction by 2050 (1990 baseline)*
Source: ClimateWorks, Accenture analysis

Since 2017, Queensland has accelerated the transition to renewable energy – but the pace is still not fast enough

The main problem with Queensland's approach to climate policy is the lack of overarching strategy.

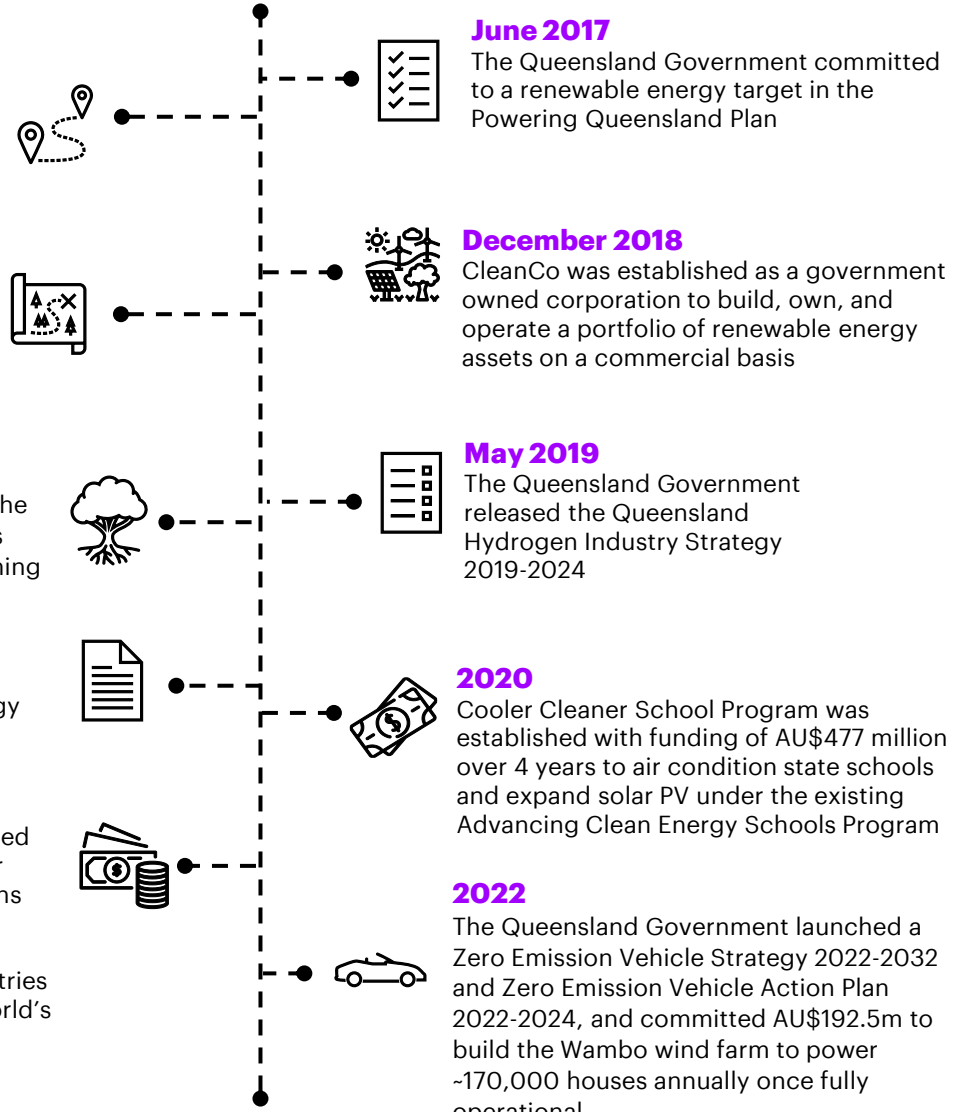
Queensland's climate policy has significantly evolved since 2017. Its ambition to build a renewables-powered future is supported by the establishment of CleanCo and other energy operators, as well as AU$145 million funding for REZs. With climate policy centered primarily around renewables development, the Queensland Government recently granted coordinated project status to a AU$4.7bn proposal to build a green hydrogen and ammonia plant in Gladstone (with the development led by Stanwell).

Queensland aims to move to 100% zero emission vehicles by 2036 through supporting the Electric Super Highway and providing an EV rebate for vehicles below a certain price point.

Queensland has little or no policy on reducing emissions from surface coal mine methane, land use and forestry, and methane emissions from cattle. Queensland does not provide a rebate or interest free loans for residential solar PV, unlike New South Wales and Victoria.

Source: Queensland Climate Action (2022); CleanCo (2022); CS Energy (2022); Accenture analysis

Figure 7: Key events in Queensland's transition to renewable energy since 2017



Source: Queensland Audit Office; Accenture analysis

A package of policies could reduce emissions by ~50% by 2030 and create a ~87,000-person workforce

Three key focus areas can radically reduce Queensland's emissions and create thousands of new jobs

Repower Queensland with clean energy
Decarbonise the electricity sector, the largest source of emissions, and create the backbone for a clean and sustainable economy

Lay the foundation for a gigaton-scale land carbon industry
Reverse emissions from land clearing and create an industry that protects biodiversity and delivers other co-benefits

Accelerate clean exports
Develop new clean energy export industries in hydrogen, batteries, and low-methane beef, and reduce methane emissions from coal mines, creating thousands of new jobs

Creating a greener, cleaner and more resilient Queensland

Source: Accenture analysis

Policy action across three focus areas could support a ~87,000-person workforce and reduce 2020 CO_2-e emissions by ~50% and 2005 emissions by ~60%[1]

Eight policies across three areas could put Queensland on the right track for developing a green, clean and resilient economy of the future where renewables are abundant and reliable, land carbon is a new vibrant industry, and exports are protected from carbon tariffs.

1. To **repower Queensland with clean energy,** the Queensland Government needs to develop 25 GW of renewable capacity, along with 5 GW both short- and long-term duration storage, as well as continuing to advance Queensland's status as the country's leader in the residential PV space. Additional energy efficiency measures should also be considered, along with PV installation. This suite of policies will require a cumulative investment of ~AU$80bn, with AU$21.5bn of this investment coming from the Queensland Government. These policies will create a ~53,000-person workforce by 2030.

2. To **lay the foundation of a carbon industry,** the Queensland Government needs to help connect demand for carbon offsets with a supply of good quality and high transparency projects, helping to catalyse a new commercial industry that will reduce emissions. This policy could potentially create a ~10,000-person workforce and will require ~AU$1bn in overall investment, with 50% of that contributed by the Queensland Government by 2030.

3. To **accelerate clean exports industry development,** the Queensland Government needs to underwrite hydrogen and battery manufacturing capacity, due to their high upfront costs that tend to deter market participants. The Queensland Government also needs to address the issues of coal mine methane leakage and methane emissions attributed to cattle, which are affecting Queensland's clean beef export potential. Combined, these policies will create a ~24,000-person workforce and require ~AU$5bn in investment, less than AU$2bn of which will be public.

Note: 1. 60% figure (reduction to 79 Mt from 2005's 197Mt) covers actions taken since the 2005 baseline to 2020 (reduction of 38Mt) and the policies in this report (reduction of 80Mt).
Source: Department of Industry, Science and Resources (2022), Accenture analysis

Figure 8: Eight recommended policies and their contribution to emissions reduction and job creation

	Policy	Queensland Government investment, AU$	Private investment, AU$	Emissions, CO_2-e	Workforce
Repower Queensland with clean energy	1. Build 25 GW of new renewable capacity by 2030	~15bn	~45bn	~60 Mt	~27,000
	2. Build 5 GW of storage and gradually phase out coal power	~3bn	~8bn		~11,000
	3. Accelerate rooftop solar and battery installations as well as consider electrifying gas connections	~3.5bn	~5.5bn		~15,000
Lay the foundation of a carbon industry	4. Reset the Land Restoration Fund to kick start a land carbon market that protects and restores 100m ha of forest and woodland	~0.5bn	~0.5bn	~15 Mt	~10,000
Accelerate clean exports industry development	5. Underwrite 6 GW of green hydrogen	~0.5bn	~1.5bn	Up to 32 Mt*	~20,000
	6. Set up a battery manufacturing fund and underwrite capacity	~0.5bn	~1.5bn	-	~3,000
	7. Tighten coal mine methane regulation	~0.5bn	~0.5bn	~5 Mt	~1,000
	8. Explore policies to curb methane from cattle**	-	-	-	-
Total		~23.5bn	~62.5bn	~80Mt	87,000

Note: *Emissions reduction includes hydrogen consumed in domestic and international markets, and the exact number of Mt will depend on which industry is using hydrogen to abate emissions. Emissions abatement from this policy is not included in the total emission reduction in this report.
**See subsequent slides on cattle methane management for more detail

Eight recommended policies could reduce emissions by ~50% by 2030, in addition to the contribution of hydrogen used in Queensland

Even though population and industrial production in Queensland increased between 2005 and 2020, the State has achieved a 19% emission reduction on 2005 levels by 2020.

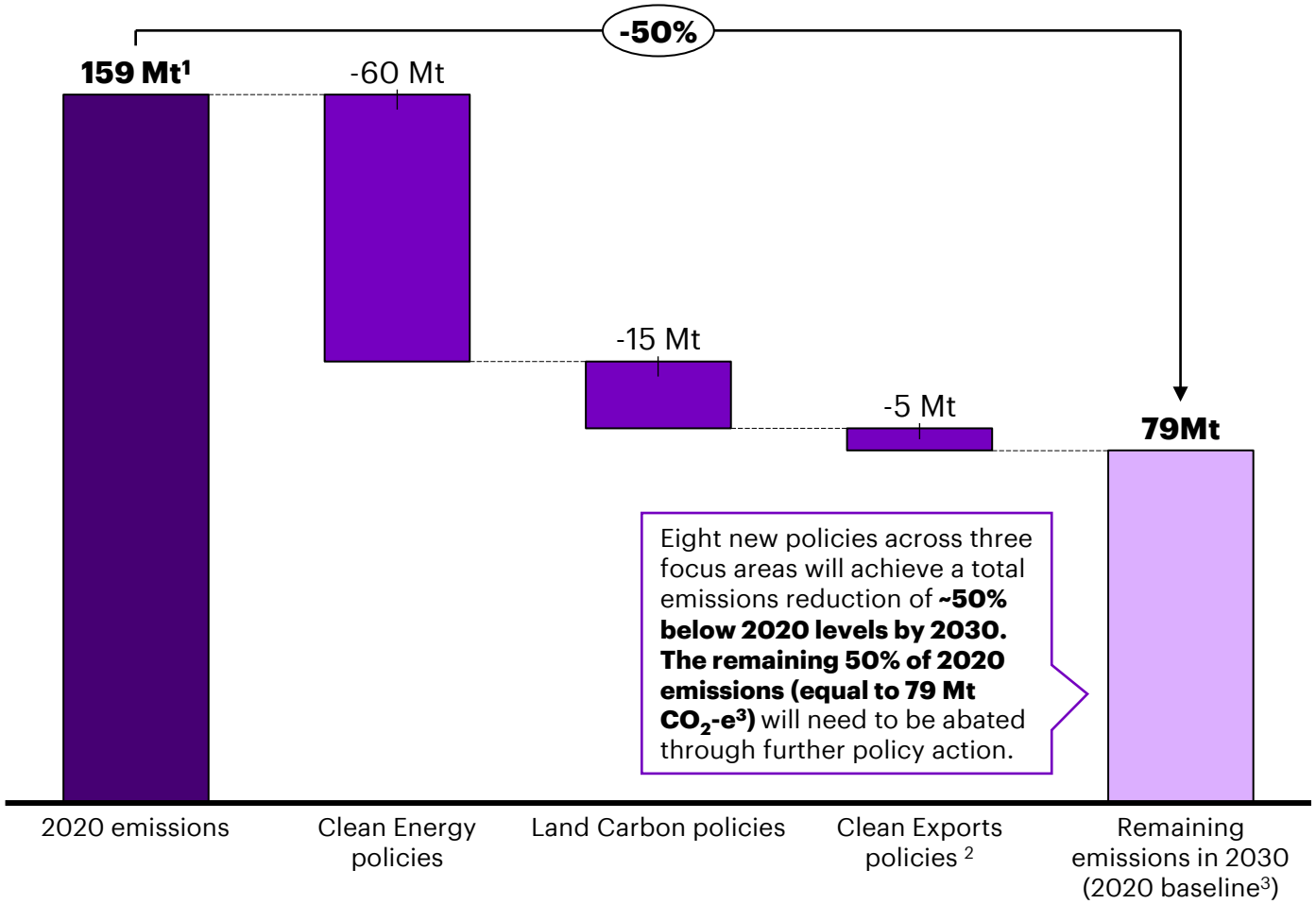
Eight recommended policies have the potential to further reduce Queensland's emissions by 50% by 2030, compared to 2020 levels. The biggest reduction of 60 Mt CO_2-e will be delivered by a package of three clean energy policies: building renewable capacity, building renewable storage and gradually phasing out coal-fired power, and further cementing Queensland's position as the leader in residential solar energy.

The seven years of land carbon projects already underway by 2030 will sequester 170-190 Mt CO_2-e over their lifetimes – 15 Mt CO_2-e of which will occur in 2030. As these existing projects mature and new projects commence, the annual rate will grow to ~29 Mt CO_2-e per year. Emissions reduction stemming from a package of clean exports policies will contribute to an estimated additional reduction of ~5 Mt CO_2-e, not counting the abatement potential of the hydrogen and cattle methane policies (see a note under Figure 9 and subsequent slides for more detail).

Together, the eight suggested policies will leave 79 Mt CO_2-e to be abated by 2030 through further policy action.

Figure 9: Emissions reduction from recommended policies

Mt CO_2-e



Note: 1. Queensland's emissions fell by 38 Mt from 2005 to 2020. 2. Hydrogen and cattle methane policies' contribution is not included in the total emission reduction potential of this policy package. Hydrogen abatement will occur both in Australia and overseas (depending on the volumes exported and consumed domestically). The exact number of Mt abated will also depend on the industry use case and the resulting efficiency of hydrogen as a low carbon source of energy. 3. For the purposes of emission reduction modelling, it is assumed that the emissions are otherwise unchanged across the 2020-2030 timeframe
Source: Department of Industry, Science and Resources (2022), Accenture analysis

Source: Department of Industry, Science and Resources (2022), Queensland Department of Science, Information Technology, Innovation and the Arts (2014); Queensland Dept. of Environment and Heritage Protection (2017); Carbon Market Institute (2022); Accenture analysis

If implemented, these policies could support a workforce of ~87,000 people, including ~31,000 direct jobs in sustainable industries

The eight proposed policies aim to create jobs and provide economic opportunity across a wide range of occupations. The policies will create a workforce of 87,000 people in clean industries – ~31,000 workers will be directly employed in these industries, and these industries will support an indirect workforce of 56,000 people.

Most direct jobs will be created in construction (e.g., construction workers, electricians) and operations (e.g., maintenance engineers, operational managers). Indirect jobs will be created all along the specific supply chains in every sector and will include transporters, processors, researchers, etc.

By 2030, the workforce in operating renewables will be 29% larger than the current domestic coal workforce. Currently, approximately 3,500 people work in coal power generation and coal mining (for domestic use) in Queensland. A workforce of approximately 4,500 people will be needed to operate renewables by 2030. This means over 1,000 more people in the workforce, which is 29% more than those currently working in domestic coal operating jobs. Making this shift will require investment in renewal and rejuvenation funds for coal communities to ensure a supported adaptation for workers and communities and will require investment in skills and training for a new wave of clean economy workers in solid, permanent jobs.

Figure 10: Direct and indirect job creation effect of the eight recommended policies

Size of direct and indirect workforce (2030)

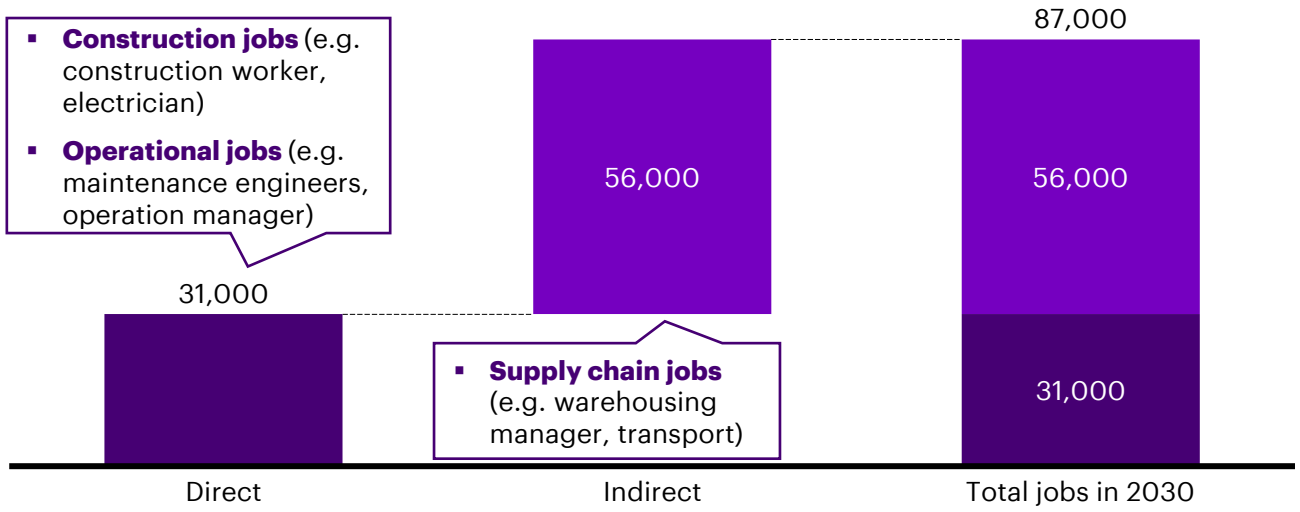
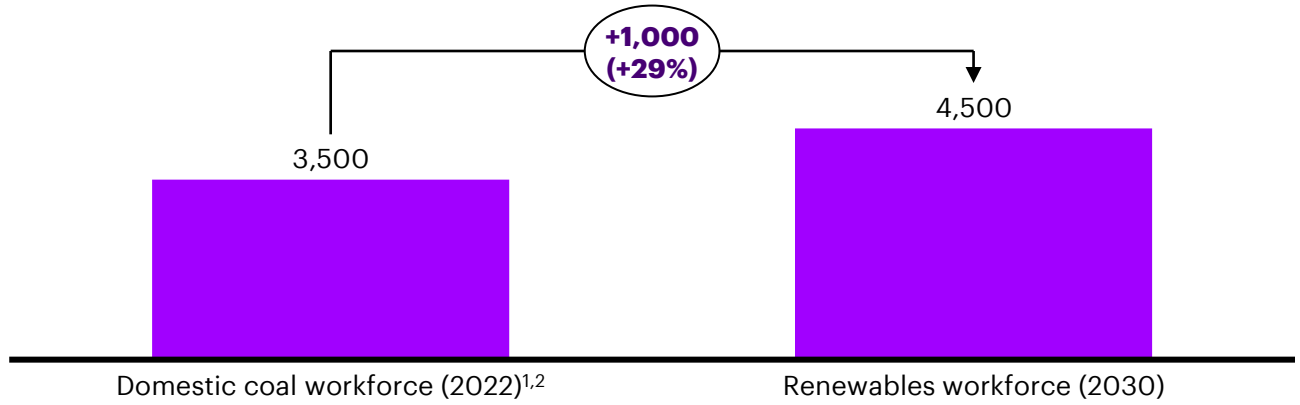


Figure 11: Current domestic coal and 2030 renewable workforce comparison

Direct operating workforce of Qld (2022, 2030)



Note: 1. Domestic coal jobs include power generation and coal mining jobs in Queensland 2. 3,500 people is the size of direct workforce in 2022
Source: UTS (2020), ABS labour force data (2022), Accenture analysis

Source: Accenture analysis

About one third of all newly created jobs will be direct, and almost 60% of those are likely to be in regional and rural areas

Eight policies will support a direct workforce of 31,100 people, including operational and construction jobs. Of these jobs, 18,000, or almost 6 in 10 new jobs, will be located in regional and rural areas.

The policies support large job creation in Queensland Renewable Energy Zones (REZs). Building and operating utility-scale renewable energy will support a 5,300-person workforce, likely around existing REZs, metropolitan areas, and the Borumba Dam.

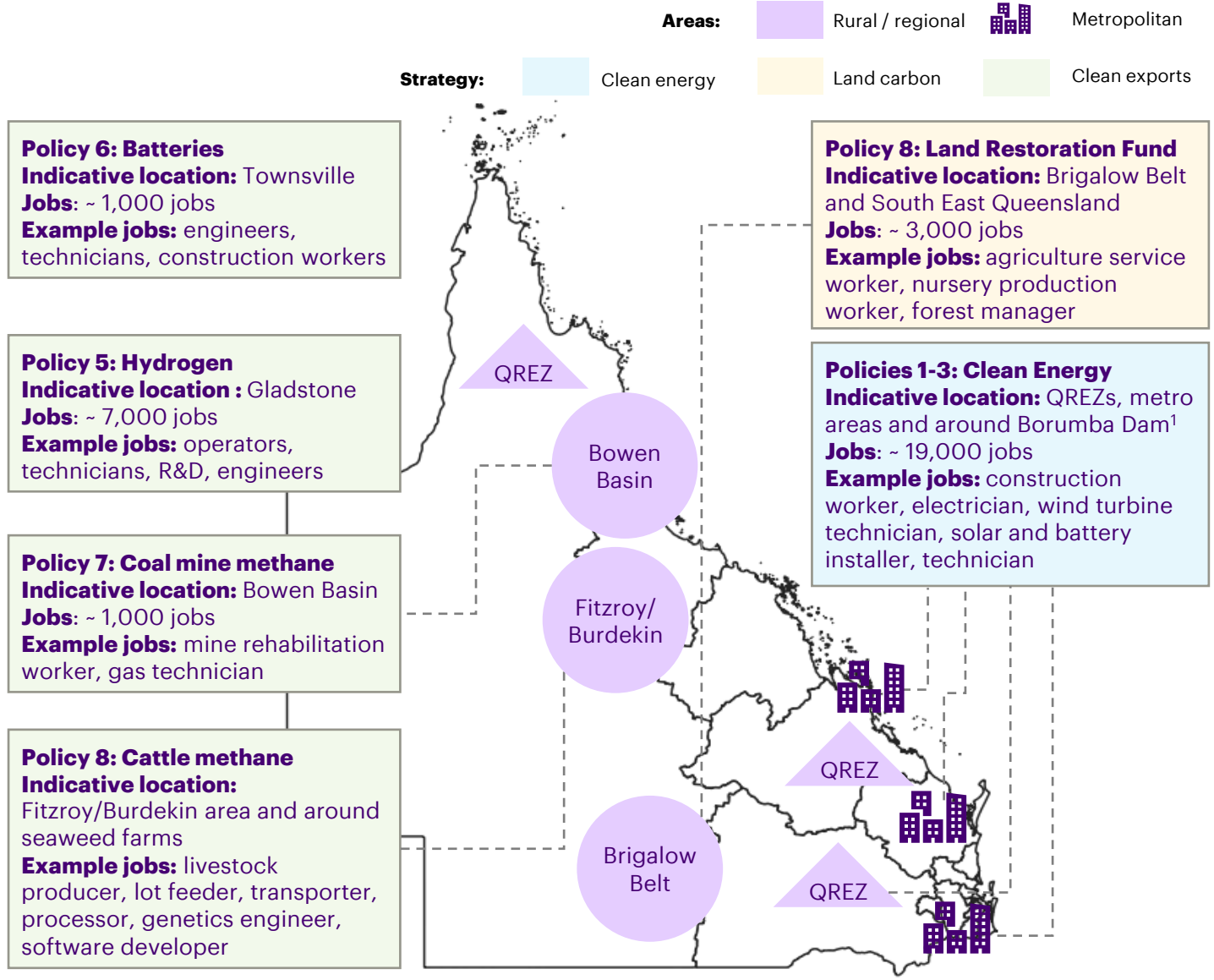
Job creation in other rural areas will be driven by reforestation efforts in Southeast Queensland and the Brigalow Belt. Coal mine methane capturing and abatement, including pre-drainage, will support jobs in the Bowen Basin and other mining-intensive areas of Queensland. Efforts to reduce methane from cattle farming are likely to mainly create jobs in the Fitzroy and Burdekin area, where most of Queensland's cattle is located, as well as around future seaweed farming locations.

Direct job creation in the metropolitan areas, (such as Brisbane, Gold Coast and Sunshine Coast), will be driven by large-scale installation of residential solar PV and residential battery storage, as well as energy efficiency improvements in households.

The clean energy industries (hydrogen and battery manufacturing) could together support over 8,000 direct jobs, likely located around existing industrial areas, such as Gladstone or Townsville.

Source: Accenture analysis

Figure 11: Indicative distribution of newly created direct jobs in Queensland



Note: 1. There is clear potential for jobs in pumped hydro (particularly Borumba Dam), but the extent of the potential is likely to be confirmed through forthcoming feasibility studies.

Our proposed policy package is aligned to AEMO's Hydrogen Superpower Scenario, which sees no coal fired power in Queensland by 2030

Effective decarbonisation requires the proliferation of renewables and eventual electrification of the entire system. This includes three components:

1. Rapid uptake of renewables

Queensland currently has 20 GW of installed capacity, 10 GW of which is renewable (including rooftop PV). The rapid uptake of an additional 25 GW of renewables delivers the 91 TWh demand of an electrified Queensland economy in 2030 with intermittent backup from gas peaking.[1]

2. Transmission and storage infrastructure building

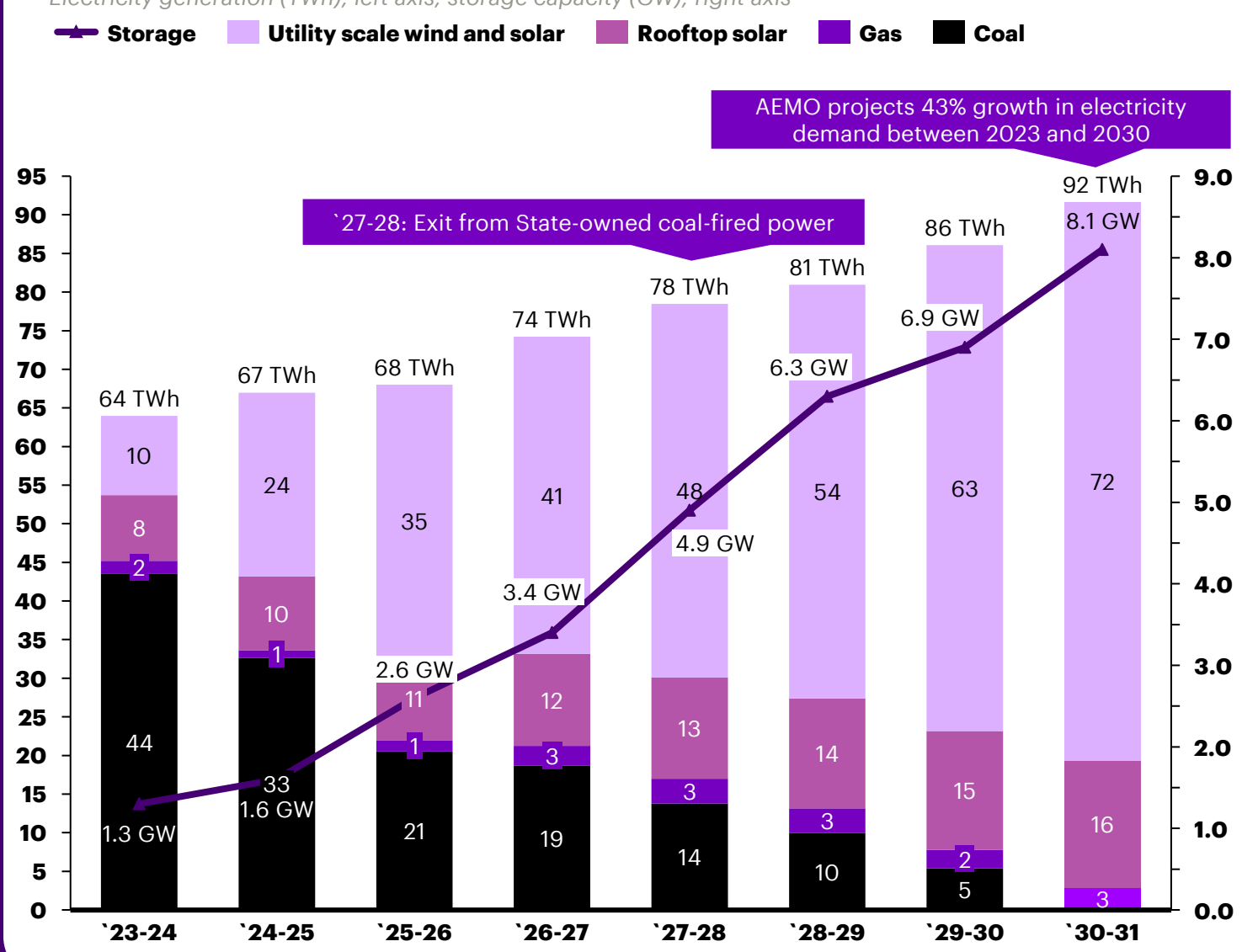
7 GW of storage infrastructure underpins the renewable projects and is built out alongside the rollout of the renewable utilities.

3. Well-planned phase out of coal

The eight coal-fired power stations would exit the market by 2030, with state-owned plants exiting early based on life expectancy and emissions intensity. In the AEMO roadmap Kogan Creek (CS Energy), Callide B (CS Energy) and Tarong (Stanwell) will all close in 2025-26.

Figure 12: Renewables meet an increasing share of growing demand, as coal exits in 2030

Electricity generation (TWh), left axis; storage capacity (GW), right axis



Source: *AEMO Integrated System Plan (2022 – inputs and assumptions workbook); Accenture analysis*

Source: 1. 43% electricity demand growth rate, compared to 2023. AEMO Integrated System Plan (2022 – inputs and assumptions workbook); Australian PV Institute Solar Map (2022); Accenture analysis

Methodology: Policy opportunities were chosen based on existing policy best practice and expert input

Step 1: A longlist of ~50 policy options was identified based on a review of current proposals from Australia and around the world. This includes the European Green Deal, the UK Government's recently announced £3 billion 'Plan for Jobs 2020', and proposals from stakeholders.

Step 2: Selection criteria were identified based on policy research and stakeholder consultations. To be effective, policies should be high-impact and feasible. Impact criteria include economic opportunity and emission reduction, while feasibility encompasses political and operational feasibility.

Step 3: The longlist was evaluated against the criteria and adapted in accordance with AEMO ISP Hydrogen Superpower scenario to select a shortlist of 8 policy opportunities. The 8 policies highlighted in this report reflect an ambition and general modelling done by AEMO. These policies create an opportunity for Queensland to create a green and profitable economy and benefit from the renewables transition. However, it is recognised that these are just some of the many possible measures to support a transition to a zero-emissions economy, and that regular review of these policies will be required in order to avoid 'last mile' delivery problems.

Step 4: Model investment, job creation and emission reduction. Modelling was done for the direct construction and operational workforce, and the indirect workforce, as well as projected emission reduction from each policy based on project capacity and size of required investment, using inputs from scientific studies, case studies and economic statistical data.

Source: Accenture analysis

Figure 13: Process overview

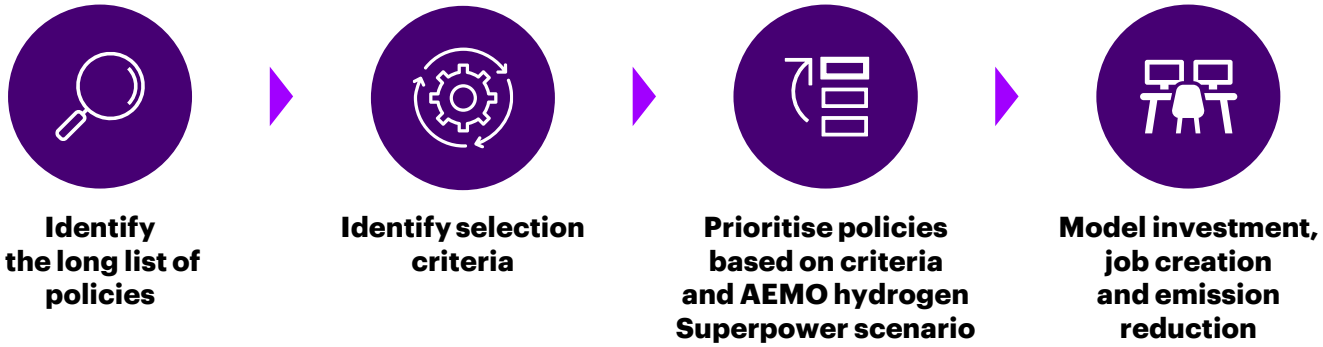


Figure 15: Prioritisation criteria

Impact	**Economic opportunity**	▪ Number and type of jobs created ▪ Private investment scale ▪ Other flow-on economic and social benefits, including regional benefits and just transition
	Emission reduction	▪ Direct reduced emissions ▪ Indirect reduced emissions
Feasibility	**Political feasibility**	▪ Acceptability of the policy by decision makers, the industry and the public
	Operational feasibility	▪ Required State investment ▪ Level of access to capabilities and skills ▪ Scale of adjustment and planning that might be required

Appendix I: Detailed policy profiles

Repower Queensland with clean energy

1. Power Queensland with low-cost clean energy

Power Queensland with low-cost clean energy

Policy:

- **Via CleanCo, Stanwell, CS Energy and Powerlink, build 25 GW of new utility-scale capacity by 2030 through a coordinated Renewable Energy Zone framework, and accelerate investment in transmission networks.**

Rationale:

- Developing 25 GW of utility-scale solar and wind will supply Queensland with low-cost electricity, enabling electrification of industries and transport, and gradual phase out of coal-fired power.
- Leveraging the Renewable Energy Zone framework will provide essential infrastructure to meet the future increase in electricity demand and will improve the efficiency of rollout by reducing the infrastructure needed to connect new renewables to the grid.
- Investing in transmission networks will increase the capacity of the network and will future proof the grid against various types of instability.

Current policy:

- Queensland has a 50% renewable energy target by 2030. Queensland is currently developing three REZs in Northern, Central and Southern parts of the State.
- Aligning renewable development with the Hydrogen Superpower scenario is a no-regrets, albeit an ambitious, option.
- Current renewable capacity in the State is 3 GW (1 GW of wind and 2 GW of utility scale solar). Building new renewable electricity generation capacity consistent with the Hydrogen Superpower scenario will require 15 GW of wind and 13 GW of utility-scale solar in 2030.
- Choosing this pathway gives Queensland a chance to develop a suite of clean industries, create many jobs, successfully decarbonise electricity – the largest contributor to the State's emissions – and become a clean export superpower.

Note: *Estimated emission reduction from the first three policies combined
Source: AEMO Integrated System Plan (2022); Queensland Department of Energy and Public Works (2022); Accenture analysis

Queensland's renewable development would present the biggest job creation opportunity – and will help build the economy of the future

CO_2-e emissions reduction

60 Mt*

in 2030- a 96% reduction of 2020 electricity sector emissions (together with two other policies in the 'Repower Queensland with clean energy' section)

Investment needed

AU$60bn

by 2030- Queensland Government action could catalyse AU$60bn of investment from public and private sources

Operational jobs

8,000

by 2030- these are permanent jobs in renewables operations and supporting jobs in the value chain

Construction jobs

19,000

on average, across the 2024-2030 construction phase

Developing utility-scale clean electricity will be feasible in Queensland; other Australian jurisdictions have successfully taken similar approaches

Developing utility-scale clean electricity will be feasible in Queensland

Feasibility	Description
Project supply	▪ New South Wales's REZs attracted proposals for projects with **a combined capacity of 95 GW,** showing great interest from developers. ▪ According to AEMO Project Tracker, there are currently **23 GW of renewable projects proposed in Queensland**, therefore attracting 25 GW of projects by 2030 for its REZs would be feasible.
Availability of capital	▪ Queensland Government could catalyse **AU$60b of public and private funding.** ▪ New South Wales REZs recently attracted projects worth AU$100b, suggesting significant capital available from private parties.
Skilled workers	▪ The pipeline of large-scale renewable projects will **require a standing construction workforce of 19,000 people** and could support a range of other occupations, including coal workers. ▪ **Workforce shortages are expected** due to the high volume of new projects. ▪ Coordinated efforts should focus on **re-training and upskilling of coal workers (e.g., through VET) and preparing a new generation of workers through TAFE.**
Community acceptance	▪ Although renewables are becoming more and more broadly accepted, large scale renewable projects **could face community resistance**, **due to impacts on habitats and endangered species,** visibility of the structures, and other consequences. ▪ Government should **facilitate the dialogue between the communities and the industry** to collectively consider the impact of transmission infrastructure on farmers, as well as various other impacts, including habitats, endangered species, and other parts of the ecosystem.

Other Australian states are supporting renewable development in REZs

Jurisdiction	Description
Victoria 	▪ The Victorian Government announced a **AU$1.6 billion clean energy package, including AU$540 million to establish six REZs.** The REZs aim to facilitate the development of **10 GW of renewable energy capacity.** ▪ The Victorian Government launched a second renewable energy auction (VRET2) in 2022 to bring online at least 600 MW of capacity, **taking the total capacity across Victorian REZs to 16 GW.** ▪ Victoria currently leads other jurisdictions in renewable energy jobs, accounting for 7,800 jobs in 2020, or **30% of total jobs in the renewables sector in Australia,** and will further expand this towards 2030.
New South Wales 	▪ The New South Wales Government has committed to **develop five REZs,** beginning with a pilot Central-West Orana REZ, before four additional zones are added. ▪ The 2021-22 **New South Wales Budget allocated a total of AU$380 million** to deliver the roadmap, including AU$164 million over four years for capital works. ▪ The New South Wales Government estimates that **investment in REZs can grow to AU$21 billion.** ▪ The New South Wales Government revealed that it had received interest from **24 solar projects, 13 onshore and 7 offshore wind projects for the Hunter and Central REZ – with the combined generation capacity of 40 GW**. This was joined by eight pumped hydro energy storage projects and proposals for 35 utility-scale batteries.

Source: NEM (2022); Roddis (2018), Clean Energy Council (2018); Victorian Government (2021); New South Wales Government (2022); Accenture analysis

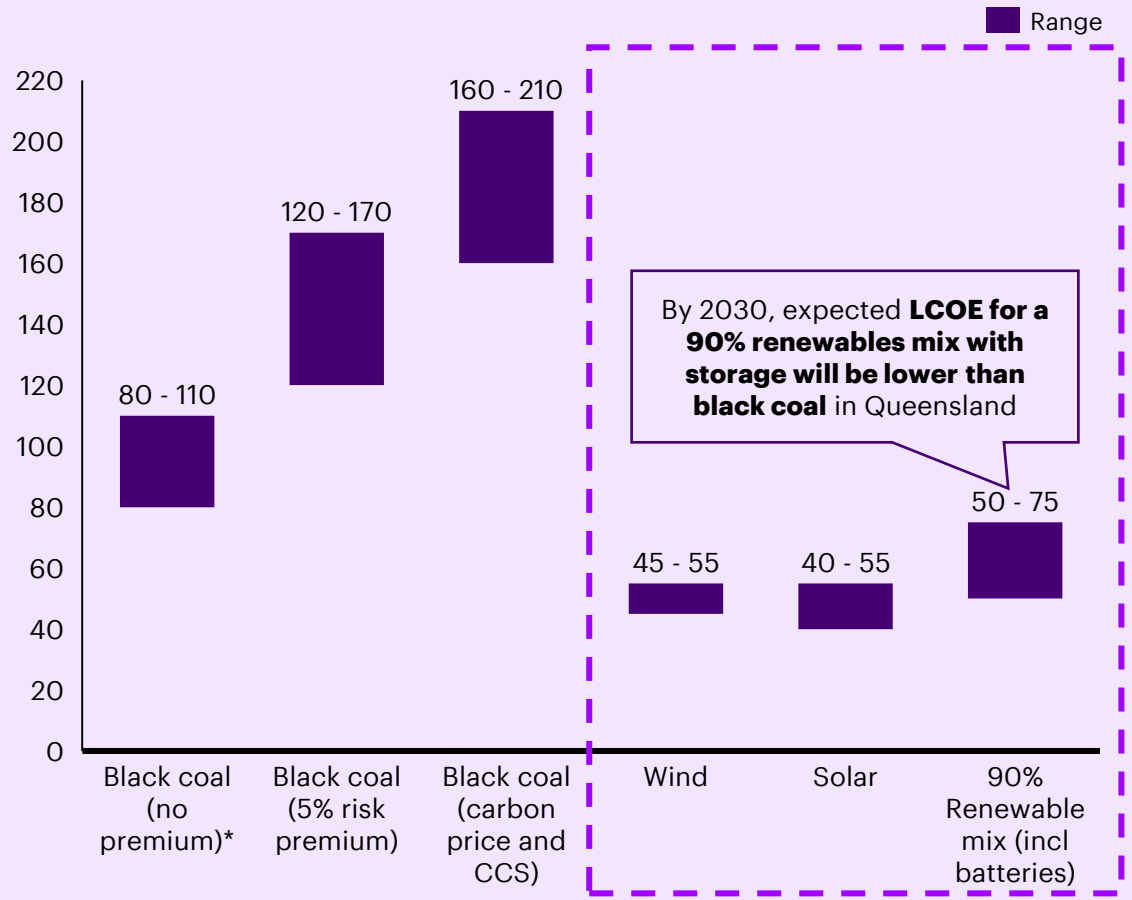
Repowering Queensland with clean energy could reduce electricity prices, and could have a greater contribution to decreasing overall emissions than any other policy

Development of renewables reduces exposure to commodity price volatility and significantly cuts emissions from electricity

Impact	Description
Economic	▪ Renewable energy supply could **lower energy costs** for Queensland. Costs for electricity generated by renewables have significantly decreased in the last 10 years and are expected to further reduce in 2030. ▪ Increased use of local renewable electricity **reduces the exposure of electricity prices to global fossil fuel price volatility.** ▪ Required public investment of ~AU$15b could attract ~AU$45b in private investment. **An extra AU$3 of co-financing could be unlocked for every dollar of public funding.** ▪ The creation of a 19,000-person renewable construction workforce – modelling suggests that **3 in 4 jobs would be regional jobs**, supporting local communities. ▪ The creation of an 8,000-person renewable operational workforce – employing **approximately 30% more people in renewables than currently in domestic coal**.
Environmental	▪ Renewable development could reduce **93% of Queensland's emissions from electricity generation**, equivalent to over a third of Queensland's emissions. ▪ Renewable energy is the strongest enabler for **decarbonisation of industries and transport sector**, including green hydrogen, clean aluminium, steel, cement, and many other industries.

Electricity from renewables will likely be cheaper to generate than black coal in 2030

LCOE[1], AU$ (in 2020-21 Dollars) per megawatt hour, projected 2030



Note: Levelised cost of electricity (LCOE) is defined as the price at which the generated electricity should be sold for the system to break even at the end of its lifetime, *No premium was applied here.
Source: UTS (2020); CSIRO (2020) 'GenCosts'; Accenture analysis

2. Invest in energy storage to help Queensland move away from coal-fired power generation

Invest in energy storage to help Queensland move away from coal-fired power generation

Policy:

- **Rapidly scale up 2 GW of large-scale battery and 3 GW of long duration (pumped hydro) storage in order to replace 100% of energy generation with renewable energy and gradually phase out coal-fired power stations by 2030, under a local Transition and Resilience Plan that ensures a just and inclusive transition for the community.**

Rationale:

- Moving away from coal fired power must go hand in hand not only with the development of installed renewable capacity but also with securing sufficient storage capacity to ensure Queensland's energy security in peak hours.
- A combination of short duration storage (primarily lithium-ion batteries) batteries and long-duration energy storage (LDES) (such as pumped hydro) is required in the long-term to ensure grid stability and adequate energy supply.

Current policy:

- Queensland has little grid scale storage, with the State's biggest battery at Wandoan with 100 MW/150 MWh only recently beginning operations. Queensland's two hydro generators are the 88 MW Kareeya and the 66MW Barron Gorge, both operated by Stanwell. The 500MW Wivenhoe pumped hydro storage station is operated by CleanCo.
- Building renewable storage capacity is consistent with Hydrogen Superpower scenario – 5 GW of utility-scale storage infrastructure** is built out alongside the rollout of the renewable utilities.
- The AEMO Hydrogen Superpower scenario calls for no new construction of pumped hydro by 2030, in addition to the already installed storage capacity of 500 MW.
- The eight coal fired power stations would exit the market by 2030 with State-owned plants exiting early based on life expectancy and emissions intensity. Closures/mothballing would occur according to a schedule and in accordance with specific transition and resilience plans.
- The AEMO Hydrogen Superpower scenario also sees no new coal fired or gas power in Queensland in 2030.

Note: *Estimated emission reduction from the first three policies combined. **The 5 GW is an approximate sum of AEMO's ~4 GW of 'utility-scale storage', 1,6GW of 'coordinated DER storage' minus ~500 MW of utility battery capacity Queensland already has in the pipeline. Source: AEMO Integrated System Plan (2022); Renew Economy; Accenture analysis

Emission reduction of 60 Mt * and support for 7,000 workforce

CO_2-e emissions reduction

***60 Mt**

(together with two other policies in the 'Repower Queensland with clean energy' section)

Investment needed

AU$11bn

by 2030- ~AU$3b in public investment, which could attract ~AU$8b in private investment

Operational jobs

1,000

by 2030- these are permanent jobs in storage operation and supporting jobs in the value chain

Construction jobs

10,000

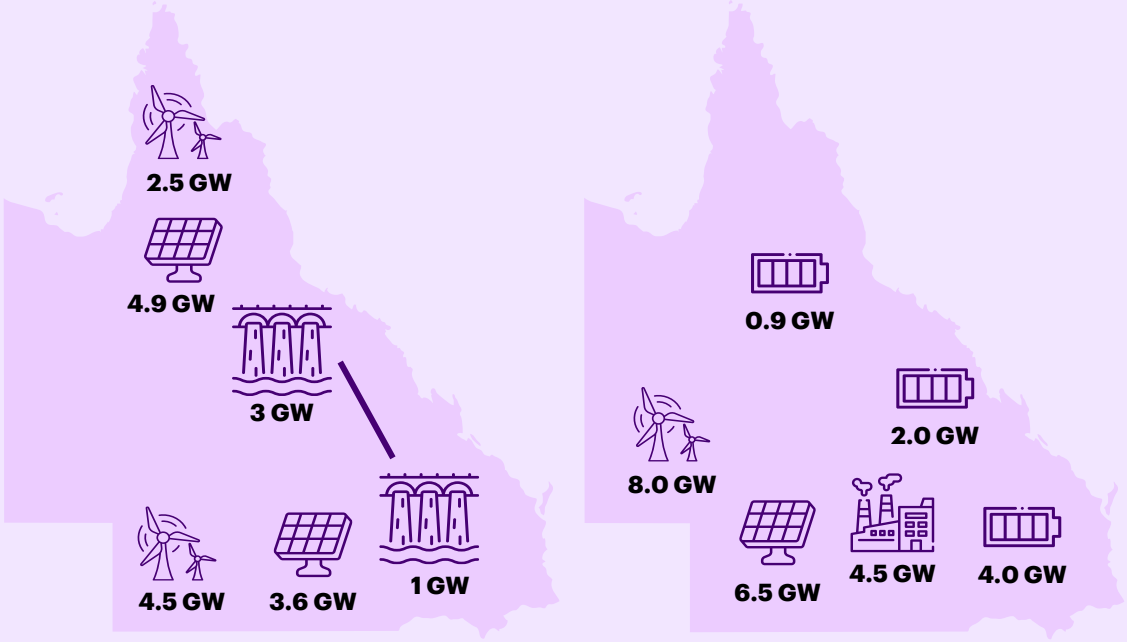
on average, across the 2024-2030 construction phase

Creating a balanced mix of short- and long-duration storage options makes it feasible for Queensland to move away from coal fired power

Long-duration storage such as pumped hydro has high upfront capital costs and takes time to deploy, but complements batteries

Feasibility	Description
Inadequate market arrangements and levels of investment in storage	▪ The optimal mix of energy storage includes both **rapid response, short-term batteries and long-duration storage options**, such as pumped hydro. Market arrangements do not currently recognise the full value of storage and are therefore not delivering sufficient levels of private investment in either. This risks delaying the phase out of coal fired power in Queensland. ▪ **AU$11 billion is the approximate total investment required between 2024 and 2030** for the short-term, large-scale battery storage, out of which AU$3 billion will be public investment. LDES investment has not been estimated in this report but according to McKinsey, 1TWh of LDES requires **a cumulative CAPEX investment of ~$US50bn**.
Feasibility of pumped hydro as a LDES option*	▪ Pumped hydro has **very low cost of storage, and once built could hold massive amounts of energy** compared to even the world's biggest battery. **However, construction may take up to 10 years and has very high upfront CAPEX, along with serious environmental concerns.** ▪ Significant long-term storage **of at least 24 hours duration** will be a critical part of managing the intermittent nature of the rapidly increasing variable renewable energy generation. ▪ With AU$22 million committed for detailed analytical studies, Queensland Government is investigating a **potential pumped hydro energy storage facility at Borumba Dam (24,000 MWh).** The feasibility study and business case are due in late 2023.
Poorly implemented transition and resilience plans for exiting coal in affected communities	▪ Along with storage development supporting renewables uptake, a solid Transition and Resilience Strategy to exit coal needs to be developed. ▪ **The Strategy needs to include a State Transition Authority and a Transition Fund** – arrangements ideally made in cooperation with the Commonwealth Government and other states and territories. ▪ **Gas and coal affected communities have been pushing for the process to be properly implemented and balanced** between Commonwealth and State regulations and local and regional processes.

Powerlink identified two broad development pathways for how Queensland transmission network could evolve for a low carbon future: one with the emphasis on pumped hydro, the other on batteries



Pathway 1 – Development of significant pumped hydro in southern and northern Queensland, complemented by large-scale solar PV. This pathway is the optimal, least cost option, across a number of sensitivities

Pathway 2 – Development of batteries concentrated around loads in southern Queensland, complemented with additional gas generation

Following pathway No. 2 where gas still plays a role might be problematic - using a combination of batteries and pumped hydro is a more flexible and reliable option for Queensland

Note: *required investment and job creation from building pumped hydro storage has not been estimated in this report.
Source: Powerlink; Powerlink; ARENA; Clean Energy Council; McKinsey; The Next Economy; Accenture analysis

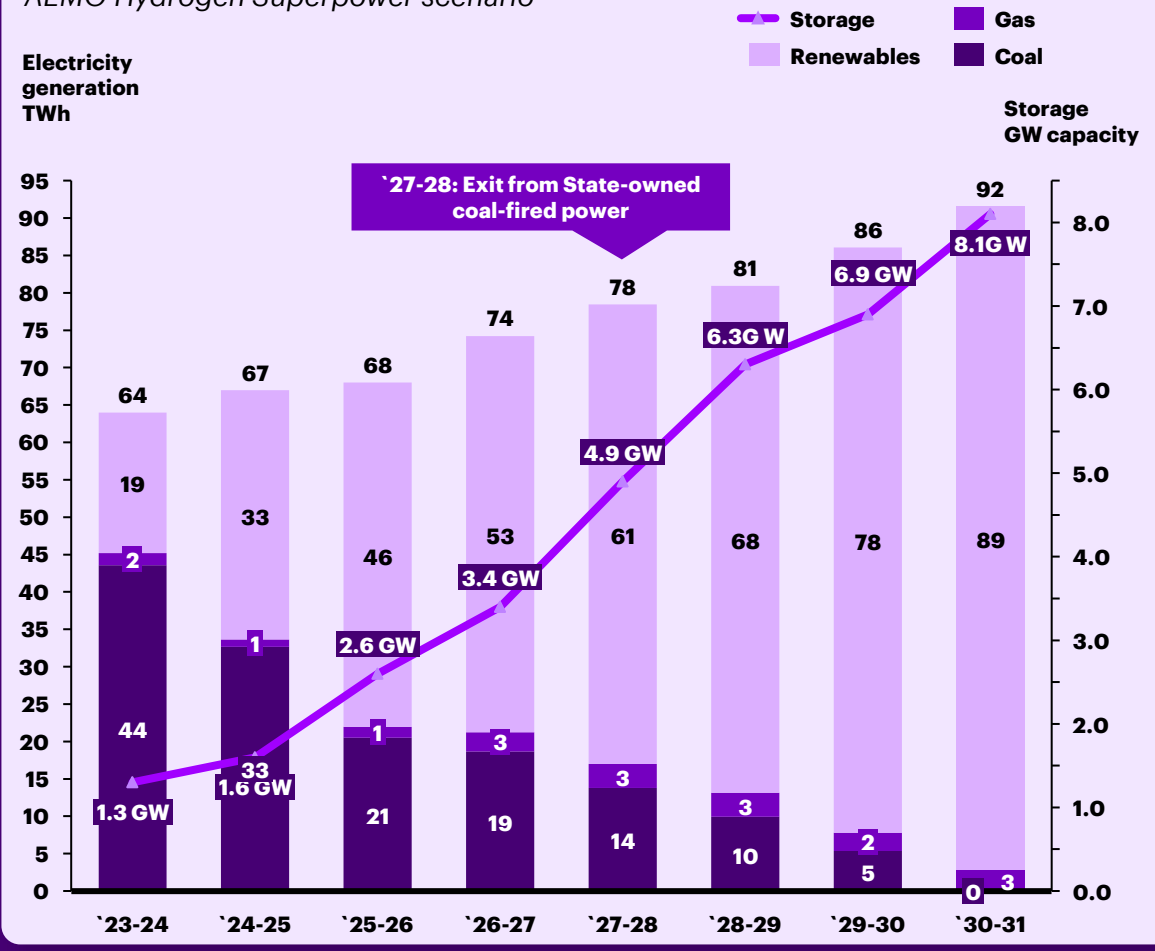
Growing storage capacity will support the transition to renewables, enable coal closure, create jobs in coal reliant communities, and attract private investment

Storage development will have a positive impact on building renewables and phasing out coal, and will create a new workforce

Impact	Description
Economic	▪ The policy will create **11,000 jobs,** and together with building renewable capacity and residential solar **will deliver a reduction of 60 Mt CO_2-e emissions for Queensland by 2030.** ▪ A demonstration project in the US showed that a 4 MW/40 MWh battery can save **$USD 2 million in fuel costs and 400 hours of grid congestion**.
Environmental	▪ Batteries will play a greater role in the future transmission network by providing **system security services, such as frequency regulation, voltage control, inertia and system strength**. ▪ The need to store renewable energy for eight hours or more is largely still unmet by battery storage. Moreover, outages of large coal-fired generators have illustrated the **need for greater dispatchable capacity in the system**, which can be ensured via LDES (pumped hydro) construction. ▪ However, pumped hydro might have a serious negative environmental impact. **Constructing large storage or pumped storage hydropower plants involves blocking, diverting, or changing the natural course of river systems.** One issue that arises with blocking a river's natural flow is the simultaneous blocking of important migration routes for fish.

Strong growth of renewables and storage need to be combined with a measured rate of closure of coal fired plants

AEMO Hydrogen Superpower scenario



Source: AEMO; Powerlink; ARENA; Energy Sage; Accenture analysis

Other countries and Australian states are deploying both short and long-duration storage to support a clean energy transition

Other Australian states and territories have invested in battery energy storage systems (BESS) of various capacities, with some big projects coming online in the next couple of years

Jurisdiction	Description
Victoria 	▪ In Dec`21, Victoria completed construction of **the 600 MW 'Victorian Big Battery'**, or battery energy storage system (BESS), in Geelong, Victoria. The project will use Tesla batteries. ▪ As of early 2022, the AU$190 million Mornington BESS with **240 MW/480 MWh capacity** is on track for completion in mid-2023. ▪ Other plans include **Syncline's 600 MW/2,400 MWh Melton Renewable Energy Hub** and a **400 MW/1200 MWh big battery project** proposed by UK-based RES for near Stanwell.
New South Wales 	▪ The Great Western Battery with **the capacity of 500 MW/1,000 MWh** was set to be completed in July 2022. ▪ EnergyAustralia and Edify Energy are partnering together on two long-term battery storage agreements for **a combined 90 MW/180 MWh** in Darlington Point, due for completion in 2023.
South Australia 	▪ Neoen's **150 MW Hornsdale Power Reserve**, more commonly known as the 'Tesla Big Battery', has been in operation since 2017, with the last 50 MW/64.5 MWh added in 2020.

Over 260 LDES projects totaling 5 GW and 65 GWh have been announced worldwide, with ~230 projects and 75% of the capacity already contracted, under construction, or operational

Jurisdiction	Description
Europe	▪ Most LDES projects in **Spain**, which account for 20% of global announcements, are thermal LDES. ▪ **Germany** has two compressed air (CAES) projects with more than 200 MW, accounting for 10% of the total announced capacity globally.
Asia	▪ **Japan and China** have announced at least 30 electrochemical projects, combining both flow and metal anode batteries. ▪ **China** accounts for around 60% of global capacity that is announced, planned or under construction.
The US	▪ The capacity in **the US** is balanced between mechanical, thermal, and electrochemical projects, accounting for roughly 30% of global capacity. ▪ The California Public Utilities Commission requires utilities and other energy suppliers to purchase 1,000 MW of long-duration storage, with at least eight hours of discharge, by 2026.
Australia	▪ Construction of **Snowy 2.0** would add **2,000 MW of generation** and provide about **175 hours of storage**. ▪ The **New South Wales** Government committed AU$50 million in grants to support the delivery of pumped hydro projects in the state as part of its Electricity Infrastructure Roadmap. GE also signed an agreement with Walcha Energy to develop a 500 MW pumped hydro project at Dungowan Dam. ▪ Hydro **Tasmania** named Lake Cethana in north-west Tasmania as its first pumped hydro site for the project.

Source: Powerlink; ARENA; Clean Energy Council; McKinsey; Victorian Big Battery; Renew Economy; Australia New Zealand Infrastructure Pipeline; S&P Global; Accenture analysis

Successful climate transition strategies are centred around strong collaboration with diverse community groups and their active involvement in managing the transition

The current Queensland Strategy requires review, with additional focus on Just Transition initiatives to support transitioning the workforce

Dimension	Description
Current Strategy **Review and Reboot**	▪ An **assessment of the current Queensland Climate Adaption Strategy** and progress to date against actions should be conducted. ▪ Updates to the strategy could include **targeted actions for regional and marginalised groups** to ensure an equitable and inclusive transition for communities adversely affected by the energy transition. ▪ To create a successful plan for achieving an **inclusive coal transition**, it is essential to bring together the **perspectives and experiences of stakeholders;** governments, public finance institutions, private sector, donor countries, trade unions, utilities and experts globally. ▪ **The updated plan should also address the issue of resilience more broadly,** because the Government needs to acknowledge the importance of building in resilience to weather events when planning the energy system and its transition (without going into adaptation).
Employee protection measures	• The transition process should properly **protect employees and communities impacted by the energy transition** through fair terms and conditions, local content in all new contracts, and employment and workforce transition incentives to retain the local workforce.
Labour Reskilling and Training	▪ **New programs and incentives to retrain people need to be designed to aid communities and workers in transition.** ▪ Current Queensland Climate Adaption Strategy contains actions to accelerating learning and understanding about climate change. Providing **additional incentives for University or Vocational programs,** including internships, creates additional opportunities for training in a growing market.
Economic Policy	▪ **Establishment of a Just Transition Fund** to support a compelling long-term vision for communities throughout the **transition to a low emissions economy**. This requires bringing together a range of different perspectives e.g., technical and policy expertise related to climate change, economic, labour market and social issues.

Workforce transition is complex and clear communication with impacted communities is vital to support a changing energy sector

Dimension	Description
Economic 	▪ Coal mines, users, transport systems, suppliers and auxiliary services all need to be considered in transition planning. ▪ Small business support and subsidised employment can temporarily boost the active labour market. ▪ Temporary income support may be required: – funding for redeployment, retraining, or supported retirement of the workforce with early retirement incentives – supporting people to move into good, well paying permanent jobs – unemployment insurance – social assistance payments ▪ The number of people employed by the energy sector is expected to increase over the years. IRENA estimates almost **100 million to be employed in the sector, twice the current levels, of which over 75% will focus on renewables, energy efficiency and grid flexibility.** ▪ Existing infrastructure should be repurposed, retrofitted and reused for the new industries and economic opportunities.
Social 	▪ In total, it is estimated by the International Energy Agency's 2021 World Energy Outlook that an additional **13 million workers** will be employed in clean energy and related sectors by 2030 (*Announced Pledges Scenario* and this figure doubles in the *Net Zero Scenario*). ▪ Women represent a small portion of the labour force, and few are in senior positions. Transition presents an opportunity for mainstream policies and measures to address issues of gender equality in energy and related sectors. ▪ Workforce Transition can be addressed in three phases: **Pre-layoff planning, pre-layoff assistance and post-layoff assistance**.

Source: IEA Report Extract, Climate Investment Funds; World Energy Outlook; The Next Economy; Accenture analysis

Examples of just transition plans point to the importance of focusing on equitable workforce transitions

Examples of initiatives to support transitioning workforce as part of climate transition and plans

Country	Description
Germany 	▪ The German government set the **2038 deadline and backed it up with 40 billion euros** to develop new industries and improve infrastructure in locations that were losing coal jobs. ▪ Germany designed a regional support program offering **compensation for losses faced by workers and companies**, in addition to a mechanism that provides tenders that compensate plant owners in exchange for retiring coal capacity.
United States of America 	▪ The House Select Committee on the Climate Crisis recommended **establishing a National Economic Transition Office** to coordinate federal activity, **expanding clean energy apprenticeship and training programs**, reestablishing the Civilian Conservation Corps (CCC), and creating a Climate Resilience Service Corps (CRSC). ▪ Some Federal Programs that exist today: Solar Training and Education for Professionals (STEP) program, Economic Development Administration (EDA), Assistance to Coal Communities program, Public Works, Economic Adjustment Assistance (EAA).

Workforce transition can be carefully managed through programs after coal mines are closed and new clean energy related jobs are generated

Region	Description
Latrobe Valley, Victoria	▪ EnergyAustralia will close the Yallourn Power station, with an accelerated closure date of mid-2028 announced. New storage capacity through a 350 MW, four-hour, utility-scale battery project will be completed by 2026. ▪ Yallourn's workforce will be supported through a **multimillion-dollar package to help them plan, reskill or retrain for their future.** This support is in addition to worker entitlements.
Liddell, New South Wales	▪ Coal-fired Liddell Power Station will close in in April 2023 to transition to clean energy infrastructure in the Hunter region, including **grid-scale battery, solar thermal storage, wind, hydrogen and pumped hydro projects.** ▪ AGL has secured planning approval to build the 500 MW/2 GWh grid-connected utility-scale battery at the site, allowing the company to **reuse the existing grid connection infrastructure.** ▪ AGL has also signed a memorandum of understanding with Fortescue Future Industries to explore a **green hydrogen production facility** as part of its planned Hunter Energy Hub, which includes a **hydroelectric power station** at Bells Mountain.
Brisbane, Queensland (EnergyLab)	▪ Australia's leading clean energy accelerator has established a base in Brisbane to help **grow clean energy businesses** and strengthen the early-stage commercialisation pipeline for **clean energy start-ups.** ▪ EnergyLab connects founders to mentors, advisors, partners, peers and investors through a range of programs and other initiatives tailored to overcome the barriers facing the rollout of the technologies and solutions necessary to decarbonise the economy.

Source: IRENA; NZ Ministry of Business Innovation and Employment; Environmental and Energy Study Institute; Liddell Closure; Yallourn Closure ; EnergyLab; Disaster Relief Australia ; Accenture analysis

3. Continue to grow residential energy efficiency, solar and storage, along with electrifying gas connections

Continue to grow residential energy efficiency, solar and storage, along with electrifying gas connections

Policy:

- **Implement energy efficiency minimum standards for rentals by 2025 . Establish a fund to supply rooftop solar onto public housing, and a subsidy combined with low interest loans for community groups, low-income households, small businesses, and public buildings to stimulate an additional 3.3 GW of rooftop solar.**
- **Provide a subsidy with low interest loans to accelerate the installation of 1 GW of community battery storage and 1 GW of distributed behind-the-meter storage with virtual power plant enrolment by 2030.**
- **Consider electrifying gas appliances in 10-20% of Queensland's homes that are not yet fully electric to save up to an additional 0.5Mt CO_2-e (this part of the policy has not been costed or included in the total emission count).**

Rationale:

- Queensland's high quality solar resources have resulted in a nationally-leading uptake of rooftop solar- 800 MW of new capacity was installed in 2021.
- Growing competition in the Virtual Power Plant market in Queensland is encouraging more distributed battery storage installation, but more capacity is needed to meet the AEMO roadmap.
- Investment in community batteries (through a co-funding mechanism with LGAs or community groups partnering with a state power utility) may help alleviate pressure on individual households who do not own a residential battery and may lower grid transmission load.
- The AU$168.1 million Advancing Clean Energy Schools (ACES) program is another effort to reduce energy costs at more than 800 state schools through the installation of 61.4 MW of solar capacity and other energy efficiency measures. However, more work can be done to continue equipping public schools with solar energy to meet their needs.
- Around 34% of Queenslanders' rentals have poor energy performance. Significant increases in energy costs during the past decade mean that many are now living in homes that are damp, too cold in winter, and too hot in summer and use more energy.

Current policy:

- This policy is designed to operate alongside the existing regional solar feed-in tariff program, which offers 7.861 cents/kWh to eligible households.
- This policy aligns renewable development with the AEMO Hydrogen Superpower scenario until 2030. This pathway calls for the installation of 7.8 GW of rooftop solar capacity by 2030 (bringing the State's total capacity to 12 GW), 4.5 GW of which is anticipated to be built privately under existing policies and market forces.

Note: *Estimated emission reduction from the first three policies combined
Source: AEMO Integrated System Plan (2022); Queensland Government; ARENA Community Batteries Cost Benefit Analysis; Queensland Council of Social Service; Accenture analysis

Queensland's strong rooftop solar industry continues to grow, expanding to include storage

CO_2-e emissions reduction

***60 Mt**

(together with two other policies in the 'Repower Queensland with clean energy' section)

Investment needed

AU$9bn

by 2030- ~AU$3.5bn in public investment, which could attract ~AU$5.5bn in private investment

Operational jobs

2,000

through 2030- these are permanent jobs including maintenance and supply chain jobs

Construction jobs

13,000

on average, across the 2024-2030 installation window

Repowering Queensland households with on-site clean energy will support them to play their part in the energy transition

Expanding into storage while growing the rollout of solar will accelerate existing trends to provide a renewable and storage centric grid

Feasibility	Description
Solar panel cost	• **Global solar panel production is growing** and the cost of panels is forecasted to continue decreasing, having fallen by over half in the last decade (from over AU$2 per W in 2012 to less than AU$1 in 2021).
Ongoing demand and system upkeep	• Demand for solar remains high, with a Powerlink survey finding **22% of Queenslanders intend to install or upgrade a PV system** within the next three years. Demand for storage is lower, with **10% of Queenslanders planning to install behind the meter storage** within the next 3 years. Both cost and lack of knowledge have been cited as key barriers. • Expansion of existing systems is also anticipated to rise, with **93% of households with an existing rooftop solar system intending to replace or upsize their existing systems** at their end of life.
Workforce availability	• The existing 3,000 jobs in the rooftop solar industry resulted in the installation of 800 MW of capacity in 2021. **This existing skilled workforce of solar panel installers and electricians only needs a minor expansion to meet the demand called for by the AEMO roadmap.**
Sufficient rooftop real estate	• ABS Employment in Renewable Energy Activities found that **over 50% of rooftops in Queensland that are suitable for solar do not have a system installed.**
Community uptake	• Queensland leads Australia in rooftop solar uptake, with one in four rooftop installations occurring in Queensland in 2019. • **39.6% of households in Queensland already have rooftop solar , with community support for continued uptake, storage installation and participation in virtual power plants.**

Existing rebates and loan programs contribute to a growing uptake of rooftop solar and battery storage across Australia

Jurisdiction	Description
Victoria 	▪ The Victorian Government's Solar Victoria program builds on the State's existing 2.4 GW of rooftop solar by **offering rebates for the installation of rooftop solar (up to AU$1,400) and solar batteries (up to AU$3,500),** as well as **solar and heat pump hot water systems (up to AU$1,000).** ▪ A **rebate for providers of community housing to install rooftop solar** is also included in the Solar Victoria program with up to AU$1400 of support available until June 2022. ▪ The Solar Victoria program is also **incentivising virtual power plants with a higher rebate of AU$4,174 for customers who enrol their new battery** until June 2022.
New South Wales 	▪ The NSW Government's Empowering Homes Program offers **interest-free loans for the installation of a rooftop solar and battery system** (up to AU$14,000) or **a retrofit of a battery to an existing solar system (up to AU$9,000).** This program aims to install 300,000 solar battery systems over 10 years.
Australian Capital Territory 	▪ ACT Next Generation Energy Storage (Next Gen) program offers up to a **50% rebate for new battery storage in homes and small businesses** (capped at AU$3,500). This program aims to support the installation of 36 MW of capacity worth AU$25 million.
Australia 	▪ The Clean Energy Regulator's award of **Small-scale Technology Certificates subsidises the purchase of rooftop solar across Australia** by offering certificates for a system's expected generation of renewable energy at installation (with a guaranteed price of 4 cents per kWh)

Source: AEMO ISP (2022); Australian PV Institute Solar Map (2022); ABS Employment in Renewable Energy Activities (2019); Powerlink Transmission Annual Planning Report (2021); Solar Victoria (2022); NSW Empowering Homes (2022); ACT Next Gen Energy Storage Program (2022); Talking (Energy's Queensland Household Energy Survey (2022); Accenture analysis

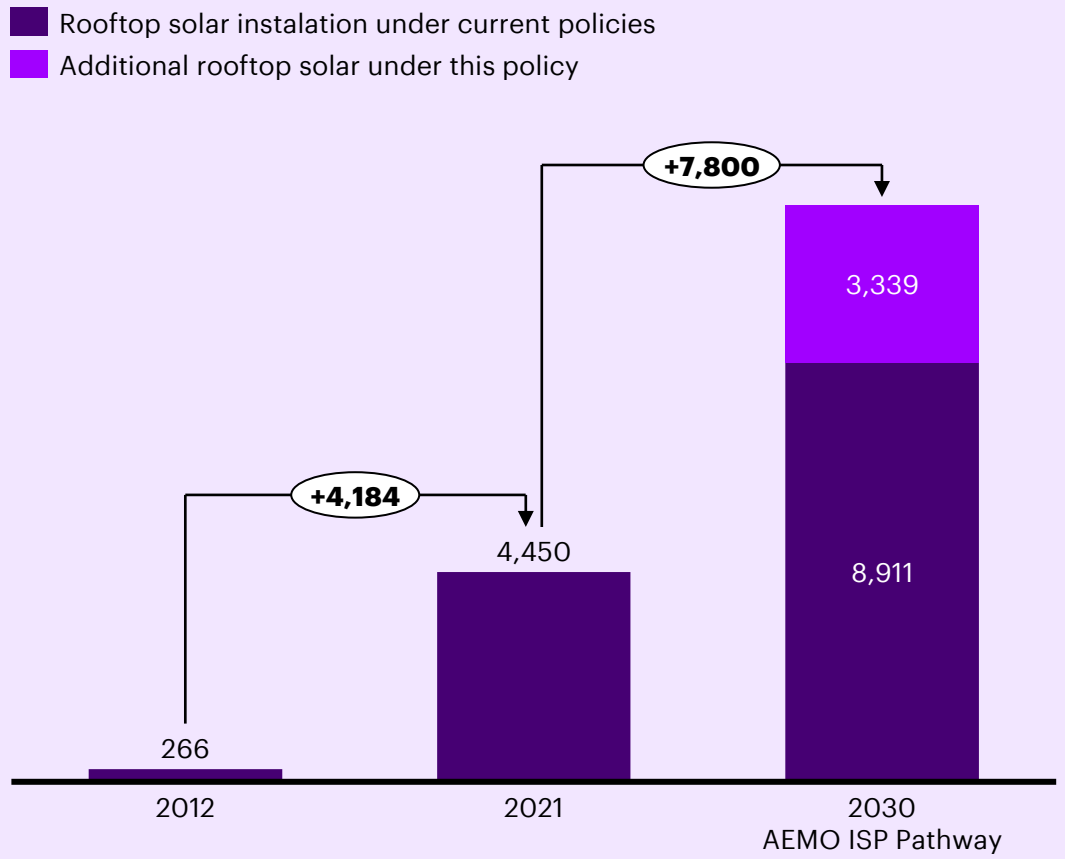
Accelerating solar and storage for households will support climate goals and grow the renewable energy workforce

Queensland is well placed to continue rooftop solar rollout and can leverage this industry to accelerate battery rollout

Impact	Description
Economic	▪ Rooftop solar could **lower energy costs** for all Queenslanders by bringing more low cost electricity onto the market. ▪ This policy will create, on average, **15,000 jobs across solar and battery installation industries, predominantly within small businesses,** across the 2024-2030 installation window.
Environmental	▪ **93% of Queensland's emissions from electricity generation could be reduced**, equivalent to over a third of all Queensland emissions, by combining residential renewable development with building utility-scale renewable capacity and energy storage, and exiting coal fired power. ▪ Renewable energy will be an enabler for the **decarbonisation of industries and the transport sector**, for example through green hydrogen and clean aluminium.
Other	▪ The addition of decentralised storage to the grid through smart batteries and virtual power plants adds to the overall storage capacity of the state and **reduces load on the central grid infrastructure**.

Queensland continues to take up PV at a rapid rate

Installed rooftop PV in Queensland 2012, 2021 and AEMO 2030 roadmap (MW installed capacity)



Sources: AEMO ISP (2022 Draft), Australian PV Institute Solar Map (2022); Accenture analysis

Source: AEMO ISP (2022); Australian PV Institute Solar Map (2022); Energy Council (2022); Accenture analysis

Lay the foundation of a land carbon industry

4. Reset the Land Restoration Fund to build a new land carbon industry

Reset the Land Restoration Fund to build a new land carbon industry

Policy:

- **Reset the Land Restoration Fund (LRF) to catalyse a gigaton scale land carbon industry in Queensland, supporting projects to net [50] million trees a year.[1]**
- **Establish and maintain a geospatial inventory across both public and private land of existing carbon assets, the potential for regrowth, and the suitability for carbon farming.**
- **Act to link growing corporate demand for low-risk carbon offsets with high quality carbon farming projects in Queensland that promote biodiversity, including undertaking public-private partnerships for carbon farming on State land.**
- **Undertake a scoping study to assess the precise mechanism and funding to facilitate and best scale a land carbon market, which could include accrediting, brokering, and underwriting projects.**

Rationale:

- The Commonwealth Emission Reduction Fund (ERF) is directly facilitating less than 1Mt of offsets a year in its voluntary market, with most companies working across secondary markets, brokers or directly purchasing offsets from individual carbon farming projects where additional assurances can be sought.
- The LRF's concentrated investment into targeted projects has demonstrated a successful framework to value, accredit and underwrite co-benefits within high quality carbon farming projects. However, the small portfolio of projects isn't catalysing growth in the carbon farming industry or its supply chain.
- Corporate demand is anticipated to continue growing and the voluntary offset market is to expand, as more companies set increasingly ambitious net zero targets.
- Queensland Government could catalyse a new industry that connects the demand for offsets with a pipeline of high quality, transparently accredited projects and, in doing so, support regional economies to develop local carbon farming industries with an ambition to protect, restore and revegetate 100 million hectares of forest and woodland.

Current policy:

- Resetting the LRF will be most effective as part of a suite of complementary reforms. These reforms include tightening Queensland vegetation laws to reduce deforestation rates particularly on exempted (Category X) land and land subject to degradation, stimulating multi-billion-dollar natural capital markets to reward landholders who protect koala habitat and Reef catchments, and developing geospatial and supply tracing tools to enable the beef sector to become deforestation-free and carbon positive.

1. Initial target focuses on net trees, counting the protection of forests otherwise lost, additional regrowth and new planting projects. The [50] million net tree target is viable in the initial scope but may be superseded if the feasibility study identifies a different portfolio of projects to more efficiently catalyse the land carbon market. 2. Emissions reduction includes projects beginning to sequester carbon by 2030 but it is important to note a significant amount of sequestration occurs in later years, as these projects mature. 3. The NCAS emissions from land clearing are likely underestimated, due to errors in woody cover mapping in the National Greenhouse Gas Inventory when compared to higher resolution SLATS data. Carbon emissions from land-clearing could be up to double current NGGI reports, affecting both the scale of current emissions and the potential for abatement.

Sources: Dept. of Agriculture, Water and the Environment (2021); Queensland Dept. of Science, Information Technology, Innovation and the Arts (2014); Queensland Dept. of Environment and Heritage Protection (2017); Carbon Market Institute (2022); Clean Energy Regulator (2022); Queensland Dept. Environment, Land and Water (2021); Climateworks (2021); McKinsey Sustainability (2021); Accenture analysis

Queensland Government could help catalyse a carbon market by expanding confidence in the quality of Queensland's offsets and by making a stronger seed investment

CO_2-e emissions reduction

~15 Mt[2]

in 2030- ~120% of 2020LULUCF sector emissions[3], **growing to a reduction of ~29Mt/year[3] as these regrowth and planting projects mature and new projects commence at the same pace**

Investment needed

AU$1bn[2]

by 2030- up to AU$500 million of additional catalytic public investment into the LRF, initially attracting AU$500 million in private co-investment

Operational jobs

~10,000

through 2030- these are permanent jobs in forest management and assessment

The components for a large land carbon market are present in Queensland but have not yet successfully been brought together

Catalysing a land carbon market requires connecting a critical mass of carbon farming operators to available land and resources

Feasibility	Description
Building credibility	▪ **Confidence in the carbon credits and any associated co-benefits** is repeatedly identified by stakeholders and external observers as key to valuing a carbon credit, particularly on the voluntary market. ▪ **Transparent assurance of projects** is critical to building this confidence, and is a role that the rebooted Land Restoration Fund is uniquely placed to fill as a central authority.
Availability of appropriate land	• **High rates of historic land clearing** (11 million hectares since 1990) have created large volumes of land (currently both public and private) that have historically supported sustainable forests, which may be **high quality regrowth or planting sites.** • Projects could also be undertaken in the **national parks, State land and new land acquired under the Protected Area Strategy** to restore previously cleared land, especially in the wake of natural disasters.
Supply of trees	• Existing Australian suppliers have **demonstrated capacity to scale supply to projects guaranteeing demand**; supplying 30 million trees to the 20 million trees program, and currently scaling to provide 25 million trees to the AstraZeneca forest.
Attracting co-investment partners	▪ Initial **partnerships with large domestic companies and associations with ambitious offset targets** could bring additional co-investment to projects.
Appropriate carbon farming methods	• Recognition of existing methods being developed and trialled in Queensland provides an **opportunity to build atop existing local best practice** from practitioners and researchers.

Existing schemes show the viability of key components needed to scale a carbon farming market

Scheme	Description
Land Restoration Fund (LRF)	▪ The Land Restoration Fund supported **16 projects in its first round (2020), providing up to AU$92 million in financing** by paying a premium for a share of each project's Australian Carbon Credit Units (ACCUs) in advance. A second round of grants with allocation for up to AU$25 million was opened in 2021. ▪ These projects are **anticipated to collectively reduce net emissions by ~3 Mt CO_2-e** across the lives of the projects. ▪ Select projects with high quality co-benefits are made viable by the scheme, with the LRF paying the co-benefit premium for up to 80% of a project's ACCUs. However, this is a capital intensive way to scale an industry beyond the LRF's portfolio of projects.
Emission Reduction Fund (ERF)	▪ Government purchasing of ACCUs accounts for **95% of the demand in the national carbon offset market**. ▪ **Confidence in the accreditation frameworks was recently undermined by ERF reported data** showing a proliferation of offsets being generated by carbon farming practices that are not valued or trusted by external observers.[1] ▪ The **private market for ACCUs grew significantly in 2021 (up 76%) with 6 million ACCUs** estimated to be contracted for between private companies dealing directly with carbon farming projects.
NSW's Carbon Asset Stocktake	• **A granular model of forest dynamics** was generated across NSW as part of the 2019/20 bushfires. This detailed historic record of forest carbon also allows for precise planning for specific carbon farming projects, and benchmarking of specific regions' baselines. • **The scope of this resource is currently limited to NSW**. The framework has been opened to other jurisdictions.

Note 1: The NCAS emissions from land clearing are likely underestimated due to errors in woody cover mapping in the National Greenhouse Gas Inventory when compared to higher resolution SLATS data. Carbon emissions from land-clearing could be up to double current NGGI reports, affecting both the scale of current emissions and the potential for abatement. Source: Carbon Market Institute (2022); Climate Change Authority – ERF Review (2020); Queensland Department of Science, Information Technology, Innovation and the Arts (2014); Clean Energy Regulator (2022); Queensland Dept. Environment, Land and Water (2021); Rural Industries Research and Development Corporation (2007); Queensland Department of Science, Information Technology, Innovation and the Arts (2014); Carbon Market Institute (2022); Renew Economy (2021); Mullion Group – FLINTpro (2022); McKinsey Sustainability (2021); Carbon Farming Foundation (2022); Accenture analysis

Unlocking private investment to scale carbon farming operations will help grow a new industry, create jobs along the supply chain, and reduce net emissions

Accrediting and proactively developing methods for a trusted land carbon industry offers opportunities to channel large private capital

Impact	Description
Economic	▪ A voluntary carbon credit market provides **ongoing funding for a new industry of emission reduction** activities in Queensland. ▪ A pipeline of carbon farming projects **fosters jobs in directly managing and maintaining the projects** themselves as well as **fostering industries to supply and accredit these projects**. ▪ This policy could create **~10,000 permanent jobs in forest management and assessment** through 2030. ▪ In the long term, high quality transparent credits can also access **international carbon offsetting investment.**
Environmental	▪ **Efficiently communicating proactively updated standards and methods** keeps best practice up to date with changing conditions and raises the efficiency of all projects within the reset LRF and its wider community of practice. ▪ **Ongoing, transparent certification of projects** ensures that the carbon sequestration and co-benefits are realised, which safeguards confidence in the market. ▪ This policy could lead to a reduction of 15 Mt CO_2-e in 2030, a ~120% of 2020 LULUCF sector emissions, **growing to a reduction of ~29Mt/year, as these existing regrowth and planting projects mature and more are commenced.** ▪ Increased accessibility and transparency within a carbon market **lowers the risk for companies and organisations to purchase offsets, particularly within the voluntary market**.
Social	▪ Additional categories of **co-benefits can be expanded over time**, opening new avenues of investment into local communities and ecosystems.

Large planting projects with co-benefit objectives have been undertaken around the world and across Australia

Jurisdiction	Description
Australia	• The Commonwealth Government's **20 million tree program** planted over **30 million trees in 6 years**. AU$62 million was distributed to 235 projects, with 39 of these projects having had some activity in Queensland. Resources were allocated through both **competitive tenders**, as well as **targeted programs** designed to deliver additional co-benefits. • A partnership between AstraZeneca and Greening Australia will plant **25 million trees** across Victoria, New South Wales, Western Australia, South Australia and Tasmania. **Habitat for endangered species** will be re-established across areas razed by the 2019-20 bushfires.
South Korea	▪ A government-lead effort to recover degraded forests across South Korea has **almost doubled total tree coverage after planting 1.4 million hectares as part of a 60-year program.**
Mexico	▪ The Center for Integral Small Farmer Development in the Mixteca has used **indigenous farming techniques to reforest more than 1,000 hectares with 1 million trees**, with a focus on economic opportunity and gender equality within the region.
The US	▪ **60 million trees were planted across 35k hectares in the Appalachian Region** to rehabilitate an inactive mine site. This public-private partnership between state government, local land holders and the mine owner has created new economic opportunities in sustainable timber harvesting and boosted the local land management and recreation industries.

Source: Rural Industries Research and Development Corporation (2007); Climate Change Authority – ERF Review (2020); Queensland Department of Science, Information Technology, Innovation and the Arts (2014); Center for International Forestry Research (2011); Insteading Analysis (2019); Carbon Farming Foundation (2022); McKinsey Sustainability (2021); Accenture analysis

Accelerate clean exports industry development

5. Build a green hydrogen industry to meet domestic and international demand

H_2 Build a green hydrogen industry to meet domestic and international demand

Policy:

- ***Provide targeted green hydrogen subsidies and underwrite [6] GW of green hydrogen production capacity***

Rationale:

- A large-scale hydrogen industry could support the increasing demand internationally and in Australia for green hydrogen, which can be used in industry, transport and electricity.
- This policy could help reduce carbon emissions by up to 32 Mt by decarbonising hard-to-electrify sectors such as steel, cement, chemicals, aluminium, shipping, long-haul trucking and others. Abatement may occur both in Australia and abroad, depending on how much hydrogen will be consumed domestically and how much will be exported. The large range of Mt is attributable to hydrogen's varying emissions abatement efficiency in various sectors.
- Queensland could focus on building large-scale, export-focused hydrogen production facilities to serve countries with high demand for hydrogen, such as Japan and South Korea.
- Hydrogen production would support a domestic specialised workforce of skilled workers and the development of clean manufacturing hubs.

Current policy:

- The Queensland Government is promoting hydrogen uptake through the Queensland Hydrogen Industry Strategy 2019-2024 and the Queensland Renewable Energy and Hydrogen Jobs Fund.
- Notable current projects include a Stanwell/Iwatani Corporation 3 GW capacity renewable hydrogen production and export facility, with production targeted to reach 280,000 tonnes per annum by 2030; a recent announced joint venture between CS Energy and Senex Energy to develop the Kogan Renewable Hydrogen Demonstration Plant near Chinchilla and the Townsville hydrogen cluster.

Hydrogen production would enable up to 32Mt in emission reduction and support a 20,000-strong workforce in construction and operation

CO_2-e emissions reduction

Up to 32 Mt*

in 2030, accounting for emissions in a variety of sectors, ***both domestically and internationally***

Investment needed

AU$2bn**

by 2030- ~AU$0.5bn in public investment, which could attract ~AU$1.5bn in private investment

Operational jobs

15,000

by 2030- these are permanent jobs in hydrogen production and supporting jobs in the value chain

Construction jobs

5,000

on average across 2024-2030 as the industry grows

Note: *Emission reduction from hydrogen by 2030 is not counted in the total volume of emissions abated by policies analysed in this report. This estimate is derived from ARENA feasibility study projections, Rocky Mountain Institute study and Accenture analysis.
**AU$2 bn is a conservative estimate, based on Hydrogen Council's projection of a significant electrolyzer capex decline by 2030 to about USD 200-250/kW at the system-level. $2bn figure is based on the average (225 USD/kW).
Source: IRENA (2020; Queensland Government; Queensland Government – Hydrogen; Townsville Enterprise; Accenture analysis

H_2 Queensland could be a hydrogen superpower, but coordinated policy is needed to catalyse private investment

Queensland has the technology to develop a hydrogen hub, but large private funding needs to be attracted

Feasibility	Description
Technology	▪ Stanwell is currently developing a **pilot-scale hydrogen hub in Gladstone,** with a capacity of 300 MW, to produce up to 70 tonnes of green hydrogen per day. ▪ Technology is available to **develop larger electrolyser plants.** Stanwell has proposed to build a 3 GW plant in the early 2030s, to produce up to 900 tonnes of green hydrogen per day.
Sufficient capital	▪ **Stanwell is currently working together with Japanese companies** Iwatani Corporation, Kawasaki Heavy Industries, Kansai Electric Power Company and Marubeni, and Australian energy infrastructure business APA Group. ▪ **The underwriting of projects is crucial to facilitate private funding otherwise deterred by risk and high capital expenditure.** Large financial commitments are needed from private companies to build 6 GW of production capacity.
Access to export markets	▪ **Australia and Japan already collaborate on hydrogen** exports via the Hydrogen Energy Supply Chain (HESC) pilot project. ▪ **Japan and other countries, such as South Korea, have limited opportunities to develop green hydrogen and may provide an export opportunity for Australia**
Skilled workforce	▪ Hydrogen production **requires a skilled, specialised and experience workforce.** Skills shortages exist, as educational institutions have not yet fostered a hydrogen workforce.
Infrastructure	▪ Queensland has **sufficient infrastructure** for hydrogen production. Queensland has **multiple ports in industrial areas**, **such as Gladstone and Brisbane**. These ports are a gateway to domestic and international trade.

The UK and Germany promote development of a domestic hydrogen industry

Jurisdiction	Description
United Kingdom 	▪ The UK Government announced its vision "to develop a world-leading hydrogen economy". ▪ **Key areas of vision** include hydrogen production, networks and storage. Government supports industry development, workforce upskilling, R&D funding, and identifying export opportunities. ▪ The plan supports **9,000 UK jobs and unlocks £4 billion private investment by 2030.** Overall value to the economy could be worth **£900 million by 2030.** ▪ **The UK Government invested £240 million** into a net-zero hydrogen fund for various projects. ▪ **The UK Government has a partnership with BP**, who is turning a former Northern England heavy-industry hub at Teesside into a Hydrogen Production and Transport Hub.
Germany 	▪ As at mid-2021, Germany is planning to invest **more than $US9.74 billion** to fund hydrogen projects, supporting chemical, steel and transport industries. ▪ The National Hydrogen Strategy states that **Germany plans to establish up to 10 GW (28 TWh) of generation capacity** including the offshore and onshore energy generation facilities by no later than 2040. This only covers part of the projected German hydrogen demand by 2030 (90 to 110 TWh). The projected gap between production and demand underlines **Germany's plan to import hydrogen.** ▪ After **a 10-year Government subsidy** (for the difference between the cost of green hydrogen and hydrogen market price), green hydrogen cost will be competitive enough for businesses to be able to produce it without government support.

Source: Stanwell (2020); Arena (2022); Reuters (2021); UK Government (2021); Reuters; CSIS; Accenture analysis

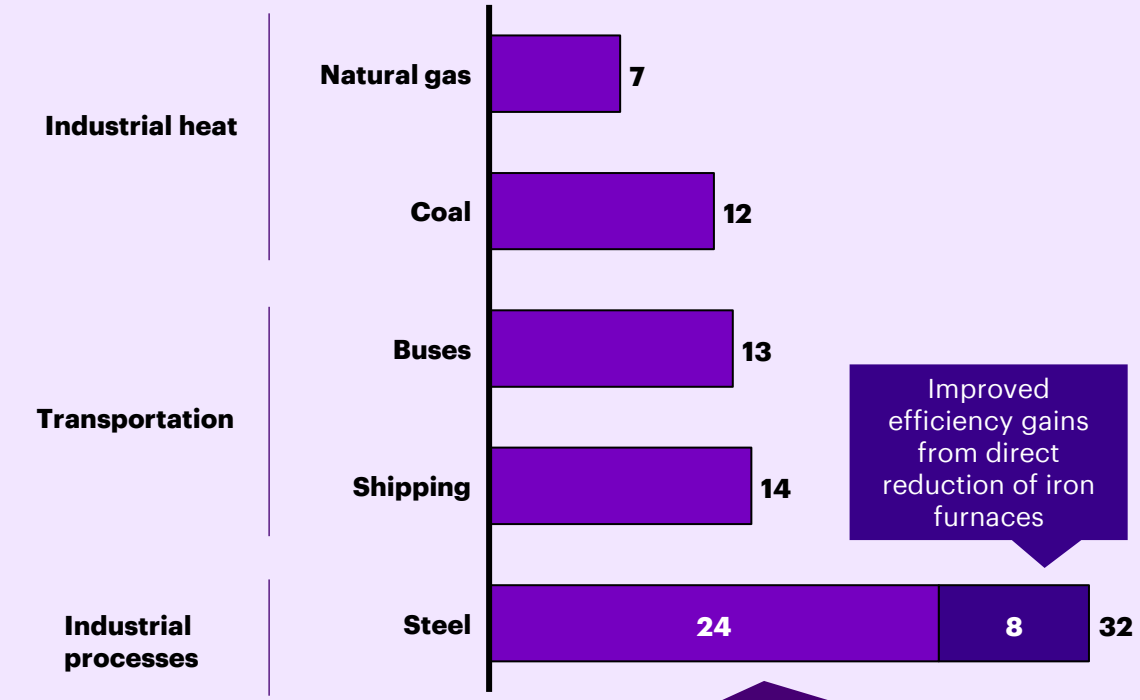
H_2 Hydrogen presents a major economic opportunity for Queensland and would create a wide range of jobs

Hydrogen provides a great economic opportunity for Queensland to facilitate the transition of coal jobs into hydrogen production

Impact	Description
Economic	▪ 6 GW hydrogen capacity could potentially **deliver AU$8.4 billion in hydrogen exports** and **AU$20 billion** to Queensland's Gross State Product over a 30-year period. ▪ 6 GW hydrogen capacity could potentially unlock **~AU$1.5 billion in private investment with ~AU$0.5 billion of public investment**. ▪ This policy could create a 5,000-person renewable construction workforce and a 15,000-person renewable operational workforce, **including highly specialised and skilled workers** in a new, low emission hydrogen industry. ▪ Around half of operational jobs will be in operations and management and other half in R&D, manufacturing and engineering, as well as comms, training and outreach – all potentially **supporting a just transition away from coal.**
Environmental	▪ This policy could **reduce carbon emissions by up to 32 Mt CO_2-e through the decarbonising of hard-to-electrify sectors**, both in Australia and abroad. Decarbonisation will depend on the sector, and on how much hydrogen will be consumed domestically or exported.
Social	▪ Coal workers could be upskilled or reskilled to **support a just transition away from coal fired power and into hydrogen production**. Queensland Government could work together with Energy Skills Queensland and the TAFE system to connect industry needs to the existing workforce and education/training providers.

Achieved CO_2-e emission reduction for each consumed kilogram of hydrogen depends on hydrogen efficiency across industries

kg CO_2/kg H_2



Hydrogen's CO_2-e abatement potential depends on the industry and how efficiently that industry utilizes hydrogen to reduce its emissions toll (for example, replacing gas with hydrogen in steel manufacturing is very efficient, whilst adding hydrogen to gas in pipes is very inefficient)

Source: Stanwell (2020); Clean Energy Finance Corporation (2021); Austrade (2022); IEA (2021); US Office of Energy (2022); Rocky Mountain Institute (2020); Accenture analysis

6. Develop a battery manufacturing industry for domestic and international markets

Develop a battery manufacturing industry for domestic and international markets

Policy:

- ***Set up a battery manufacturing flagship fund to underwrite battery manufacturing capacity.***

Rationale:

- Queensland could capture up to AU$1.4 billion value add from batteries in 2030, meeting growing global demand for batteries in transport and stationary energy.
- A Queensland battery industry will serve Australia's increasing demand for energy storage to complement variable renewables and deliver grid stability.
- A battery flagship fund could allow Queensland to build independent capabilities in battery manufacturing, which would increase the diversity of battery suppliers and reduce the impacts of supply chain disruptions.
- This policy could support a domestic specialised workforce of skilled workers in new battery industries and the development of manufacturing hubs.

Current policy:

- Queensland Government allocated $3.1m for Townsville-based Imperium3 battery storage solutions manufacturing plant, an international joint venture led by Boston Energy and Innovation, Magnis Resources and Charge CCCV LLC. A feasibility study has been completed.
- Notable current projects include the Zero Emissions Developments (ZED), which is seeking $30 million in private investment to kick start the local manufacturing of battery storage systems and establish a manufacturing plant that will produce 100% recyclable PowerCap batteries/

Domestic battery manufacturing capacity could create a potential value add of AU$1.4b and support a 3,000 person workforce

Potential value add from battery industry

AU$1.4bn

in 2030, by developing a battery industry focused on domestic and ASEAN markets

Investment needed

AU$2bn

by 2030- ~AU$0.5b in public investment, which could attract ~AU$1.5b in private investment

Operational jobs

2,000

by 2030- these are new permanent jobs in battery manufacturing and supporting jobs in the value chain

Construction jobs

1,000

on average across 2024-2030 as the industry grows

Source: Accenture (2021) Future Charge; ACF (2022); Future Charge; Manufacturers' Monthly; Queensland Government; Renew Economy; Accenture analysis

Supporting battery manufacturing capabilities in Queensland is feasible, but partnerships with foreign companies are needed to access battery technologies

Lack of sufficient capital and skills in the battery industry have so far prevented Australia from moving up the value chain

Feasibility	Description
Technology	▪ Battery technologies have improved substantially in recent years. **Queensland has limited battery-related R&D ready for commercial use,** but can access foreign technology through licensing and partnerships.
Lack of sufficient capital	▪ Australia invests over AU$1b in mining projects but is lagging behind in battery manufacturing. Less than ~AU$200m of investment is made in Australia, and less than AU$50m of this investment is made in Queensland. **AU$2-3b is needed** to develop Queensland's battery manufacturing industry. **Limited capital availability** can be attributed to difficulties demonstrating proof of concept.
Access to supplies and suppliers	▪ **Over 50% of the world's lithium** is extracted in Australia. ▪ The battery industry has the opportunity to catalyse cross-border collaborations to become internationally competitive off the back of the resource advantage, and to move Queensland up the supply chain from mining to manufacturing.
Skilled workforce	▪ Battery manufacturing **requires highly skilled, specialised workers**. ▪ The battery workforce also relies on migration and is **prone to shortages**, and Australian universities are not yet focused on fostering the future battery workforce.
Infrastructure	▪ Queensland has **multiple ports in industrial areas**, **such as Gladstone and Brisbane**. These ports are a gateway for domestic and international trade, and provide essential infrastructure for the battery industry.

The EU and Canada invest heavily in sovereign battery industries

Jurisdiction	▪ Description
European Union 	▪ The European Union created **the European Battery Alliance** in 2017, which has attracted over **$US113 billion** of investment commitments. ▪ The EU aims for both **technological sovereignty in battery manufacturing and reducing the impacts from trade tensions** and global instability. ▪ The Alliance could create **up to 150,000 jobs** in the EU, and supports the just transition of fossil fuels jobs. ▪ **$US3.5 billion has been allocated by the European Union to subsidise** companies that produce batteries in Europe including Tesla and BMW.
Canada 	▪ Canada has **a strategic partnership with the US** to ensure critical mineral security and has significantly invested in battery manufacturing facilities. ▪ The Canadian Government **facilitated the joint venture** between international leading battery manufacturing LG Energy Solutions and carmaker Stellantis. ▪ The joint venture between LG Energy Solutions and Stellantis will see **a total investment of over US$4 billion** in a facility to manufacture batteries for EVs in Canada. The project supports the development of **2,500 skilled, well-paying jobs** in Windsor, Ontario.

Notes: OECD exchange data used to convert investments in foreign currencies to USD using data from the nearest complete year to an announcement
Source: European Union (2020); Canadian Government (2022); Accenture analysis

Building battery manufacturing capabilities in Queensland could provide a large economic opportunity, and support jobs in construction, engineering and R&D

Battery manufacturing could provide a large economic opportunity for Queensland in supporting a just transition

Impact	Description
Economic	▪ Battery manufacturing could capture up to **AU$1.4 billion value add** and **up to AU$6 billion revenue** from batteries in 2030, servicing domestic and ASEAN demand. ▪ Battery manufacturing could unlock ~AU$1.6 billion in private investment from ~AU$0.4 billion of public investment. **An extra AU$4 dollar of co-financing could be unlocked for every dollar of public funding.** ▪ Battery manufacturing could support the creation of a 1,000 person renewable construction workforce and a 2,000 person renewable operational workforce, **including highly specialised and skilled workers** in a new, low emission battery industry. ▪ Independent capabilities in battery manufacturing could help Queensland develop a **sovereign industry, which in turn** could reduce impacts from **supply chain** disruptions and geopolitical tensions.
Environmental	▪ Battery manufacturing could support Queensland's increasing demand for energy storage systems, the deployment of renewable electricity generation, and the **reduction of emissions from electricity generation using fossil fuels.**

Developing a battery industry could support a diversity of jobs

Type of jobs created and proportion of jobs

Category	Proportion of jobs (%)	Description
Construction workers	33	▪ Construction workers for the construction and installation of infrastructure e.g., building, equipment installation, cabling and machinery operation.
Technicians and production workers	52	▪ Technicians and production associates for assembling and testing manufactured products in the entire production process.
Engineers	8	▪ Engineers for project management, surveying, electrical and mechanical design, and computer systems management.
Quality Technicians	5	▪ Quality technicians responsible for ensuring that products meet standards for usage and operations.
Researchers	2	▪ Researchers including specialist engineers, chemists, technologists who can shape the design and intellectual direction of R&D.

Construction jobs Operational jobs

Source: Accenture (2020); ACF (2022); IRENA (2017); Tesla (2017); Accenture analysis

7. Tighten coal mine methane regulation

Tighten coal mine methane regulation

Policy:

- ***Tighten coal mine methane reporting, measurement and monitoring (ground and satellite), and mandate capture or destruction of high-concentration methane.***

Rationale:

- Methane is a potent greenhouse gas. It is more than 84 times more potent than carbon dioxide at trapping heat in the atmosphere over a 20-year period.
- For every ton of coal produced in the Bowen Basin region, an average 7.5kg of methane is released, which is 47% higher than the global average in 2018.
- Coal mining and gas extraction are the largest contributors to fugitive emissions. Methane release from resource extraction contributes to 11% of Queensland's emissions.
- Capturing high-concentration methane via pre-drainage of underground mines, chemical or enzymatic destruction could significantly reduce emissions from coal mining.
- Investment will be required in reporting administration, utilising an advanced program for methane monitoring (e.g., Methane SAT 3) and actual methane capturing and abatement, including pre-drainage.

Current policy:

- Current regulations to reduce methane emissions only require minimal monitoring and ventilation in underground coal mines for safety and health reasons.
- Emissions are likely underreported due to insufficient monitoring. Improved monitoring is possible via ground and satellite and increased accuracy of mapping fugitive emissions from closed mines.
- The *Coal Mining Safety and Health (Methane Monitoring and Ventilation Systems) Amendment Regulation 2019* clarifies and confirms minimum methane monitoring requirements at additional relevant locations in underground coal mines and requires signposting of additional explosion risk zone (ERZ) boundaries. The amendment also includes record keeping of methane monitoring and methane incidents, tripping of electrical supplies to machines, and consequential amendments about actions to be taken if a methane detector activates or is non-operational. The regulation does not apply to surface mines.
- Queensland Government's health and safety reforms for the mining industry also include a AU$35mil commitment to improve health and safety, a commitment to tighten controls on mine dust levels, and a AU$1.21mil funding boost for black lung and silicosis screenings.

Source: Queensland government (2019); Factcheck.org; Bloomberg; Queensland legislation; Bulk Handling Review; Accenture analysis

Increasing capture or destruction of methane could reduce emissions by 5 Mt and support a 1,000 person workforce.

CO_2-e emissions reduction

5 Mt

in 2030, a 23% reduction of 2020 emissions from resource extraction

Investment needed

~ AU$1bn

by 2030- *~AU$0.5b in public funding, which requires additional ~AU$0.5b in private funding*

Operational jobs

1,000

by 2030- these are permanent jobs in monitoring, measuring and reporting; and supporting jobs in the value chain

Monitoring and reducing fugitive emissions from coal mines is feasible with current technologies, as shown in the EU and United States

Current technologies are available to monitor and reduce methane from coal mining

Feasibility	Description
Sufficient methane monitoring	▪ Methane emissions are currently insufficiently monitored, underestimating fugitive emissions from coal mines and resource extraction. ▪ **Baseline data of methane emissions needs to be captured and reported**, and modelling should provide predictions of methane emissions during the project and the supply chain. ▪ New technologies are accessible and available to monitor methane emissions from coal mines, such as **satellite monitoring**. For example, MethaneSAT is a satellite that will study global methane emissions using a high performance spectrometer methane sensing system.
Sufficient methane capturing	▪ The European Union **increased their industry standards to prevent methane release**, such as replacing existing devices, installing new devices, and improved leak detection and repair. ▪ **Preventing methane leaking of decommissioned mines could be part of the care, maintenance** and site rehabilitation supported by government mandates.
Accurate methane measurement	▪ **Direct field measurements** using methane meters are needed for all aspects of every coal and resource extraction project, such as mine sites, wells, pipelines and transport. ▪ Better measurement of methane could detect leakages and provide more accurate estimates for fugitive emissions.

Other jurisdictions pledged to reduce methane emissions by 2030, focusing on reducing leakage from decommissioned mines

Jurisdiction	▪ Description
European Union 	▪ **The European Union made a joint pledge to reduce methane emissions by 30% by 2030** to fulfill goals from the Paris Climate Agreement. ▪ Reducing methane emissions from mines and gas wells that have ceased production was a specific point of interest. Jurisdictions within the European Union will adapt policies to **measure leakage, document ownership, and cap or fill leaks** to reduce methane leakage. ▪ **Legislation to ban venting and flaring** by the energy sector is proposed by the European Commission, including on imports of fossil fuels. ▪ **Legislation to improve leak detection and repair (LDAR)** for equipment and pipes **and binding rules on measurement, reporting and verification (MRV)** in the energy sector are proposed by the European Commission.
United States 	▪ **The United States pledged to reduce methane emissions by 30% by 2030**, which was announced at the COP26 climate summit. ▪ Green completions or **capturing methane when a well is made ready for production is mandated** in the United States. Captured methane can be stored or pumped into a gas pipeline to prevent leakage in the atmosphere.

Source: IEA (2020); ACF (2022); MethaneSAT (2022); European Union (2020); Canadian Government (2022); Accenture analysis

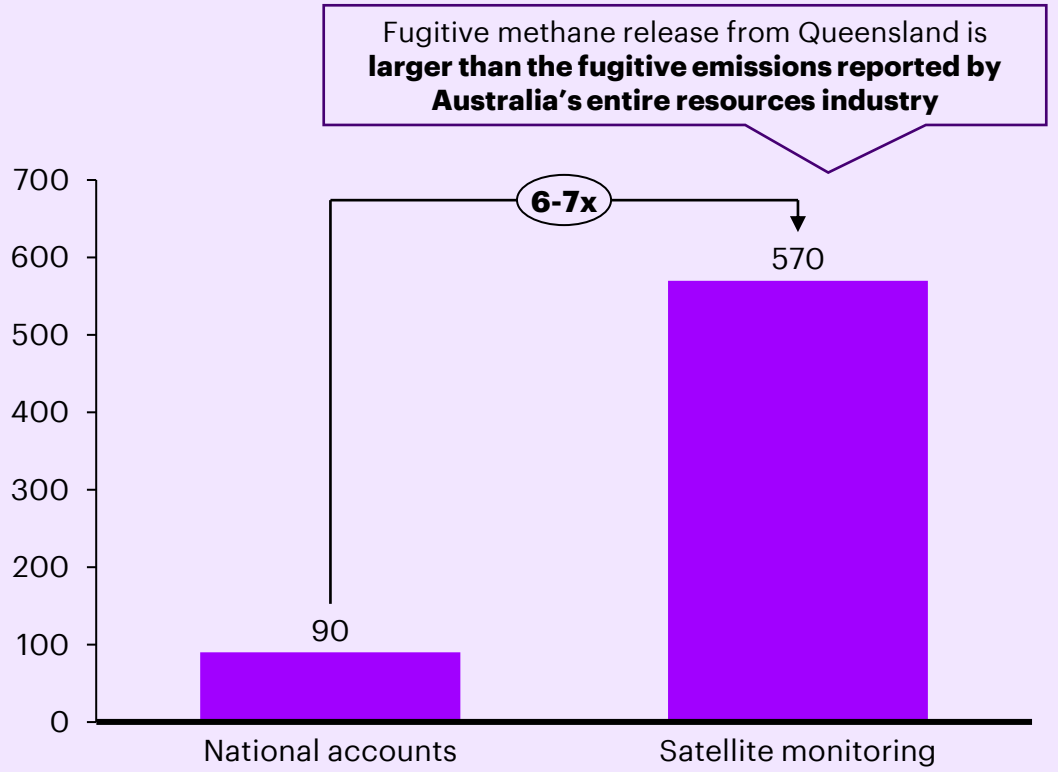
Methane emissions are underreported: better monitoring and reduction of fugitive emissions are needed to reach climate goals

Monitoring and reducing methane emissions has a large impact on Queensland's emissions

Impact	Description
Economic	▪ This policy could support a workforce of up to **1,000 operational jobs by 2030**. These are permanent jobs in monitoring, measuring and reporting, and supporting jobs in the value chain. ▪ **Highly skilled jobs in satellite monitoring could be created**, such as supporting the international MethaneSAT program. The MethaneSAT is an American-New Zealand space satellite, which will take high-resolution measurements of global methane emissions. The launch of the satellite is scheduled in October 2022.
Environmental	▪ Capturing and destroying methane could **reduce 5 $MtCO_2$ equivalents by 2030, a 23% reduction** of 2020 fugitive emissions from resources extraction. ▪ Abating emissions from natural gas extraction, transmission and distribution could **reduce additional methane emissions.** ▪ Improved monitoring will likely result in **identification of higher levels of methane fugitive emissions**. Newly identified sources of methane emissions need to be abated to reduce the impact on the environment.
Other	▪ Better monitoring and reporting of methane will allow for **better climate target setting**, and could contribute to reaching climate goals of the Paris Agreement.

Satellite monitoring of coal mines in Queensland suggests that methane emissions are underreported in the National Accounts

Annual methane emissions ($Gg\ a^{-1}$)



Source: Sadavarte *et al.* (2021) 'Methane Emissions from Superemitting Coal Mines in Australia Quantified Using TROPOMI Satellite Observations'

Source: Accenture (2020); ACF (2022); IRENA (2017); Accenture analysis

8. Reduce methane from cattle

Reduce methane from cattle

Policy:

- **Investigate options to reduce cattle methane emissions, through various solutions including genetics, feed additives and grazing management**
- **Co-invest in multiple trials involving feed additives (a biogenic solution), in order to familiarise farmers with the practice and investigate possible commercial adoption drivers for future widespread use**

Rationale:

- In 2018-19, the red meat and livestock industry contributed $17.6 billion to Australia's GDP – or 1.4% of Australia's key industry GDP. The Australian red meat and livestock industry also created (direct and indirect) employment for approximately 434,000 people
- Queensland has ~11.3 million cows, ~1,3 million of which are grain fed. Most of Queensland's cows feed in an open grazing settling.
- There are various solutions to curbing methane from cattle:
  1. **Genetics** (tools to inform and improve the efficacy and efficiency of strategic culling and breeding decisions, e.g., for feed efficiency);
  2. **Grazing management** (tools to help producers improve production efficiency and reduce the time over which they are producing methane);
  3. **Biogenic interventions** (modifying the rumen of the animal, for example through feed additives, so that it produces less methane);
  4. **Digital enablers** (innovation and investment across measurement and data collection, analytics, and data sharing solutions for livestock.).
- No solution has been piloted as the clear winner that is also commercially developed. Feed additives are however by far the most frequently cited solution: although most of them are currently only used in feedlots, the wider industry is working on ways to take it to an open grazing setting.
- The emissions reduction potential of feed additives is estimated to be between 10% and 90% for different types of feed additives. Most studies involving feed additives have however been short-term, small-scale studies.

Current policy:

- The Queensland Government does not currently have policies aimed at reducing methane emissions from cattle. Meat and Livestock Australia (MLA) has a policy of aiming for zero emissions by 2030.
- The Commonwealth Low Emissions Technology Commercialisation Fund, administered by the Clean Energy Finance Corporation (CEFC), specifically references feed supplement as one of the leading technologies.
- In late 2021, the Global Methane Pledge was announced, in which more than 100 countries committed to limit methane emissions by 30% compared with 2020 levels. Australia has not signed the pledge.

Source:; Agthentic; Agthentic; MLA; Accenture analysis

Establishing a new industry to support low carbon beef exports will address methane emissions and create a lucrative opportunity

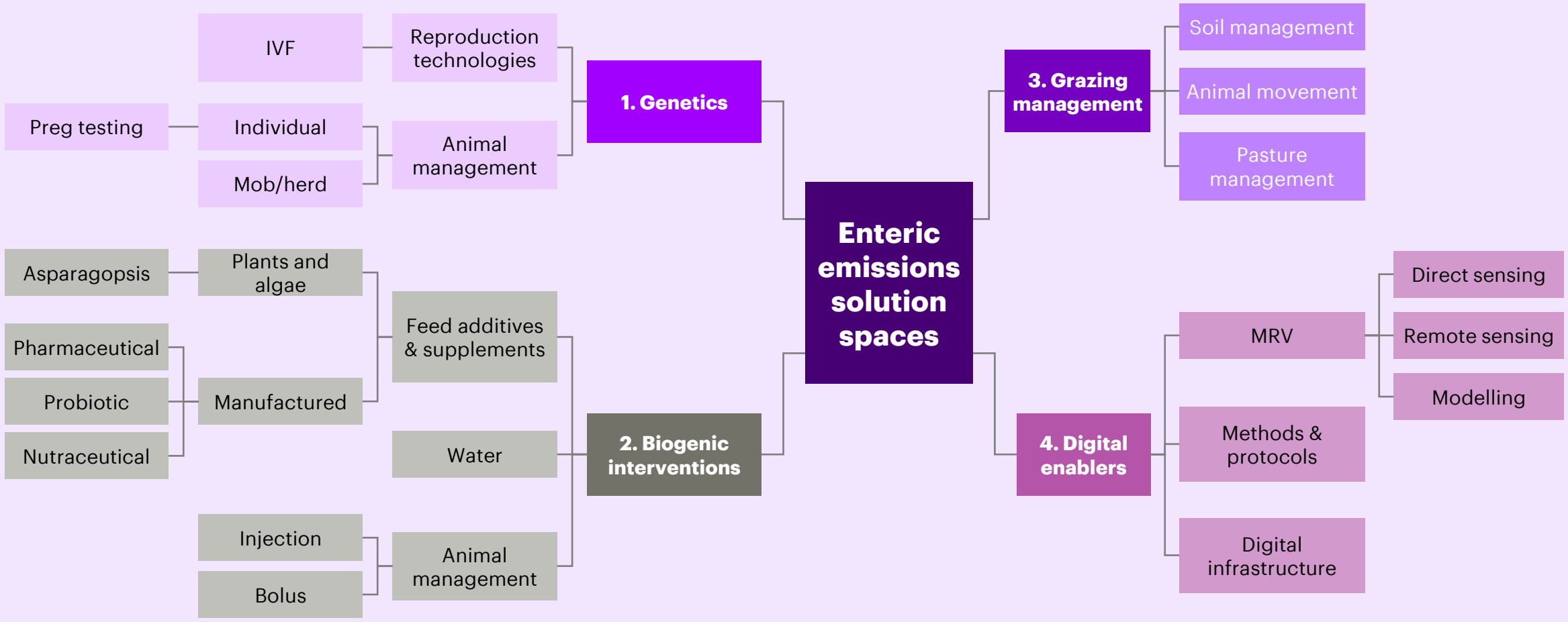
CO_2-e emissions

~15 Mt

Total cattle emissions from Queensland's ~11 million cows (total addressable emissions), almost 10% of Queensland's total 2020 emissions

Each solution space has its advantages and disadvantages and requires more research and trialing in order to identify the preferred policy direction

Four solution spaces for combatting enteric emissions are genetics, grazing management, biogenic interventions and digital solutions



Source: Agthentic; Accenture analysis

Appendix II: Long list of policies

We developed a long list of policies based on research, international case studies and ongoing stakeholder consultations

Sectors		*Long-list of policy options*
Electricity generation	1	Via CleanCo, Stanwell, CS Energy and Powerlink, build [3] renewable energy zones with [25] GW of new capacity by [2028] to decarbonise Queensland's high demand from a rapidly electrifying economy
	2	Create a jobs and resilience plan for future closure of State-owned coal fired power stations and consult communities on a station-by-station retirement schedule (i.e., by [2030])
	3	Accelerate investment in distribution networks to support uptake of distributed renewable energy, [8 GW] storage, and the electrification of transport and industry
	4	Invest in rooftop solar infrastructure for low-income households and public housing
	5	Establish a coal Transition Authority
	6	Develop a coalfield and infrastructure renewal and repurpose strategy that develops innovative regeneration plans for sites
Transport	7	Set a zero emissions target for heavy-duty trucks and buses
	8	Consider a ban on ICE vehicles from [2035] [in urban areas]
	9	Extend the AU$3,000 rebate to [all] EVs
	10	Adjust EV rebate eligibility based on income and place of residence to support EV uptake in regional areas and poorer communities
	11	Set a target for electrifying 100% of State vehicle fleet and initiate fleet procurement for Qfleet and local Gov fleet, including buses and heavy vehicles
	12	Introduce a buyback program for old diesel vehicles
	13	Exempt EVs from stamp duty and registration fees
	14	Establish a Zero Emissions Vehicle Innovation Fund
	15	Introduce a co-funding mechanism for public charging infrastructure, aiming for [1,000] stations over [5 years]
	16	Encourage uptake of cycling and use of public transport to reduce personal vehicle usage
	17	Co-finance residential two-way vehicle-to-grid charging infrastructure ('batteries on wheels')
	18	Make the rail network 100% renewable by [2035]
Agriculture and LULUCF	19	Set a [20%] agriculture sector emissions target
	20	Review land classifications for clearing, restrict land clearing in certain areas, and require offsetting of clearing emissions
	21	Increase Land Restoration Fund's promotion of carbon farming and biodiversity
	22	Provide government accounting of abatement and standardise measurement practices for projects within the Land Restoration Fund
	23	Invest in the infrastructure to rapidly expand reforestation, such as commercial nurseries, and upskill local communities to undertake cultivation work at scale
	24	Ban land clearing on all state-owned land (forests, stock routes, unallocated state land) and private land adjacent to state-owned land
	25	Co-invest in pilots for feed additives, breeding and vaccines to reduce methane emissions and protect export potential
	26	Further protect waterways from erosion and run off in the Great Barrier Reef catchment

Source: Accenture analysis

We developed a long list of policies based on research, international case studies and ongoing stakeholder consultations

Sectors		*Long-list of policy options*
Industry	27	Set up a battery manufacturing flagship fund [is this impactful enough?] and invest in pilot scale battery manufacturing plant for energy storage systems
	28	Provide targeted green hydrogen subsidies in the steel sector and invest in a [3 GW] pilot-scale green hydrogen facility to lay groundwork in Queensland to decarbonize industry and heavy transport
	29	Underwrite green power contracts for smelters and investigate repowering the Boyne Island aluminum smelter with green energy to catalyse green metal exports
	30	Develop clean export precincts in Abbot Point, Brisbane, Bundaberg, Gladstone, Karumba, Port Alma, Townsville, Weipa
	31	Invest in industrial energy efficiency, process electrification, zero-carbon manufacturing
	32	Set carbon neutral production targets in aluminum, cement and chemical manufacturing and establish thresholds for embodied emissions of material (e.g., steel) in public infrastructure projects
Resource extraction	33	Stop approving the opening of new coal and gas projects
	34	Do pre-drainage for surface coal mines
	35	Use methane from coal mines for a gas pipeline
	36	Mandate monitoring (ground and satellite), measurement, reporting and verification of methane emissions
	37	Establish an independent body responsible for enforcing measurement, monitoring and reduction in methane emissions
	38	Charge a fee for unabated methane emissions via venting or flaring of methane
Buildings	39	Tighten the building code
	40	Introduce large rebates for residential and commercial buildings energy efficiency retrofits
	41	Introduce large rebates for household batteries
	42	Ban all new gas connections and electrify existing two-connection households
Waste	43	Raise landfill levy progressively to AU$[200]/tonne
	44	Set a 60% target for organic waste sent to landfill
	45	Further increase the annual waste levy by [AU$20/tonne]
	46	Conduct more FOGO trials across Queensland
	47	Support LGAs to procure FOGO infrastructure
	48	Introduce a household food and garden waste collection from [2025]

Source: Accenture analysis

Appendix III: High level modelling methodology

We have modelled the direct construction and operational workforce, and the indirect workforce based on project capacity and size of required investment

Total size of supported workforce = **A. Total size of direct construction workforce** + **B. Total size of operational workforce** + **C. Total size of indirect workforce**

A. Total size of direct construction workforce = **Energy capacity (MW)** × **Construction job-years/MW** ÷ **Time between start and end of investment (years)**

Sources:

- Modelling ISP scenario
- Clean Energy Council, UTS Report
- Estimated investment timeline (i.e. 7 years, from 2023 to 2030)

B. Total size of operational workforce = **Energy capacity (MW)** × **Operational jobs/MW**

Sources:

- Modelling ISP scenario
- Industry reports (e.g. Tesla battery, UTS Report)

C. Total size of indirect workforce = **Number of direct jobs per sector** × **Indirect jobs multiplication factor**

Sources:

- Accenture modelling
- ABS, REMPLAN

Note: size of workforce is defined as the average number of ongoing jobs over a sustained period of time
Source: Accenture analysis

We used inputs from scientific studies, case studies and economic statistical data in our modelling approach to estimate the size of the direct and indirect workforce

	Category	Wind	Utility PV	Rooftop PV	Utility Battery	Pumped Hydro	Distributed Battery	Hydrogen
Direct job contribution (Australian job-years/MW)	**Construction**	2.8 job years/MW[a]	2.3 job years/MW[a]	5.8 job years/MW[a]	0.25 job years/MW[a]	11.1 job years/MW[a]	5.6 job years/MW[a]	2.0 job years/MW[a]
	Operational	0.127 jobs/MW[b]	0.1 jobs/MW[a]	0.2 jobs/MW[a]	0.04 jobs/MW[c]	0.2 jobs/MW[a]	0.3 jobs/MW[a]	1.0 job/MW[e]
Indirect job contribution (Indirect/direct jobs ratio)	**Construction**	1.92[d]	1.92[d]	1.92[d]	1.10[e]	1.92[d]	1.92[d]	1.92[d]
	Operational	1.47[d]	1.47[d]	1.47[d]	1.47[d]	1.47[d]	1.47[d]	1.47[d]

Source: a. UTS (2020) Renewable Energy Jobs in Australia: Stage One; b. Wind Power Engineering (2018) How many jobs do wind farms create?, c. Aurecon (2020) Economic assessment report; d. REMPLAN (2022) I/O tables e. the Examiner (2020); Accenture analysis

Key assumptions in emissions modeling have been made based on publicly available and reputable sources of insight for every sector

Policies[1]		Emissions reduction (CO_2-e in 2030)	Share of sector (from 2020 baseline)	Key Inputs	Value	Sources
1	Build 25 GW of new renewable capacity by 2030	***~60 Mt***	***97%***	AEMO Hydrogen Super power scenario	Generators and storage modelled to meet **92.1 TWh** of energy demand in 2030	AEMO ISP (2022)
2	Build 5 GW of storage and gradually phase out coal power by 2030			Generator level emissions	Queensland's gas generators weighted energy efficiency is **0.43 t CO_2-e / MWh**	Clean Energy Regulator (2018-19)
3	Accelerate rooftop solar and battery installations as well as consider electrifying gas connections					
4	Reset the Land Restoration Fund to kick start a land carbon market	***15 Mt***	***120%***	Cost of a carbon credit with co-benefit	**~AU$49 / ACCU** with co-benefit in LRF round 1 projects	Lexology analysis (2020)
				Carbon accumulation	**1 tonne CO_2-e / eucalypt** over the first 25 years of growth	CSIRO (2011)
				Curve for carbon sequestration rates for planting and regrowth	**Planted forests peak at 2.7% of total biomass in the ninth year** of growth and **2.2% of total biomass in their 11th year for regrowth**	Queensland Dept. of Science, Information Technology, Innovation and the Arts (2014)
				Carbon accumulation rate of reforested eucalypt woodland	At its peak, reforested eucalypt woodland can accumulate from **1 to over 3 tonnes CO_2-e / hectare.**	Queensland Dept. of Science, Information Technology, Innovation and the Arts (2014)
5	Underwrite 6 GW of green hydrogen	***Up to 32 Mt***	***(unknown, partly offshore)***	Production rate of electrolysers	**163 tonnes hydrogen / MW / year** from Thyssenkrupp electrolysers, which represents an output of **19.6 PJ / MW capacity / year**	Stanwell Feasibility Study for Gladstone Hydrogen Hub (2020)
7	Tighten coal mine methane regulation	***5 Mt***	***23%***	Contribution coal mine methane to fugitive emissions	Underground coal mining contributed to **8.8 Mt CO_2-e, or 46%** of fugitive emissions documented for 2018 in the 2020 State of the Environment report.	State of the Environment Report 2020, Queensland Government
				Potential reduction of fugitive emissions from mining	Cost effective reduction of methane from coal, between **approximately 70% of methane**	IEA (2021) Driving Down Methane Leaks from the Oil and Gas Industry

Notes: 1. Policy No. 6 ('Set up a battery manufacturing fund and underwrite capacity') is not included in this table, as it does not lead to direct emissions reduction but rather serves as an enabler for emissions reduction in other sectors
Sources: Accenture analysis and as per final column

Disclaimer

This document is intended for general informational purposes only. The analysis in this report was commissioned by the Australian Conservation Foundation (ACF), WWF Australia (WWF), Queensland Conservation Council (QCC), the Sunrise Project and the Australian Climate and Biodiversity Foundation (ACBF) and prepared by Accenture on behalf of the Australian Conservation Foundation (ACF), WWF Australia (WWF), Queensland Conservation Council (QCC), the Sunrise Project and the Australian Climate and Biodiversity Foundation (ACBF).

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