The Australian Industry Group

Climate and Energy

Post pandemic policy

August 2020

AiGROUP

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About Ai Group

The Australian Industry Group (Ai Group®) is a peak employer organisation representing traditional, innovative and emerging industry sectors. We have been acting on behalf of businesses across Australia for nearly 150 years.

Ai Group is **genuinely representative** of Australian industry. Together with partner organisations we represent the interests of more than 60,000 businesses employing more than 1 million staff. Our members are small and large businesses in sectors including manufacturing, construction, engineering, transport & logistics, labour hire, mining services, the defence industry, civil airlines and ICT.

Our vision is for ***thriving industries and a prosperous community***. We offer our membership strong advocacy and **an effective voice at all levels of government** underpinned by our respected position of policy leadership and political non-partisanship.

With more than 250 staff and networks of relationships that extend beyond borders (domestic and international) we have the **resources and the expertise** to meet the changing needs of our membership. We provide the **practical information, advice and assistance** you need to run your business. Our deep experience of industrial relations and workplace law positions Ai Group as **Australia's leading industrial advocate**. We ***listen*** and we ***support*** our members in facing their challenges by remaining at the cutting edge of policy debate and legislative change. We ***provide solution-driven*** advice to address business opportunities and risks.

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Executive Summary

Australia has a strong national interest in successful global efforts to limit climate change; in contributing to that success by achieving net zero emissions by 2050; in safely managing the change we cannot avoid; and in increasing our competitiveness and shared prosperity in the process. We have opportunities to emerge strongly from the pandemic through reform and investment across energy and the clean economy – or the risk of a reversion to uncompetitively high energy costs if we do not manage well.

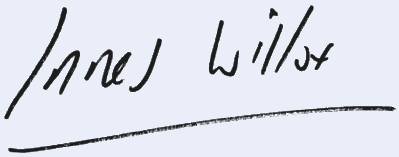
It is fundamentally important that we inform economic policy and reform across multiple portfolios by adopting a clear, agreed and national vision for successful transition to net zero emissions. Setting that vision will help the development of robust and pro-competitive strategies for gas, electricity and a broader clean economy.

For gas, Australia's strategy should include facilitation of new supply options that make long-term sense; expansion of alternative fuels including biogas and hydrogen; a heavy focus on demand reduction through gas efficiency and electrification; and continued policy reform to promote a competitive and secure local market.

Achieving competitive, reliable and clean electricity requires that we renovate our power markets; enhance our electricity networks; de-link power prices from volatile fuel export prices; manage coal closures effectively; improve energy productivity and management across the economy; aim for globally competitive costs for energy infrastructure delivery; and close the emissions gap in electricity market designs and policies.

Building a broader clean economy demands that we develop clear and practical transition pathways across all sectors; ramp up platforms for supporting clean economy innovation and cost reduction; build a policy suite to drive mass take-up when improved technologies and practices are ready; and manage risks to our existing exports through economic hedges, a more diverse economy and fair transition and opportunity for communities, workers and supply chains.

All that is a tall order, but well within the capabilities of a talented and richly endowed country – and strongly in the interest of a nation whose future prosperity requires both success on climate and a new energy advantage.



Innes Willox

Chief Executive

Australian Industry Group

PART ONE

1. Analysis

The domestic and international effects of the COVID-19 pandemic have had impacts on energy prices and emissions that look positive at first glance – a pre-existing decline in wholesale electricity prices has steepened; a global oil price crash and weak East Asian gas demand have pushed spot gas prices far down; and early signs are that global and Australian greenhouse gas emissions have been significantly depressed. However, all these effects appear temporary or come with significant baggage. Australia's long-term interest in a global energy advantage and a successful transition to net zero emissions require continued attention and action on these issues. There are opportunities to advance these long-term goals while also speeding recovery from the economic effects of the pandemic.

1.1. Gas

Before the crisis Eastern Australia's export-dominated gas market was expected to sustain wholesale gas prices of $8-$12 per gigajoule over the long term, rather than the historic $3-$4/GJ average. This reflected both the rise in production and transport costs as cheaper conventional supply was replaced by more remote coal seam gas without associated oil, and the expected range of parity with exports to East Asia. The latter historically reflected a link to oil prices. In recent years a more competitive market for Liquefied Natural Gas (LNG) may have started to weaken this link.

"Gas is very unlikely to remain cheap in Eastern Australia, and there is significant risk of a fresh price crunch."

Oil prices have collapsed in the face of excessive supply, price wars and the steep decline in personal transport and aviation during the pandemic. International spot gas prices have likewise plunged, and many LNG customers appear to be rejecting cargoes. With excess local supply and lower export parity, Eastern Australian spot gas prices have fallen to around $4-$4.5/GJ. Firm contract prices have not fallen as far – early feedback is around $6-$7/GJ and terms of no more than 1-2 years, since suppliers hope for a price recovery and do not wish to lock in lower prices now.

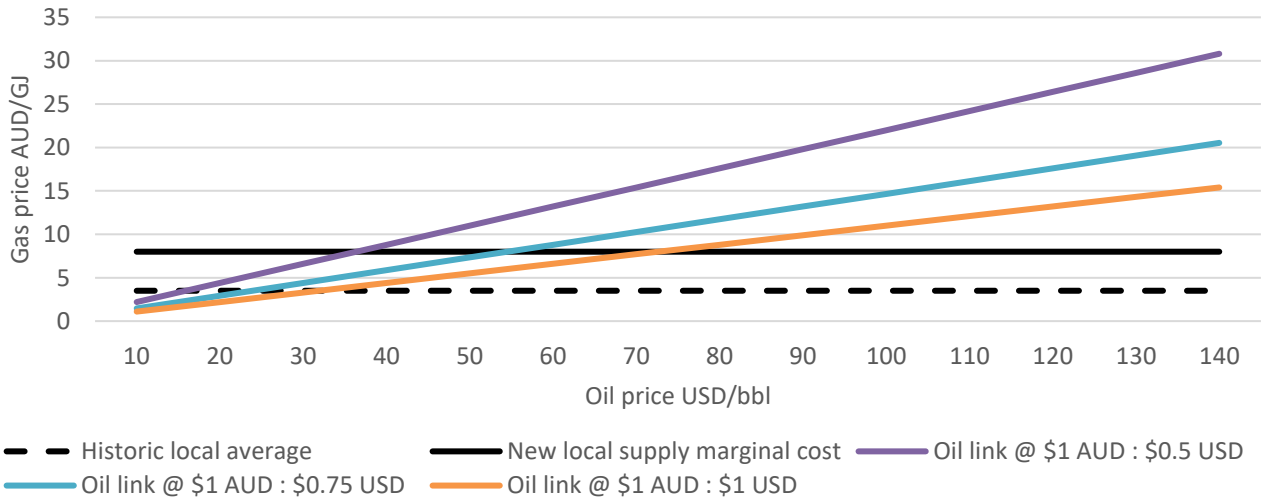


Figure 1 - Relationship of international oil prices and Eastern Australian gas prices at indicative exchange rates (Ai Group)[1]

[1] In the past decade international oil prices have ranged from over USD$100/bbl. (in 2014) to below USD$20/bbl. (in early 2020). Oil major BP recently reduced long-term oil price expectation to around USD$55/bbl.; if realised and if oil-linkage remains an important basis of gas

There is every reason to expect that gas prices will recover eventually to the previously expected $8-$12 range. Existing supply is declining, and new supply must at least expect to recover its production and transport costs. Eastern Australia's geology has not improved: unconventional gas resources largely have no oil, require numerous and frequently replaced wells to extract, and are mostly distant from existing demand centres. LNG export capacity is large enough to potentially absorb much more supply, making the export price critical to the price expected from domestic customers. International oil and gas prices are likely to normalise in coming years as supply exits and demand recovers with economies. Economic recovery investments are very unlikely to alter these fundamentals (see 2.3.2).

Eastern Australia could face even higher gas prices if supply falls short of demand. Conventional oil and gas production in the Bass Strait is declining fast; unconventional production requires regular investment to sustain; and the global oil and gas industry is slashing exploration and development budgets to survive. Pre-crisis the Australian Energy Market Operator modelled a growing gap between expected demand and committed supply over the next few years. Some of the anticipated supply investment may now be cancelled or significantly deferred.

In short gas is very unlikely to remain cheap in Eastern Australia, and there is significant risk of a fresh price crunch where prices surge above export parity – as in 2017.

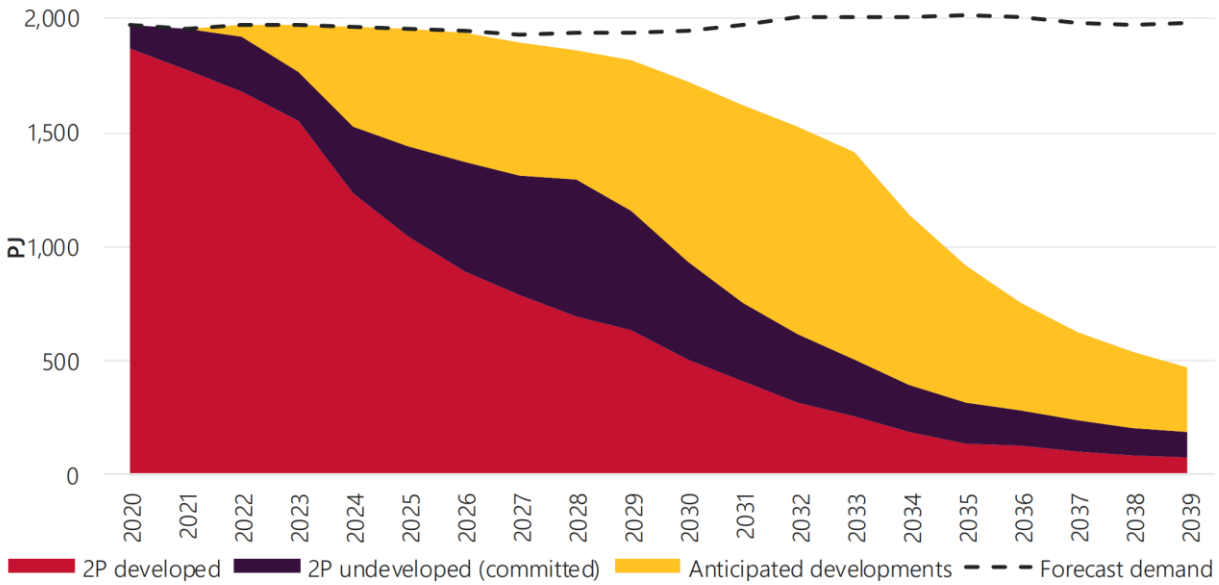


Figure 2 - Projected eastern and south-eastern Australia gas production (export LNG and domestic) – existing projects, and committed and anticipated developments; Central scenario, 2020-39 (AEMO)

pricing in East Asia and Eastern Australia, this would imply Eastern Australian gas prices around AUD$8-12/GJ, depending on prevailing exchange rates.

1.3. Electricity

Electricity prices had long been expected to fall as new largely renewable supply eased the tight post-Hazelwood market. Falling gas prices appear to have accelerated this over the past year, with electricity futures prices now as low as they were under the former Carbon Pricing Mechanism.

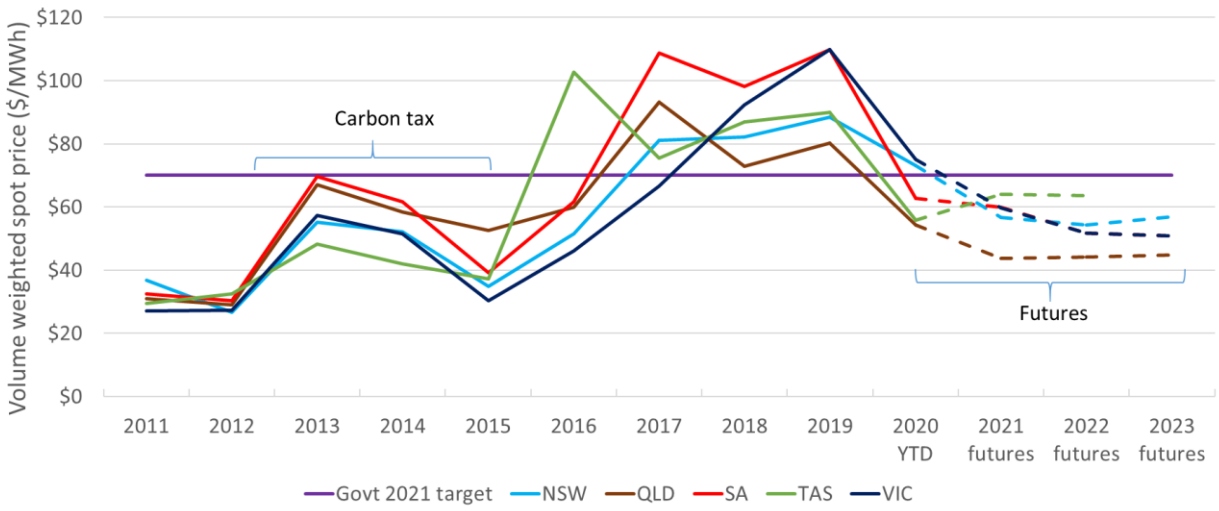


Figure 3 - NEM wholesale electricity prices - historic and futures as at June 2020 (AEMO, ASXenergy)

Reliability also looks relatively comforting, with all jurisdictions projected to meet the standard over the coming decade and a range of additional assets and policies being put in place to provide additional assurance. However, there are four price risks to electricity users.

Firstly, while the volume of energy supplied by gas generation has declined sharply in the face of zero-marginal-cost renewables, as long as flexible gas remains important to balance the market and influence prices and bidding, rebounding gas prices may drive electricity up.

Secondly, relatively lower wholesale prices and growing renewable supply may accelerate the retirement of old coal-fired generators, which are physically inflexible, have significant operating costs and require ongoing investment to remain operable. Well-managed retirements with adequate replacement resources should present no problem, but if exits are too chaotic or market and policy uncertainty inhibit replacement investment, we could see a very tight market again.

> "Well-managed generator retirements should present no problem, but if chaos or uncertainty inhibit investment, power could be very tight again."

Thirdly, over the long-term consumers will bear the costs of the assets needed to meet demand. Wind and solar are cheap and getting cheaper, but they also require complementary investments in transmission, network strength and flexible resources to match their variability. While it looks very likely that bulk energy will be dominated by renewables, it is not yet clear what mix of supporting resources will be best, whether other low- or zero-emissions generation will be required, or what the total systemic cost of all this may be.

Fourthly, the intense focus by governments on boosting electricity reliability may lead to excessive costs. The existing wholesale reliability standard requires an expected outcome of no more than 0.002% unserved energy (USE). Even stricter expectations are beginning to be reflected in policy,[2] despite the lack of enthusiasm from energy users and the fact that

[2] The former COAG Energy Council agreed measures in March 2020 aimed at ensuring no more than 0.0006% USE in any region in any year, to last at least until 2023. The NSW Government is introducing an Energy Security Target aimed at having sufficient capacity to meet 1-in-

nearly all supply interruptions relate to disruptions in local distribution networks rather than supply shortfalls. The costs of higher levels of redundancy will ultimately fall on energy users.

1.4. Emissions reduction

Australia's overall greenhouse gas emissions appear to have levelled off in recent years after earlier falls, with a cleaner electricity sector and drought-struck agriculture offset by growing emissions from transport and the LNG industry. Future emissions projections have been repeatedly revised down as past assumptions about economic growth rates, the energy intensity of growth and the emissions intensity of new energy have changed. Prior to the pandemic it was still likely that projections would reduce further with additional technological and economic change, and if new State or Federal policies were introduced. However, Australia appeared set to rely heavily on the carryover of old Kyoto Protocol credits to bridge the gap between projected emissions and the carbon budget associated with our current national commitment to reduce emissions to 26-28% below 2005 levels by 2030. And extrapolating forward from that target trajectory, Australia was far off course to the widely supported goal of net zero emissions by 2050.

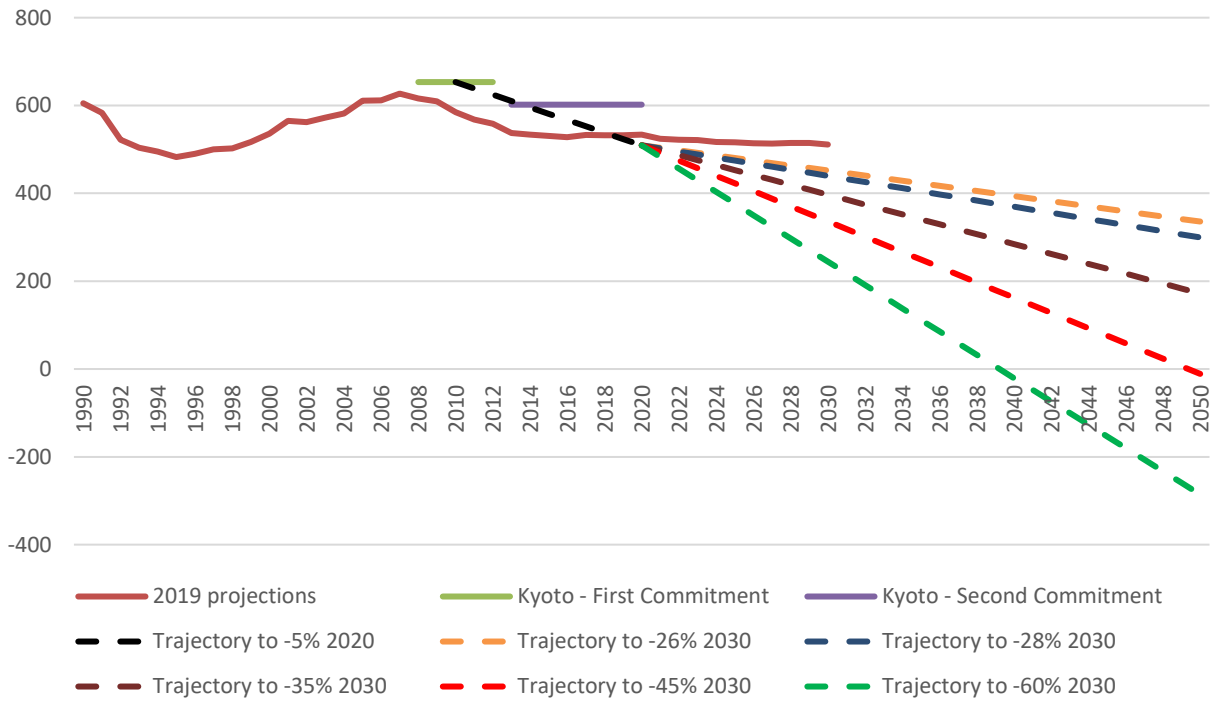


Figure 4 - Australian emissions, projections and alternative targets (DISER, Ai Group)

The pandemic has radically reduced emissions from personal transport and aviation; beyond the public health crisis it is plausible that videoconferencing and work-from-home will be a new normal for many people and that transport demand will not fully recover. Power emissions are down further, though more from the continuing rollout of renewables than from so-far only slightly lower demand. A pandemic recession will reduce many sources of emissions, though our declining emissions intensity means the general fall in emissions will be much less than the fall in overall economic activity.

While the Commonwealth's reliance on Kyoto credit carryover may not be tenable, faster than expected economic change; the impacts of the pandemic; and growing State action are likely to be significant. The net effect is that it is plausible that Australia will meet its current self-defined national emissions budget to 2030.

However, there are at least three reasons for continued concern and focus on emissions.

10-year demand levels if the State's two biggest generation units are out of service. Both NSW and COAG EC seek to contain the costs of pursuing these goals.

Firstly, much of the current fall in emissions is temporary and will be reversed as the domestic and international economies recover. Emissions may even rise above 'business as usual' levels if we experience elevated 'catch-up' growth or Australian and East Asian recovery investments drive demand for high-emissions activities.

Secondly Australia's overriding climate challenges are to avoid as much climate change as possible, by encouraging a global transition to net zero emissions by 2050; to adapt to the serious impacts of the climate change we can't avoid; and to ensure competitiveness, prosperity and fairness while doing so. Many economic sectors still lack a clear transition pathway, and a temporary emissions slump does not bring them any closer. Our climate adaptation challenge is also large and growing, as emphasised by a horror 2019-20 summer of heatwaves, fires and coral bleaching.

"Australia is far off course to the widely supported goal of net zero emissions by 2050."

Thirdly there is a risk that the pandemic and recession cause emissions policies to lose traction and fail to drive long-term abatement, increasing costs through missed opportunities, stranded assets and the lock-in of higher emissions. Existing reform processes, such as efforts to update the Safeguard Mechanism and consider crediting below-baseline emissions, are understandably likely to be delayed. Many businesses, investors and governments will be cautious about investment given lost income and economic uncertainty. Policy-makers may bank temporary emissions reductions and relax, rather than using them as a platform for deeper transition; this is particularly likely if we focus on interim 2030 goals rather than the long-term drive for net zero emissions. Consequently, Australia would lose precious time and risk the misallocation of investment. The costs could be severe, whether they fall on investors or all Australians.

1.5. Implications

Given the challenges we face in gas, electricity and climate, Australia needs a strategy that maintains focus on our long-term needs: a net zero emissions world where climate change is limited and manageable, and a dependable energy system that gives Australia competitive advantages in that world. While some necessary steps will only pay off over many years, we should be especially alive to energy transition options that also deliver immediate benefits for economic sustainment and recovery.

PART TWO

2. Action

2.1. Overall

Australia should pursue a successful transition to net zero emissions by 2050 as an organising goal with implications across all policy areas, not just energy. There are several components to this.

2.1.1. Net zero vision

Climate change is a large and intensifying threat to Australians. It is in our national interest to drive successful global efforts to limit climate change; to contribute to that success by achieving net zero emissions by 2050; to safely manage the change we cannot avoid; and to increase our competitiveness and shared prosperity in the process. Building a new energy advantage is critical to seize new opportunities while ensuring a fair and successful transition for existing industries, workers and communities. Achieving this vision requires coordination across all areas of public policy and investment.

Australia's Long Term Strategy for emissions, in development now for release before the COP26 climate summit now set for late 2021, is an excellent opportunity to articulate this vision and address many of the energy and clean economy issues canvassed elsewhere in this paper.

2.1.2. Policy approach

Energy policy should be organised around the pursuit of long-term competitive advantage in a net-zero emissions world, which can support expansion of energy-intensive industries.

The climate policy principles agreed by Ai Group and the Australian Climate Roundtable provide important guidance for climate policy development. They address effectiveness, efficiency, fairness, trade competitiveness and more.

Climate policy also needs to be calibrated to ensure it advances steadily towards the long-term goal, rather than relaxing or tightening spasmodically as interim targets appear easier or harder to meet.

Near term measures to accelerate Australia's recovery from the economic consequences of the pandemic should be developed and implemented with an eye to our long-term needs, including on climate. Measures should avoid locking in higher-emissions pathways and seek to cut the cost and accelerate the pace of successful transition to net zero emissions where possible.

"Energy policy should be organised around the pursuit of long-term competitive advantage in a net-zero emissions world."

2.1.3.Plausible pathways to net zero

We know we *can* achieve this vision – Australia has a wealth of energy resources and there are many practical options to decarbonise our economy. But we do not know how we *will* achieve it – which combination of options will turn out to be best. It is important to acknowledge the inevitability of surprise and keep policy and strategies open to unexpected shifts in technology, practices and markets. A combination of technology-neutral policy mechanisms and bet-spreading investment portfolios is needed. Nonetheless, a prosperous net zero emissions economy in 2050 could look like the following:

Electricity

The electricity sector could be several times larger than today as many energy-intensive activities and exports electrify. Extremely cheap but variable renewable energy is likely to dominate bulk energy, supported by geographic dispersion, technological diversity and many forms of flexible resource on both the supply and demand sides, connected by smarter and capable transmission and distribution networks: large- and small-scale battery systems, pumped hydro, demand management, and backup generation from biogas, biomass or hydrogen. Nuclear energy or fossils with carbon capture and storage could play important roles if innovation can reduce their costs substantially and if the integration costs of additional variable renewables begin to outweigh their value above a high penetration threshold.

Heating

Some residential, commercial and industrial heating needs will be electrified, such as through reverse cycle air-conditioning, induction cooktops and high-temperature heat pumps. Other needs, particularly for very high temperatures or with strong seasonal peaks, will best be met through combusting clean fuels that may include biogas and hydrogen. Greater efficiency and thermal performance in buildings, and higher average temperatures, will moderate total heating needs.

Industry

Beyond broad industry needs for reliable affordable power, heat and transport, a range of important subsectors will operate differently to today. Aluminium made with inert anodes can be as clean as its power source. Cement can be made with CCUS and many other potential improvements. Chemicals and plastics can be made with inputs like hydrogen, biogas, biomass and synthetic hydrocarbons; ammonia for fertiliser and explosives already requires hydrogen as an input. Steel can be made cleanly using hydrogen, carbon capture and utilisation or storage (CCUS) or biochar. Total Australian output in these industries may expand substantially as we build a clean energy advantage. A more circular economy with higher levels of recycling and resource recovery will moderate demand for primary energy-intensive materials. Innovative materials including cross-laminated timber and carbonated minerals may compete with existing materials while durably sequestering carbon.

Land and agriculture

The land sector becomes a strong net carbon sink. Reforestation, commercial forestry and advanced bioenergy crops expand, particularly on marginal land. Improved soil management, livestock management and agricultural practices predominate. Livestock methane is sharply reduced through feed supplements, vaccines and breeding. Australia becomes a strong producer of plant-based and cultured meats.

Transport

Some transport needs will be displaced by improved technology and social acceptance for telepresence and telecommuting. Battery-electric technology will predominate in lighter vehicles and over moderate distances, while hydrogen-electric, biofuels, liquid hydrogen or synthetic fuels will be relevant for heavier or longer-distance land, sea and air travel and freight.

2.3. Gas

Natural gas is an important part of Australia's economy today, as a fuel for dispatchable power; a heat source for industry and households; a feedstock for plastics and chemicals; and an export commodity. In the course of a transition to net zero emissions, Australia should minimise the exposure of our economy and society to risks from high gas prices or short supply with four steps:

2.3.1. Reduce gas demand

There are considerable and increasing opportunities to reduce gas demand across the Australian economy through improved efficiency and electrification, and these can play an important role in limiting gas market pressures and limiting the impact of future gas prices on businesses and households. Important steps include:

- **Electricity sector** – the ongoing growth of low-cost renewable energy has sharply reduced the volume of higher-priced bulk energy supplied by gas generators and this is likely to continue. However mid-merit and peaking generators still play an important role in supporting the grid and firming renewables, and in the process shape wider power prices. These applications require secure gas supply, though not necessarily large volumes. Improved technology, energy policy and market design should enable a wider range of resources to compete in this role, especially different forms of energy storage and demand response.
- **Energy efficiency** – useful upgrades could be made across Australia's private and public housing; commercial, community and government buildings; and industrial facilities. Improvements could include more efficient and controllable appliances and major equipment, especially for heating and cooling; improved thermal envelopes and shading; smart meters and sub-metering; distributed energy generation and storage; fuel switching; and the equipment, training and external advice needed for better energy management.

If done well, these investments would durably lower energy bills; ease strains on a rapidly changing energy system; improve health and safety during increasingly hot summers; boost the competitiveness of local manufacturers, whose value to Australia is clearer than ever; enable deeper emissions cuts – and sustain activity across a broad range of trades and industries.

Electrification should be coupled with other improvements to the efficiency of buildings, controllability of appliances and systems and incentives for energy management to ensure networks are not overloaded by spikes in peak demand. Seasonally flat loads should be prioritised until and unless concerns about full system costs of electrifying winter heating can be fully resolved.

"Energy efficiency upgrades are an enormous recovery and transition opportunity over the next two years."

Broadly distributed energy efficiency upgrades, including gas efficiency and fuel switching, are an enormous recovery and transition opportunity over the next two years. Policies to drive these upgrades should manage risk by building on existing delivery channels where possible (including State energy efficiency schemes and the Federal Energy Efficient Communities program); and by requiring use of appropriately licensed or trained workers and standards-compliant equipment. Strong upfront financial support is appropriate to unlock investment at a time when people and businesses will be naturally cautious about making new commitments. However, since efficiency projects have strong financial returns, government may be able to structure programs to recover the cost of support over time.

2.3.2. Sustain gas supply

Australia should encourage and facilitate additional gas supply options to meet expected demand in light of declining production from existing sources. Options should be facilitated where they make long-term sense considering their underlying cost to supply, the amount of capital at risk, and the associated production and consumption emissions; and where they can be developed with community safety and consent.

Forms of support could include improved regulatory regimes that offer timely and predictable decisions while protecting vital community interests; matchmaking with anchor customers; and potentially financial support that is competitively neutral and technology neutral. The present deep distress of the global and Australian oil and gas industries reflects high global supply, low demand and deep uncertainty; these underlying factors make private investment more difficult and public support riskier.

"No new gas supply options appear likely to sustain low prices in Eastern Australia."

There are a range of potential supply opportunities across Australia, each with strengths and weaknesses. None appears likely to sustain low prices in Eastern Australia, due to the combination of high production and transport costs for large options, low volume from potentially cheap options, and the overwhelming price influence of the export channel. Among the options:

- LNG import terminals are proposed in NSW and Victoria and may make increased sense in the current environment: they put very little capital at risk, are flexible for seasonal demand, and can ensure international pricing is a ceiling on local prices. However, they inherently offer no prospect of sustaining prices below international levels.
- Onshore production opportunities in Victoria and NSW will take years to develop and are too low-volume to transform the wider market but can ease supply risks. Improved regulatory frameworks and timely regulatory decisions are needed to ensure that where they make sense they can be pursued.
- Multi-decade megaproject options need a convincing rationale for their viability:
    - Price assumptions need to be credible in light of production and transport costs, the influence of international markets, the lack of reservations or price controls in Eastern Australia and the opacity of the never-enforced reservation in Western Australia.
    - Demand assumptions need to be credible in light of the barriers to expansion of gas-intensive activities. Most manufacturing is not gas intensive, some currently gas-intensive processes (such as milk powder production) are constrained by other supply- or demand-side factors rather than gas supply, and gas-intensive activities are likely to transition over time to electricity, biogas or clean hydrogen with different patterns of supply and demand. In power, 'baseload' combined cycle gas turbines are not competitive with existing coal fired generators even if gas prices were low. They would not repay their full cost to investors unless policy puts a strong value on their relatively lower emissions (see **Error! Reference source not found.**). Meanwhile flexible peaking gas generators are more competitive with other current options to firm cheap renewables, but their lower and more variable gas requirements may be a poor fit to underpin gas supply megaprojects.
    - Given likely local and global demand trends in a long-term transition to net zero emissions, dual-use infrastructure that can facilitate fossil methane in the nearer term and biogas or hydrogen in the longer term may have a stronger case.

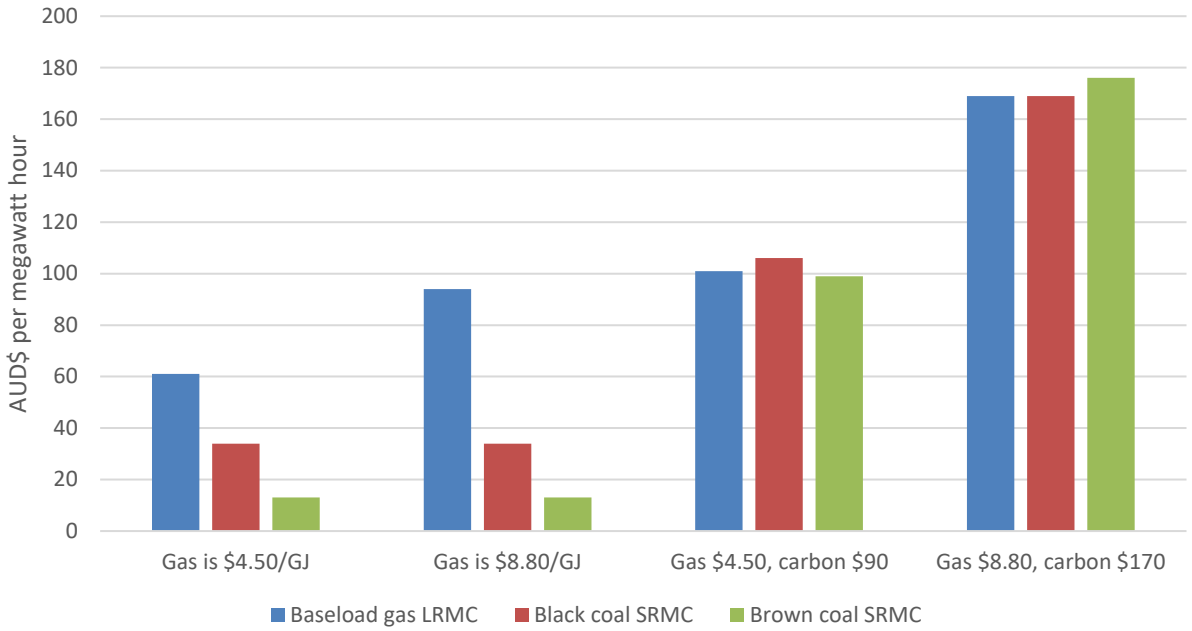


Figure 5 - Comparison of long run marginal cost (LRMC) of new baseload gas generation with short run marginal cost (SRMC) of existing black and brown coal generation (Ai Group)

2.3.3. Grow alternative supply

Alternative fuels can bolster or replace existing natural gas supply, including biogas produced from organic waste streams and energy crops; clean hydrogen produced from electrolysis ('Green H2') or fossil fuels with CCUS ('Blue H2'); and synthetic methane from power-to-gas. These may be very important to meet energy and feedstock needs in the long term, and there are near term opportunities to advance them.

- Biogas production from existing organic waste streams can have strong economics and the achievable volumes appear comparable to fossil methane resource options in NSW and Victoria. Biogas is fully substitutable with existing supply.
- Green H2 is currently expensive, but it can plausibly follow a comparable cost reduction pathway to wind, solar and batteries as global installed electrolyser capacity expands. With ambition and strong capital support significant Australian electrolysis projects could be activated within two years and would contribute to these cost reductions while building local experience and supply chains. Blue H2 supply projects may take longer to complete but can also be significant. H2 can relatively easily be blended into gas distribution networks up to around a 10% share before infrastructure and appliance upgrades are required. Industrial and other use of hydrogen is discussed further at 0 below.

Projects for alternatives to gas supply are an important recovery and transition opportunity in the next two years.

2.3.4. Drive better consumer outcomes through gas policy and market reform

Continued reform remains necessary to improve the transparency, security and responsiveness to national interest of our gas markets, which remain relatively opaque and immature compared to electricity markets. The Australian Competition and Consumer Commission's monitoring role is extremely important and has made a major contribution to public and private understanding.

The Commonwealth's existing emergency gas export control powers – the Australian Domestic Gas Security Mechanism – have not been triggered and appear unlikely to be triggered before their scheduled sunset in 2023. The ADGSM does play an important role in avoiding potential supply shortfalls and should be maintained at least until 2023.

The Commonwealth has announced a review of a potential forward-looking national domestic gas reservation policy.

Depending on design, a reservation might contribute to energy security and limit extreme price movements; curtail supply investment; or do nothing at all. A prospective reservation might take many years to have an appreciable effect on the wider market. This review should fully ventilate all options to safeguard Australia's energy users, including different forms of reservation; continuation of ongoing emergency export control; national interest assessment of new export capacity and gas production; and combinations of these options.

2.4. Electricity

Reliable electricity is crucial to all households and the continuity of all businesses, and electricity costs play an important role in household budgets and the competitiveness of many industries. Australia should maximise long-term opportunity in a net zero emissions world and reduce medium-term risks to electricity price and reliability by taking the following steps:

2.4.1. Renovate power markets

Existing electricity market designs and supporting policies need updating if they are to operate efficiently and attract efficient investment as the electricity system transitions to play its part in a net zero emissions economy. Designs and policies need to work together to:

- Integrate the expected mix of variable renewables and flexible resources, while being robust to technological and economic surprises;
- Coordinate and appropriately reward efficient use of distributed energy resources and demand response;
- Scale as needed if a net zero emissions economy requires a much larger electricity system; and
- Efficiently achieve a level of reliability that is valued by energy users, not absolute reliability.

It is essential that governments and stakeholders arrive at a consensus in the Post-2025 National Electricity Market (NEM) Design process, stick by the resulting design and calibrate their energy and climate policies to support it, reversing the recent trend of fragmentation and uncoordinated interventions.

"Consensus on the post 2025 National Electricity Market design is essential to halt fragmentation and uncoordinated interventions."

2.4.2. Enhance power networks

Improved and expanded transmission and distribution networks can help develop valuable new energy resources and increase resilience, but costs to energy users need to be commensurate with value. Key steps are:

- Continue to iterate the Integrated System Plan as our best shared platform for network development, acknowledging that pre-pandemic demand forecasts are outdated but that post-pandemic demand is highly uncertain;
- Refine our approaches to selecting and funding transmission infrastructure, currently including the Regulatory Investment Test - Transmission (RIT-T) and state-specific approaches, to ensure we develop useful infrastructure efficiently while protecting energy users' long-term interests;
- Use public finance and guarantees to facilitate development of transmission assets where they have high expected value in plausible but uncertain market scenarios, protecting energy users from undue cost and risk;
- Accelerate distribution network investments with long term value and recovery benefits through regulatory changes, public investments and financial guarantees as appropriate. Important elements include:
    - Migrating edge-of-grid customers to stand-alone power systems, microgrids or minigrids where this will save all parties money and increase resilience;
    - Accelerating the rollout of smart meters, which are necessary for improved energy services and full value

from distributed resources (but not sufficient – market design, pricing and regulatory reform are also critical);

- Improving bushfire safety and resilience across regional areas, especially those recovering from the 2019-20 summer fires.

There are large recovery opportunities among the above steps; transmission infrastructure is challenging to accelerate but important to facilitate other supply-side and demand-side activity. Public finance can ensure energy users do not bear excess cost or risk from any accelerated projects; it may be appropriate to swap such assets into Regulated Asset Bases once their utilisation and operational value has been confirmed. Since the value of emissions and abatement cannot currently be included in regulatory decisions on network assets, there is a role for additional public funding to reflect this value.

2.4.3.De-link power prices from gas prices

Given the likelihood that gas prices rebound from current lows, sustaining lower power prices depends on breaking the nexus between electricity prices and volatile prices for export gas (and export coal, which has also contributed to power price pressures in recent years). The best pathway to this is likely to be greater development of alternate resources that can provide flexibility, particularly demand response and energy storage, and of more geographically and technologically diverse renewables that moderate the amount of complementary flexibility required. Market design elements including the Wholesale Demand Response Mechanism and future Two-Sided Market are very important. Public incentives for the mass take-up of battery storage should be calibrated to ensure these provide value to the energy system as a whole, such as through participation in Virtual Power Plants or shared batteries integrated with distribution network operations.

2.4.4.Manage coal closures effectively

Reducing Australia's greenhouse gas emissions to net zero by 2050, on a pathway consistent with our fair share of global efforts to keep warming well below 2C, will entail earlier-than-otherwise closure of existing high-emissions electricity generators. If well planned and well implemented this transition should be manageable and create opportunity for energy suppliers, energy users, investors, workers and communities throughout Australia.

“Recent power station closures were bad experiences.”

However, the most recent closures were bad experiences. With inadequate notice for meaningful preparation, reduced power supply combined with surging gas prices to deliver high electricity prices and reliability risks that are only now moderating. Industry needs confidence that this experience will not be repeated and that future closures will not threaten the affordability, reliability or security of energy.

The following elements can give energy users, suppliers, workers and communities confidence in future closures:

Adequate replacement energy	In most parts of Australia current coal-fired power stations generate enormous volumes of bulk energy, at short-run marginal costs that are often low (though rising over time where coal is exposed to export market pricing). Projects need to be in place to deliver similar volumes from the lowest-cost new sources. For example, efficiently developed Renewable Energy Zones could unlock a diversity of low-priced energy resources.
Adequate replacement flexible capacity	While variable renewables may supply most new energy, we need complementary dispatchable resources to ensure that energy is available when required at an overall cost that is competitive. For example, gas peakers currently play this role, while demand response, distributed energy resources, and major pumped hydro projects may be the most cost effective in future.
Adequate supporting infrastructure	New and upgraded transmission, interconnectors and essential system services are needed to bring the above resources to market.
Time to respond	Adequate replacement resources will take time to deliver, especially for transmission and some dispatchable resources. Several years' notice is needed between confirmation and completion of closure.
Investment grade policy	Without clear and reliable market rules and public policies working together, the investment required for the above resources will not flow fast or far enough. Confidence and clarity are needed on the timing and drivers of closure and the treatment of new investment.
Equity	Workers, communities and supply chains impacted by the closure of old generation need fair treatment and support for a successful transition to new opportunities.

Governments should give industry and other stakeholders confidence in the above through their own policies, intergovernmental cooperation, and collaboration with the energy market authorities, energy suppliers and energy users.

2.4.5.Improve energy productivity and management

As addressed in greater detail under section 2.3.1, investing & incentivising for a substantial increase in demand-side efficiency and energy management across all sectors would have extremely large benefits for economic recovery, energy transition and the comfort and financial security of Australian households and businesses.

2.4.7.Close the emissions gap

Current national and State policies, electricity market designs and reform efforts typically assume that a low-emissions energy transition will occur and may encourage individual technologies or projects consistent with this. However overall policy and market designs do not consistently reflect the value of emissions and abatement in operational and investment decisions. The Renewable Energy Target was a partial though imperfect solution, but with the large-scale component met and the small-scale component phasing out its influence is now limited. There is a serious gap in the market, particularly given the scope of the net zero task and the room for uncertainty about technological and market trends. The specifics of climate policy ambition and mechanisms can make an enormous difference to the expected returns of a given power project (see Figure 6). Climate policy will also help determine how rapidly older high-emitting generation retires. Deep uncertainty about these settings is a major barrier to new investment and adds greatly to the risk premium, ultimately increasing costs for electricity users.

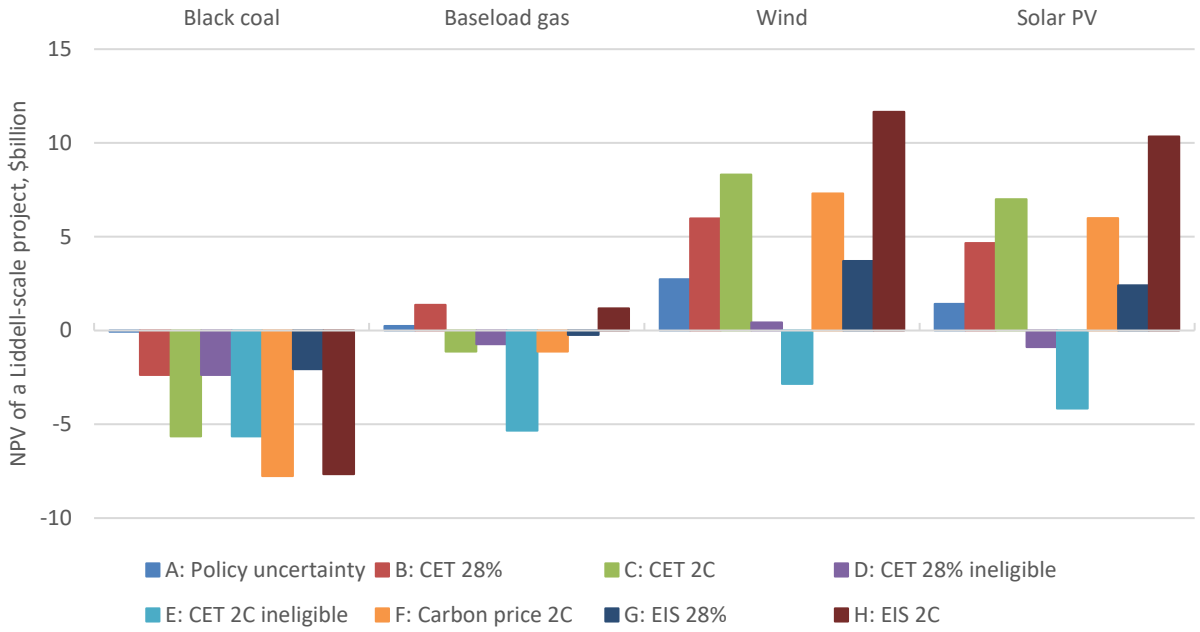


Figure 6 - Estimated net present value of hypothetical generation projects varies hugely under different policy scenarios (Ai Group)[3]

There are many ways of correcting this gap – whether technology-neutral or technology-specific; electricity-only or multisectoral; using standards, credits, charges, or otherwise. Ai Group believes that measures for market-wide mass rollout of low-, zero- and negative-emissions technologies will be most efficient when they are technology-neutral, offering incentives or disincentives to all technologies in proportion to their performance. It may be desirable to connect emissions policy, recovery stimulus and long-term tax reform: the economic situation will require fiscal expansion for some time, but eventually consolidation will be needed.

“Deep uncertainty about future climate policy settings is a major barrier to new investment in power.”

Whatever the specific solutions chosen, the absence of a coherent policy driver of electricity sector emissions reductions leaves the power system more open to inefficiency and perverse outcomes. For example, energy storage helps achieve more value from any inflexible generation source. In the absence of a systematic value on emissions, increased storage could just

[3] The chart depicts 2017 estimates of the net present value of different potential generation projects, sized to replace the energy from the Liddell Power Station, under different scenarios for climate policy design and ambition. For more detail see https://blog.aigroup.com.au/why-the-fuss-about-climate-policy-certainty-for-the-electricity-sector/.

as easily increase output from the highest-emissions generation as from the lowest.

2.4.8. Aim for globally competitive costs for energy infrastructure delivery

Most of the cost of new electricity infrastructure is in capital expenditure rather than operating costs. This is particularly so for wind and solar photovoltaics, which have zero fuel costs. Australia will benefit from, and can to some extent contribute to, global reductions in technology costs through learning, scale, materials efficiencies and so on. But to translate Australia's strong energy resources into globally competitive energy prices we will need to construct energy infrastructure at a pace and cost that is at least comparable to our peers.

> "To turn Australia's resources into globally competitive energy prices we need to construct energy infrastructure at a pace and cost at least comparable to our peers."

Contributors to the cost of new construction include finance costs; construction sector productivity; and the regulatory environment.

Finance costs can be significantly reduced by easing uncertainty over electricity market design (see 2.4.1) and electricity sector climate policy (see 2.4.6). The impact of market design choices on finance costs, and hence final costs to energy users, should be prominently considered in the NEM process.

The productivity of the engineering construction sector is the outcome of technology, practices and workplace relations. There have been tensions between unions, governments and the energy sector as recent electricity projects have rolled out. However ultimately a lower cost and faster rate of delivery can underpin both more energy projects and more employment growth in energy-intensive industries. Maximising productivity in the construction of new energy projects should be a key focus for collaboration between unions, governments and business, and adds an important dimension to the wider industrial relations reform discussions now underway.

Other policy settings can influence the speed and cost of project delivery. For instance, the recent extension of Foreign Investment Review Board scrutiny to a much wider range of investments threatens to slow down many job-creating projects across Australia unless decisions can be greatly expedited. More broadly, planning and environmental approval regimes need to provide timely and predictable decisions that are seen to be legitimate and hence likely to stand.

2.5. Clean economy

Successful transition to a competitive net-zero economy extends well beyond electricity and gas, to industry, transport, agriculture and more. Transition to a clean economy will require pathways, platforms and policy.

2.5.1. Pathways

While the electricity sector is increasingly confident of its future in a net-zero world, the transition options for many activities are not yet as clear. Ongoing work by industry, government and the community to illuminate what can be done and guide policy and investment. The discussion paper for the Commonwealth's Technology Investment Roadmap appears to be a strong contribution, foreshadowing an ongoing iterative process to assess options and progress. The Roadmap will benefit from a sharper vision statement that Australia's national interest lies in global success in limiting climate change through net zero emissions by 2050; and in building global competitive advantage in a net zero emissions world. A range of other public and private Australian and international initiatives will also help chart our course. One is the Australian Industry Energy Transitions Initiative, an industry-led collaboration in which Ai Group and some of our leading members participate.

2.5.2. Platforms

Infrastructure, funding and finance for innovative low- zero- and negative-emissions technologies are critical to

commercialise options, reduce their costs and ready them for scale.

The Australian Renewable Energy Agency (ARENA) and Clean Energy Finance Corporation (CEFC) have been successful institutions in this regard over the past decade and should be continued and expanded to drive broader clean economy progress over the coming decade. It is appropriate to expand their technological and sectoral scope to ensure they can address all relevant tools towards net zero emissions by 2050.

However, the funding and finance at the disposal of ARENA and CEFC will need to expand likewise to meaningfully address a broader remit; Ai Group supports fresh funding for ARENA in particular of at least $3.3 billion over ten years. If ARENA or CEFC are asked to administer or guide further specific recovery investments in the near term, given their relevant expertise, this should involve additional funding. Some activities, like agricultural innovation, may be far outside the existing expertise base of both organisations; whether these are covered by investing in the institutions' capability or by setting up equivalent institutions, it is critical to address all major economic sectors and sources of emissions. Continuing existing strong governance and maintaining autonomy within a clear overall net-zero mandate are important to ensure funds are allocated sensibly.

Physical infrastructure is also an important part of net zero innovation. Transmission and interconnection can unlock new kinds of generation and energy project, including novel energy-intensive industries. Hydrogen infrastructure supports development of a hydrogen economy. Carbon capture, utilisation and storage infrastructure is necessary to unlock considerable emissions reduction and negative emissions potential.

2.5.3.Policy

Pathways and platforms are important to bring low- zero- and negative emissions options forward and lower their costs, but they do not substitute for climate policy mechanisms to drive efficient mass uptake and scale-up while preventing loss of trade competitiveness.

"Technology investment platforms are important to lower costs, but do not substitute for policy mechanisms to drive mass uptake."

Some clean technologies appear highly price-competitive with high-emitting options even without placing a value on emissions – variable renewables have become extremely cheap and both batteries and light battery-electric vehicles look set to become so. However, other options may always involve some degree of cost premium; for instance, conducting industrial or power generation activities with carbon capture and storage is inherently more expensive.

More fundamentally, emissions reduction and sequestration have a value derived from the impacts and risks of climate change that we wish to avoid. Unless we recognise that value and embed it in policy instruments, emissions will not reduce as far or as fast as is in Australia's national interest. As discussed at 2.4.6 above in the electricity sector context, there are many ways to drive mass emissions reduction and sequestration, including both packages of more numerous and specific instruments and systems of fewer broad-based mechanisms.

Building on the existing Safeguard Mechanism as a long-term abatement driver for large-emitting facilities is an important option. There are real advantages in modifying already-familiar structures rather than developing new systems from scratch. The Government recently accepted a King Review recommendation to introduce crediting for Safeguard facilities that reduce emissions intensity below baseline. While complex to implement, this could ultimately drive substantial abatement supply if there is demand. Gradually lowering baseline intensities is a logical way to do this, but this would need to be accompanied by measures to ensure the competitiveness of trade exposed industries is maintained.

Other existing and proposed mechanisms, including government purchase of Climate Solutions Fund credits and the goal-oriented technology co-investment program recommended by the King Review, can make a useful contribution in the near and medium terms. However, a pure public-funding approach is unlikely to be efficient or fiscally acceptable for mass scale-up and ongoing sustainment of a clean economy over the long term. As noted above, drawing together emissions policy, recovery stimulus and long-term tax and fiscal reform may suggest pathways to make climate policies budget-neutral over

time.

2.5.4. Opportunities

There are numerous specific opportunities to build a clean economy, including some already partially addressed above.

Fostering a hydrogen economy should be a high priority and public investment should ramp up considerably from the levels contemplated when the National Hydrogen Roadmap was adopted pre-pandemic. On the production side, electrolysis is a big opportunity, but initial investments are necessarily expensive when measured in cost per unit of output. Their real value lies in accelerating learning and scale to drive down future capital costs. A substantial investment in electrolysis capacity now will have large long-term benefits and drive deeper local content and supply chains, though Australia should also encourage global investment in capacity. Blue hydrogen with CCUS has cheaper early potential, and while it appears unlikely to dominate in long term there are useful opportunities to pursue and kickstart the local hydrogen economy. Hydrogen production is an important recovery investment opportunity.

On the hydrogen demand side, gas network blending as previously discussed is a large and useful early opportunity, though it is unclear what mix of hydrogen, biogas and electrification may be most efficient for existing gas users in the long term. Supply to ammonia producers is achievable with some demand-side investment but the economics are highly dependent both on the price of hydrogen and the impacts of gas prices on the overall viability of the chemicals sector. Usage in steelmaking may be very important in the 2030s but is unlikely to scale in the next few years. Transport applications are likely to be strongest in heavier and longer-range contexts. Exports are ultimately the largest long-term Australian hydrogen opportunity, whether directly or as an input to energy-intensive export commodities like steel.

Carbon capture and utilisation or storage does not currently look likely to be a competitive technology in electricity generation, but it remains a very important option to address heavy industry emissions, alongside hydrogen, bioenergy and electrification. Co-investment in CCUS innovation is important, particularly for novel contexts and utilisation in durable materials, but ultimately the main barrier to uptake of CCUS over the past two decades has not been technology or assistive funding, but the lack of durable long-term policy frameworks to value emissions and underpin investment decisions on very long-lived assets. Without a strong price signal of some sort, CCUS is unlikely ever to be competitive with high-emitting technologies.

"Without a strong price signal of some sort, Carbon Capture, Utilisation and Storage is unlikely ever to be competitive with high-emitting technologies."

Transport electrification and hydrogen integration needs major focus, particularly given the parallel concern over Australia's lack of transport fuel security. There is substantial potential for recovery activity across Australia by supporting installation and provisioning for electric vehicle charging (and where appropriate hydrogen fuelling, with a focus on heavy vehicles), including in public parking lots, shopping centres, apartment complexes and service stations along major routes. Public charging complements home charging and addresses range anxiety, easing take-up; while clean vehicle costs are declining sharply and model variety is increasing globally, local Australian access and take-up is well behind. Clean vehicle incentives are worth considering, particularly if overall new vehicle sales remain depressed, and public fleet procurement can provide demand certainty and get more models available in Australia. Vehicle efficiency standards are worth reconsidering but agreed implementation may take much longer than more specific incentives. Electrification will increase overall electricity demand but impacts on peak demand and network infrastructure depend on how intelligently charging is managed; energy management infrastructure, tariff reform and market reform all have critical roles.

Agriculture and the land sector have the potential to be substantial net emissions sinks. Reforestation and improved management of soil and livestock are encouraged by the existing Climate Solutions Fund. The improvements adopted in the King Review response will increase potential activity and credit supply if matched with expanded demand through greater public purchasing, private local demand if the Safeguard Mechanism becomes an abatement driver, and international demand if Australia legislates to allow export of abatement and can reach Paris Agreement-compliant linkage arrangements with other countries.

Further opportunities worthy of substantial co-investment and development effort include a multitude of techniques to reduce livestock emissions through feed supplements, vaccines and new breeds; and developing Australia's potential as a supplier of feedstock for, and processor of, plant-based meats. The strong recent growth of global demand for the latter may be less a threat to animal husbandry than an opportunity for enhanced growth and value-add in horticulture and manufacturing.

2.5.5.Managing risks around Australia's fossil exports

Exports of thermal coal, metallurgical coal and natural gas are important to Australia's economy today and support significant employment and public revenue; however scenario analysis from the International Energy Agency and other experts make it clear that successful global efforts to contain climate change will entail dramatic reductions in fossil fuel demand over coming decades. The fate of our exports ultimately rests with our customers overseas. Decisions in China, India, Japan and elsewhere about the future of their energy systems will determine the level of demand for these resources. Australia cannot control those decisions, but we can be ready for them by taking the following steps:

Develop economic hedges

Australia has bright prospects for energy-intensive industries in a decarbonising world. The potential demand for clean products including hydrogen and green metals is both very large and likely to be inversely proportional to fossil demand. Seizing these opportunities will protect Australian prosperity.

Diversify our economy overall

The relatively large role of the resources sector in recent Australian growth has brought important benefits, but also left us highly exposed both to short-term fluctuations and long-term megatrends that affect prices and volumes for resources. Growth and opportunity across sectors and supply chains not directly connected to resources is essential to maintain diversity and resilience. A vibrant growing and innovative manufacturing sector is an important part of this vision; see also Ai Group's companion paper on industry development.

Fairly manage transition for affected workers, communities and supply chains

Even if Australia's macroeconomy becomes resilient to a decline in demand for our fossil exports, we will still need a close focus on good outcomes for the most intensely affected workers, communities and supply chains. Recent research indicates that some of the biggest clean economy opportunities are a good geographic and skills match for current fossil industry centres. Even if so, bringing about a fair and successful transition for these regions will require notice, full engagement and coordination across the policy agenda.

"The fate of Australia's fossil exports rests with our customers. We cannot control those decisions, but we can be ready for them."

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