GRATTAN Institute

Seizing Australia's hydrogen opportunities

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Overview

Hydrogen offers two historically important opportunities for the Australian economy and the environment.

The first is the opportunity to revitalise and expand export-focused manufacturing, based on globally competitive renewable hydrogen, to produce and export green iron and steel, alumina, and ammonia.

These sectors have three characteristics shared by other difficult-to-decarbonise industrial activities. First, they require technology developments that are inherently risky, a boundary rarely crossed by markets alone. Second, carbon uncertainty raises those risks. And third, we need a historically rapid structural transformation that is poorly aligned with the nature of the investment risks.

Together, these elements provide a case for a 21st Century industry policy, characterised by sustained collaboration between the public and private sectors. This requires clear sectoral goals, strong commitment to the revised Safeguard Mechanism, and targeted and sustained investment in those hydrogen applications that are export oriented and will grow in a net-zero global economy. Previous Grattan reports have described this approach to industry policy in more detail.

The second opportunity is decarbonising several sectors where electricity can't do the job – high-temperature heat for industry, chemical feedstock, heavy-vehicle transport, and possibly balancing a high-renewables power system.

The recently announced sectoral decarbonisation plans should include the policy mechanisms to support the most effective role for hydrogen. That means the revised Safeguard Mechanism as proposed above for heavy industry; extending emissions standards to long-distance road transport; and a mechanism in the electricity market to deliver dispatchable capacity. But on their own, these will not deliver large-scale production and use of hydrogen – more targeted policies are needed.

Hydrogen could play a role in the cost-effective pathway to a net-zero domestic economy, and has the potential to replace carbon-intensive exports with zero-emission technologies. Australia cannot and should not seek to replicate the Inflation Reduction Act of the US. Our economy is too small, but we have opportunities that we can deliver with better strategic focus and coordinated implementation.

We will elaborate on these policy initiatives in a Grattan Institute report to be published in the coming months.

1 Introduction

Grattan Institute is an independent think tank focused on Australian domestic public policy. It aims to improve policy by engaging with decision-makers and the broader community.

We welcome the federal government's decision to formally review Australia's National Hydrogen Strategy. It is both timely, in terms of developments in Australia and overseas, and important, given the potential for hydrogen to contribute to lowering domestic emissions and creating future export opportunities.

This submission responds to the government's Consultation Paper, 'National Hydrogen Strategy Review', issued by the Department of Climate Change, Energy, the Environment and Water in July 2023.

The consultation paper covers a wide range of issues including specific end-use applications of hydrogen and supporting policies. This submission focuses on those areas where we have relevant views and knowledge. Accordingly, we have not attempted to address all the matters raised in the consultation paper. This submission draws largely on reports we have published and submissions we have made in the past couple of years.[1]

Australia's hydrogen-based export opportunities, primarily green iron and steel, alumina, and ammonia, will be most effectively delivered by a 21st Century industry policy, one that is also able to embrace other strategic opportunities such as critical minerals.

Domestically, hydrogen is most likely to play a role in sectors where emissions reductions are difficult or very expensive to achieve via alternative methods. In a policy landscape dominated by sector-specific pathways, these include high-temperature heat for industry, chemical feedstock for fertilisers and explosives, fuel for hydrogen fuel cells in heavy-vehicle road transport, and possibly balancing a high-renewables power grid.

In Chapter 2, we make the case for 21st Century industry policy and describe its components. In Chapter 3 we set out how this could be applied to hydrogen.

Declaration of interests

Alison Reeve is a member of the federal government's Hydrogen Advisory Group.

1. See Wood et al (2022), Wood et al (2021), and Wood et al (2020). Links to these report are provided in the Bibliography.

2 21st Century industry policy

To meet long-term emissions reduction targets, Australia's industrial sector must be transformed in fewer than three decades. A 21st Century industry policy framework is needed: one that de-risks technology, requires polluters to pay, uses markets to scale up, and builds sustained collaboration between the public and private sectors.[2]

Australia has already used this approach to decarbonise the electricity sector. That was more by accident than design, but there are lessons that can be learned from the successes and failures in the electricity sector which apply more broadly.

Critics of industry policies raise concerns about efficiency and effectiveness, and rent-seeking. While these concerns are valid, we argue that good policy and good institutional design can avoid them.

2.1 Making the case

Industry policy can be controversial, so it is worth making the case for why such a policy is needed in Australia today.[3]

First, markets do not generally provide adequate incentives for research and development of new technologies, because knowledge is often intangible, making it difficult to appropriate. Low-emissions technologies are particularly complex and uncertain.

Second, many of the technologies that might produce large emissions reductions are expensive and high-risk. Early investors face high costs, low returns, and the risk of competitors free-riding on their initiative. Investors require a reliable, long-term carbon price or equivalent to underpin their investments. Yet a carbon price, whatever its form, is inherently uncertain because it depends on the decisions of governments. For both these reasons, private investment in low-emissions technologies is, and will remain, critically inadequate.

And third, there is a time imperative. There are only 26 years until Australia's net-zero deadline – less than one capital replacement cycle for many industrial assets. Market forces are not good at managing structural transformations at high speed when the future is deeply uncertain. Moreover, the long-lived nature of the assets in some industries means they are poorly suited to fast changes.

To address these challenges, Australia needs a new industry policy framework that can position it to capitalise on trade opportunities and boost the economy.

Such a framework would use three components to achieve a clear goal: support for supply of green commodities and products; building demand for these commodities and products; and technology-specific measures that improve the technical performance and economics of particular technologies and processes. These policies need to change over time so that support matches technology readiness and industry capacity. The underlying objective must be creating a thriving and viable sector not reliant on subsidies. In Chapter 3, we explain how this might apply to hydrogen.

2.2 Learning from the electricity sector

The electricity sector is the only part of the Australian economy where policy has successfully contributed to material transformation away from carbon-intensive production.[4]

2. Wood et al (2022).
3. Wood and Mullerworth (2012), Wood et al (2022)
4. Noting that this transition has not been without issues, and is not complete.

Transformation of the Australian electricity system by building a renewable energy industry has all the components of 21st Century industry policy: policies and programs to stimulate supply; targeted support for technology-specific market failures; and market-based policies to underpin demand for 'greener' electricity. These policies changed over time, from grants to financing to enabling infrastructure, as the renewables sector grew and matured. While this combination of policies evolved more by accident than design, and implementation was far from perfect, renewables' share of the national electricity supply has grown from about 11 per cent in 1997 to 27 per cent in 2021.[5]

The key policies that developed the renewable electricity industry are summarised in Figure 2.1 on the following page and explained in Box 1.

5. DISER (2021). Figures include hydro power built before 1997.In the second quarter of 2023, renewables made up 35 per cent of electricity supply: AEMO (2023, p. 22)

Box 1: Transforming Australia's electricity industry

Policies to stimulate supply of renewable electricity began in the late 1990s, when the cost of renewable generation was orders of magnitude higher than conventional electricity. The technology – whether solar, wind, biomass, or geothermal – was small, untested, and risky. Recognising this, successive Australian governments subsidised pilots, trials, and demonstrations of renewable generators, usually with grant funding.

As the industry grew and matured, governments shifted to risk-sharing via finance, such as through the Clean Energy Finance Corporation (CEFC). Rather than picking 'winners', this involved picking the 'willing' – those who were happy to take part of the risk. The requirement that the CEFC makes a return on investment similarly weeds out 'losers'.

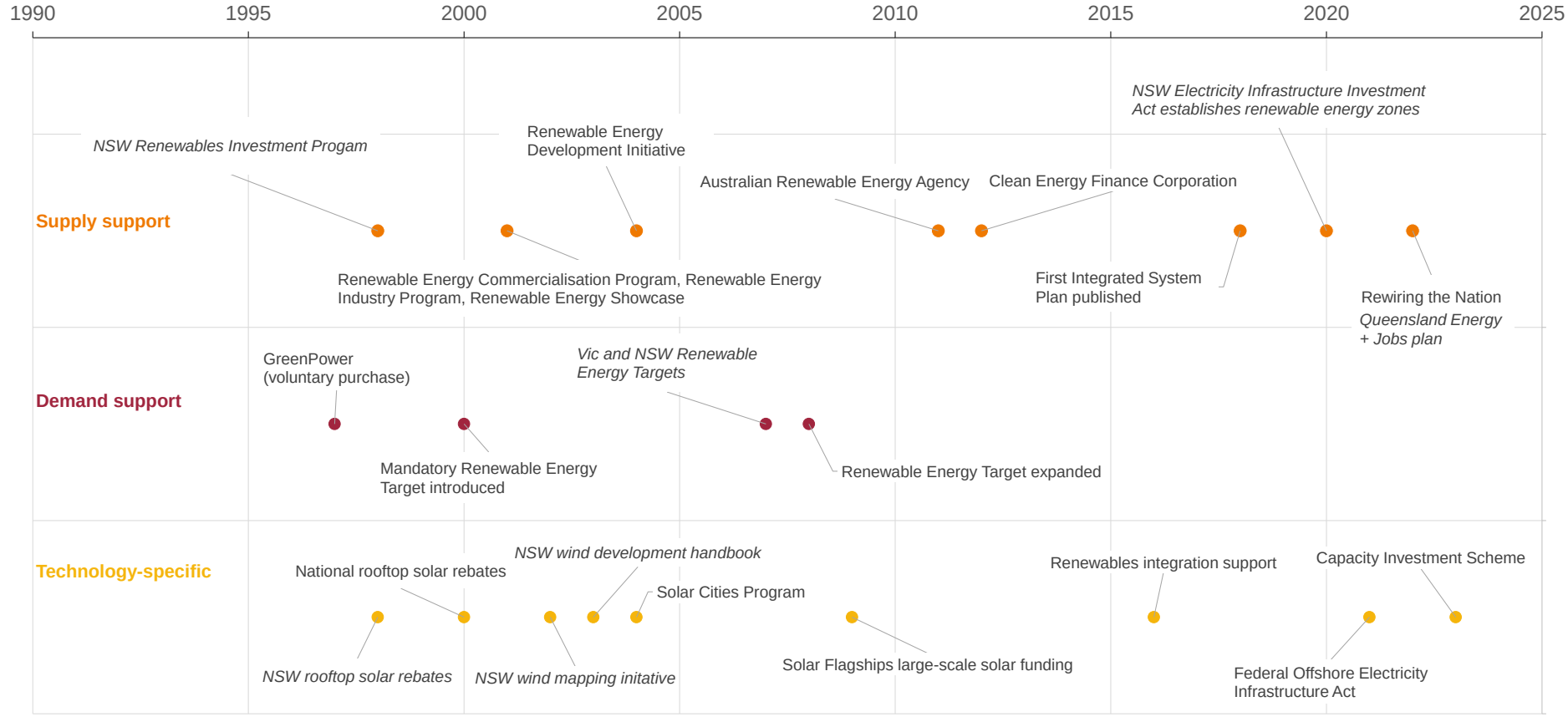
On the demand side, early attempts to create demand for renewable electricity via voluntary purchases (through the GreenPower program) had limited success – only about 60,000 customers Australia-wide signed up over four years.[a]

The more successful driver of demand was the Renewable Energy Target, which made it mandatory for electricity retailers to purchase an increasing percentage of renewable electricity each year. Starting with a target of an additional 2 per cent of electricity by 2008, it expanded to 20 per cent of electricity by 2020 – a goal that was achieved in 2019.

From the 2020s, governments began to focus less on supporting supply and demand, and more on enabling policies such as transmission investment and dispatchable capacity support.

a. SEDA (2002).

Figure 2.1: 21st Century industry policy is transforming Australia's electricity supply



Notes: State policies are shown in italics. Not every policy targeting renewable energy across the period 1997 to 2023 is shown.

Source: Grattan analysis of National Library web archive (2022).

2.3 Refuting objections to industry policy

Critics of industry policy focus on two arguments.[6] The first is that governments are not best-placed to set the direction of the economy. This argument says that governments simply do not have enough information to choose which industries or firms to support[7] and that governments should not pick winners but should rely on market forces to determine them.

The second argument is that industry policy brings with it the risk of rent-seeking – that well-connected firms may be able to use their financial power, connections, and influence to get money.

These arguments do not undermine the case for industry policy. Rather, they create the imperative for good industry policy.

To address the first concern, government intervention should resemble a portfolio. This means setting the future direction for the sector and then choosing not the 'winners' but the 'willing' – companies that are willing to transform to carbon-neutral. As in any investment portfolio, failure of some 'bets' is expected. The key is to stop supporting the losers. Any industrial policy must have a clear set of guidelines on when to 'pull the plug' and redirect support to more promising projects or firms. Further, using a broad range of interventions such as recoupable grants, loans, underwriting, and equity allows governments to share in the upside from the winners. It makes sense to tilt the playing-field towards a desired goal,[8] so long as the power of markets is used to determine who the 'winners' should be.[9]

The solution to the second concern – rent-seeking – is better institutional design. Here, governance structures are critical. The group administering the funding elements of industry policy should be at arm's length from government, like the Australian Renewable Energy Agency. And a clear set of targets, milestones, and procedures for accountability and transparency is needed.

2.4 Current approaches to industry policy

Australia currently has two approaches to industry policy – one old, one new but incomplete.

The old approach is one of targeting general productivity and business improvement (through things like skills, training, and facilitation). It is a relic of the last great change in Australian industry policy, away from tariff walls and protection and towards a streamlined, efficient economy able to compete globally. It reflects antipathy towards 'picking winners' and is fit-for-purpose for an economy with no pressing deadlines. It is still useful, but it will not bring about an energy transformation within two decades, which is what is needed to meet net-zero targets.

The new approach – choosing goals and focusing effort on achieving them – is patchy. The rhetoric is there from both sides of politics, but the policy to transform the economy in less than 30 years has emerged from neither. Large sums of money are available, but exactly what they are meant to achieve is unclear – leaving them vulnerable to capture by rent-seekers.

There are numerous small policies and programs, but no over-arching framework that organises them. Clear goals have not been set for any sector, targeting of existing programs is (with some exceptions) poor,

6. Aiginger and Rodrik (2019).
7. Ibid.
8. Mazzucato (2021, p. 207).
9. It is not easy to forecast who the 'winners' will be, even using a market-based approach. Modelling in 1999 for the Renewable Energy Target predicted that most of the new renewable energy capacity would draw on bioenergy and waste, with nothing from solar and very little from wind. In the end, wind and solar took nearly 100 per cent of the target: McLennan Magasanik Associates (1999) and Clean Energy Regulator (2022).

and there is a disconnect between energy policy, industry policy, and regional policy.

Some policies are working to push emissions in the wrong direction – up – and these should be phased out.

2.5 What governments should do

Australia needs 21st Century industry policy that sets clear emissions-reduction targets, pushes down emissions from existing facilities, encourages low- or zero-emissions refurbishments and new facilities, and supports export-led industries that can flourish in a net-zero world.

Australia has national emissions reduction targets for 2030 and 2050, but it is unclear how these targets translate to sectoral activity. The government's recent commitment[10] to develop sectoral decarbonisation plans across the economy is a step in the right direction; even better is the intent to coordinate across the relevant Cabinet portfolios. To create a credible policy framework, the sectoral plans should set clear goals for emissions reductions in each sector that align with national targets. Existing policies could then be adjusted and streamlined to achieve these goals, and any gaps could be filled.

Many of the necessary policy tools already exist and need only a few tweaks to make them more effective. The reformed Safeguard Mechanism should push down emissions from existing facilities and, provided stringent standards are set for new facilities, encourage low- or zero-emissions refurbishments and new facilities.

The major federal funding facilities such as the Northern Australia Infrastructure Facility, the Australian Renewable Energy Agency, Export Finance Australia, the Clean Energy Finance Corporation, and the new National Reconstruction Fund should be able to support export-led industries to develop. But there are some gaps, particularly in bringing forward investment in low-carbon refurbishments of existing facilities and supporting demand for 'green' commodities.

2.5.1 Getting industry policy right

Australia's clean energy opportunities are large, but they are far from certain. Governments cannot single-handedly drive the creation of new global-scale industries, nor invest the hundreds of billions of dollars required. But they should implement policies that plan for, and can facilitate, this future.

Over the remainder of this decade, Australian governments should take targeted policy action to give us the best chance of capturing opportunities that may emerge later on. This should be followed by an expansion phase which is both less certain and less dependent on Australian policy. It will be driven by global markets and policies, and by private investment.

Success will require avoiding three traps: over-reaching on competitive advantages, picking losers, and short-term policy thinking.

There is a risk that enthusiasm and poor understanding of the extent of Australia's competitive advantage results in too much investment in industries where Australia can't compete internationally.

There is a risk that 'losers' – failing facilities – will seek to be propped up to protect regional jobs, national security, or a future (unlikely) market. And short-term policy thinking will reduce the chances of establishing sustainable competitive industries.

In Chapter 3, we describe how these approaches to 21st Century industry policy should be applied to the National Hydrogen Strategy.

10. Bowen (2023).

3 Using 21st Century industry policy to support hydrogen

Australia's advantage in a net-zero global economy lies in its abundant renewable resources in proximity to rich mineral resources, with demand for both expected to grow. There are two areas of potential competitive advantage for the Australian industrial sector in a net-zero global economy. One is building on traditional strengths (mining and minerals) to create more value, while ensuring this growth in value does not have a corresponding growth in emissions. The second is moving into new industries where cheap, clean energy gives Australia an advantage.

The challenge for governments is to determine the role hydrogen can play in these areas, and how to support that. This includes considering where hydrogen might be used to support low-cost domestic emissions reductions, and what role it can play in producing and exporting green commodities.

The current status of hydrogen development in Australia means that it is a perfect target for industry policy.

3.1 Hydrogen's role in achieving Australia's net-zero goals

Hydrogen is likely to be important in reducing domestic emissions in several sectors.

Grattan Institute is preparing an in-depth report, to be published in coming months, on opportunities for hydrogen use in Australia. Our initial analysis indicates two applications that should not be pursued further, one where policy uncertainty makes it difficult to tell, and three where hydrogen seems prospective.

3.2 Where hydrogen should be ruled out

3.2.1 Hydrogen will not decarbonise residential gas loads

Electricity is already a more economical option than gas for the vast majority of Australian homes.[11] Hydrogen is unlikely to be cost-competitive with gas before 2050 (Figure 3.1), and hence, it is highly unlikely to be competitive with electricity for the current uses of natural gas in homes and small businesses for cooking, water heating, and space heating.

About 75 per cent of the cost of making hydrogen comes from the cost of electricity consumed in the process. Cheap hydrogen requires cheap electricity, and cheap electricity opens up more options for using electricity than are economical today, further undermining the economic case for hydrogen in many applications that currently use gas.[12]

Burning hydrogen is less efficient than using electricity for the same task (Figure 3.1). As a rule of thumb, you need to burn three energy units of hydrogen to achieve the same outcome as from one unit of electricity. This makes the effective cost of hydrogen three times higher. Or, it means the cost of delivered hydrogen needs to be one third of the cost of electricity to achieve the same service at the same price.[13]

3.2.2 Most manufacturing will not need hydrogen

Hydrogen is likely to be essential for Australia's current gas-reliant manufacturers, where natural gas currently makes up more than 10 per cent of input costs. These include polyethylene, ammonia, and alumina. Steel-making is potentially another large user of hydrogen.

11. Wood et al (2023).
12. Ibid.
13. Ibid.

Gas-reliant manufacturers employ about 10,000 workers and make up just over 0.1 per cent of the Australian economy.[14] By contrast, more than 750,000 workers are employed in manufacturing sectors where gas makes up less than 1 per cent of input costs on average. For most of the manufacturing sector, electrification and energy efficiency are better decarbonisation solutions than hydrogen.

When supporting decarbonisation of industry and manufacturing, governments should be clearer about where hydrogen can and cannot help, and more targeted in where they support its use. This would save companies time and money, would mean less government money wasted on feasibility studies for uses that were unlikely to be economic, and would help governments and hydrogen exporters to better understand the competitor technologies for hydrogen, and thus get a realistic idea of future export market potential.

The absence of government funding does not, of course, preclude private sector investment in low-emissions projects and technologies within the appropriate regulatory boundaries.

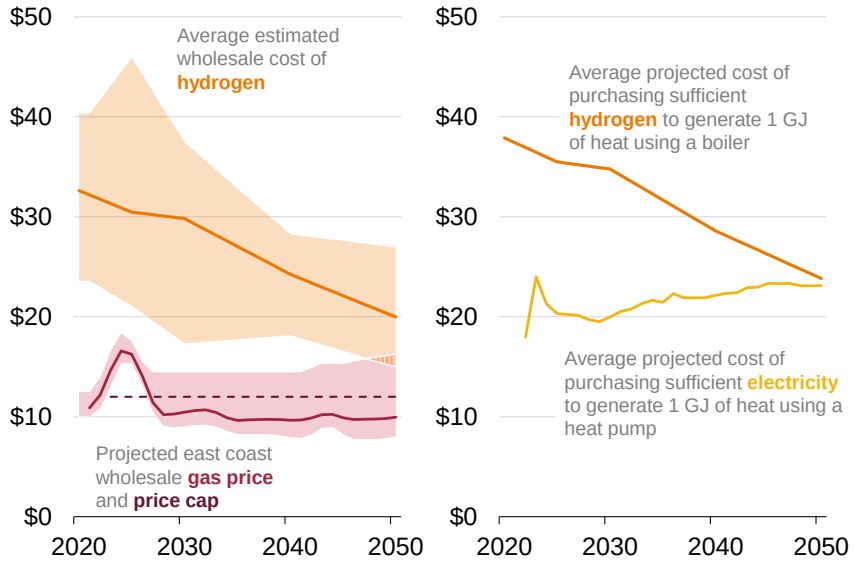
While there is some overlap in areas such as renewable ammonia, the other export opportunities bring much bigger economic job-creation benefits and are best supported by the sort of 21st Century industry policy described in Chapter 2.

3.3 Power generation – too early to tell

Power generation (using hydrogen turbines) could be a source of hydrogen demand. Our analysis indicates that, with appropriate transmission, an electricity supply of up to 90 per cent renewable electricity is possible at low cost. At present, the most economic option for the remaining 10 per cent would be gas generation, with the associated emissions offset.[15]

Figure 3.1: Hydrogen cannot compete with gas or electricity for household use

Hydrogen, electricity, and gas costs ($/GJ)



Source: Wood et al (2023).

14. Wood and Dundas (2020).
15. Wood and Ha (2021).

It is this remaining 10 per cent where hydrogen could play a role. However, the economics of this depend on how cheaply hydrogen can be produced and stored, and whether the energy market can be adjusted to appropriately value dispatchable generation capacity.

3.4 Prospective uses in Australia

Domestic heavy industry applications

This area covers two domestic industrial sectors: high-temperature heat, including alumina; and chemical feedstock, including ammonia.

Hydrogen will probably have a role in high-temperature heat for industrial use, required for manufacturing processes such as the calcination of alumina and clinker for cement, and iron smelting. It is currently difficult to achieve high-temperature heat for these processes with electricity. Hydrogen will also probably play a role in decarbonising ammonia production, which requires hydrogen molecules as a feedstock.

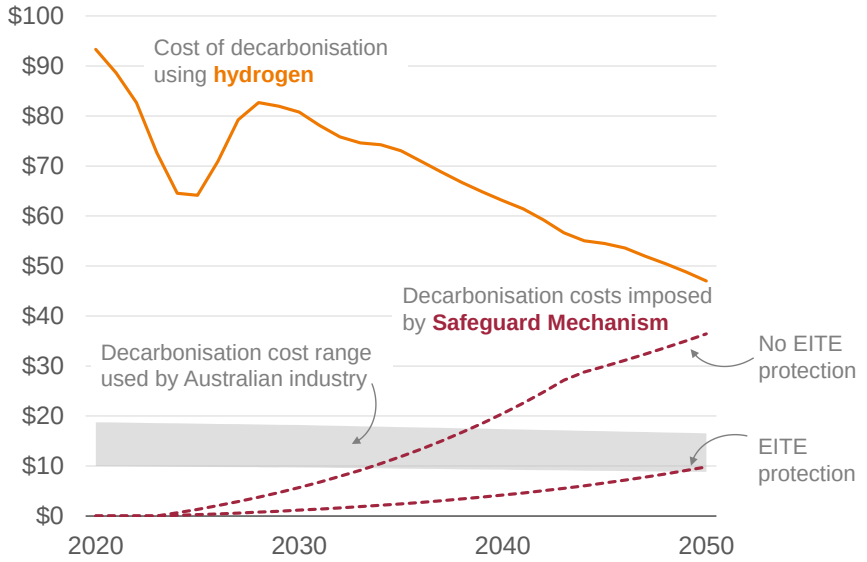
To support the adoption of clean (including hydrogen-based) technologies in these use cases, governments should:

- Set stringent benchmarks for new Safeguard facilities, to encourage low-emissions technology development and avoid locking in future emissions.
- Establish embodied carbon standards for buildings and construction, to create a green premium for steel, aluminium, cement, and other commodities.[16]

The Safeguard Mechanism has capped the emissions of Australia's largest polluters, and requires them to reduce these emissions each year (see Box 2). This imposes a cost on many industrial facilities that

Figure 3.2: The Safeguard Mechanism isn't sufficient to make hydrogen competitive for alumina calcination

Decarbonisation costs ($/tonne of alumina)



Notes: CO2-e = carbon dioxide-equivalent. EITE = emissions-intensive-trade-exposed. EITE protection policy is under development, chart shows upper and lower bounds based on DCCEEW (2023). Chart assumes calcination uses natural gas, and that Safeguard cost-containment policy settings and baseline decline rates continue unchanged beyond 2030.

Sources: Grattan analysis based on Wood et al (2023) (hydrogen costs), Climateworks centre and CSIRO (n.d.) (calcination energy consumption and retrofit costs), publicly disclosed internal carbon prices for Australian alumina producers.

16. Wood et al (2022).

don't reduce their emissions, against which the cost of decarbonisation technologies can be considered.

However, this price is not sufficient to make hydrogen cost-competitive in many industrial applications. Figure 3.2 shows an illustrative example for alumina calcination. Four things could change this: higher-than-projected fossil fuel costs in the future, a higher price cap in the Safeguard Mechanism, lower costs for hydrogen calcination retrofits, lower hydrogen costs, or consumers' willingness to pay a green premium. The challenge for government across all industrial sectors is to strike the right balance between these four factors to close the cost gap.

Heavy vehicles

Decarbonisation of the transport sector will mostly occur through widespread adoption of battery electric vehicles. However, hydrogen is likely to have a role in decarbonising transport in use cases with high vehicle utilisation, long distances, and high loads, and especially use cases that have a combination of all three.

The relative role of electrification and hydrogen will also depend on the development of hydrogen supply chains, adjustments in freight duty cycles, and further technological developments in both sets of technologies.

Despite this uncertainty, there are policies that governments can implement now to support heavy vehicle decarbonisation:

- The federal government should impose Euro-VI Stage-C pollution standards from 2024 for new models, and from 2025 for all models of new heavy vehicles.
- The federal government should set binding zero-emissions sales targets for sellers of new trucks. Standards would not distinguish

Box 2: How the Safeguard Mechanism works

The Safeguard Mechanism is a federal policy applying to all facilities emitting more than 100,000 tonnes annually. It identifies 90 'production variables' (outputs, inputs, or intermediate products in industrial processes), each of which has a defined emissions-intensity value (in tonnes of carbon dioxide-equivalent per tonne of production).

Facilities are required to keep emissions below a 'baseline', which is determined by multiplying the volume of production variable they produce in a given year by the emissions intensity for that production variable. Baselines decline by 4.9 percentage points each year to 2030. Facilities must decide whether to adjust their operations to stay under their baselines, or purchase and surrender Australian Carbon Credit Units (ACCUs) to offset their excess emissions.

A 'cost-containment measure' ensures that facilities with excess emissions who can't find sufficient ACCUs can purchase them from the government at $75/tonne. This price rises at CPI plus 2 per cent every year. The cost containment measure creates a price against which technology options can be assessed.

Because only 4.9 per cent of emissions are covered in the first year of operation, this means the effective price from 1 July 2023 is $3.68 per tonne of emissions in 2024 (4.9 per cent of $75). It rises to $33.50 per tonne in 2030, thanks to a combination of falling baselines and the CPI+2.5 per cent increase to the cost containment price each year.

between electric or hydrogen trucks, but would allow the trucking industry to choose the best (zero-emissions) option for the job at hand. Targets for rigid trucks should reach 100 per cent of sales by 2040, and for articulated trucks, 70 per cent.

- To make it easier and more viable for owners to choose a cleaner truck, the federal government should scrap regulations requiring Australian trucks to be 2 per cent narrower than the global norm.[17]

3.5 Industrial policy for export opportunities

Rapid reductions in the cost of wind and solar power over the past decade have turned Australia's large, sunny, and windy land mass into a globally significant resource. A decarbonising world will enable Australia to diversify beyond its existing carbon-intensive industries, by exporting renewable energy – either as electricity or hydrogen – or low-emissions energy-intensive commodities, such as metals, chemicals, and biofuels.

Of Australia's clean energy export opportunities, the largest and most economically viable appears to be using renewable hydrogen to produce 'green' (near zero-emissions) iron and steel. With globally cost-competitive hydrogen, it will be cheaper to produce green iron here than to ship hydrogen and iron ore to countries such as Japan or Indonesia that have inferior renewable resources.[18]

There are also attractive, but probably smaller, opportunities for Australia in producing biofuels or synthetic fuels, renewable ammonia, and possibly by exporting electricity via undersea cables.

These opportunities are not certain and will generally rely on either international policies to reduce emissions, or customers being willing to pay a 'green premium'. But these opportunities are credible, particularly as the world moves away from fossil fuels.

3.6 What's missing for hydrogen policy?

In Chapter 2, we showed how measures to support demand worked alongside supply-side policy to build the renewable energy industry. Government support for hydrogen so far has focused strongly on the supply side (Figure 3.3). As well, there has been little support for specific technical problems that will need to be solved to make hydrogen supply chains work, such as storage.

3.7 Getting policy settings right

The federal government should help Australia's steel-making, ammonia, and alumina sectors move to lower-emissions technologies over the next decade.

Government funding for hydrogen-based 'flagship' projects would underpin investment in lower-emissions technologies and build the skills and capabilities Australia will need to create export-scale production in the expansion phase. The government's $2 billion Hydrogen Headstart program could be designed along these lines.

3.8 Avoid picking losers

One criticism of industry policy is that it involves governments 'picking winners'. Governments don't have unlimited resources, and targeting policies necessarily means that not everyone gets assistance.

Hydrogen has attracted these criticisms. But more important than not 'picking winners' is ensuring that the government is not propping up 'losers': hydrogen production or consumption that isn't economic and does not have a chance of becoming so.

17. Terrill et al (2022).
18. Wood et al (2020).

Australian governments have a sorry track record of propping up uneconomic facilities in regional areas and justifying this on employment grounds. Governments need to be much better informed about which facilities have a future and which don't, and clear-eyed about whether facilities in distress are worth saving.

As well, governments should apply stricter funding criteria, to ensure funding reaches the hydrogen projects with the most potential to contribute to a resilient net-zero economy. In section 3.2 we argued that hydrogen to replace gas use in the residential, commercial, and light industrial sectors is unlikely to ever be economic.

It's time for governments to stop funding hydrogen experiments in these sectors. Instead they should direct hydrogen funding to sectors where hydrogen is a clear alternative and desperately needs to be made cheaper and more available. And they should remove barriers to electrification in the residential, commercial, and light industrial sectors.

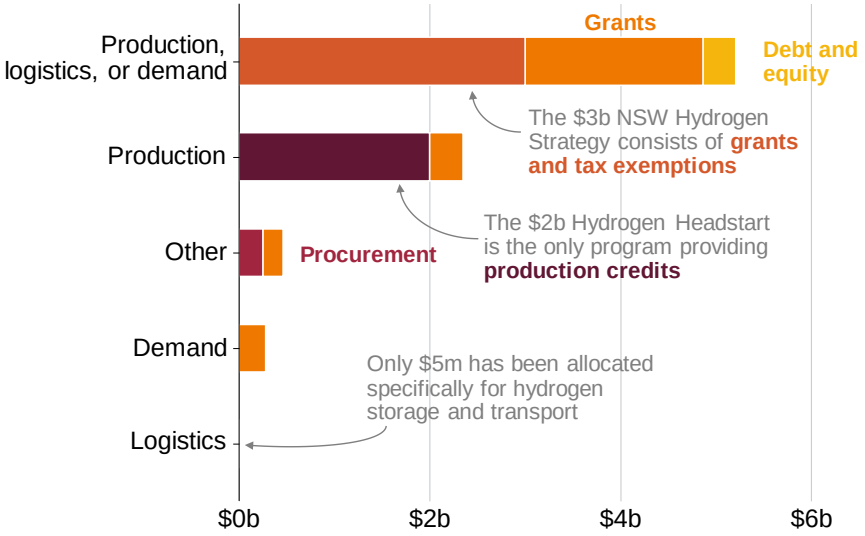
It is clear that the best renewable resources are in regional areas, but it does not necessarily follow that hydrogen production and industrial use should also be in these areas. The best locations are a function of land value and use and water availability; and the economics and social licence of moving electricity (via transmission lines) or hydrogen (via pipelines). Governments need to commission independent analysis to better understand these trade-offs, before funding projects on the basis of regional development.

Some companies may approach governments seeking support to use hydrogen because their operations could, with changes in technology, pivot to 'green'. Some of these opportunities may be genuine, others may be rent-seeking by a distressed business or a business trying to put off the inevitable decline of their operations in a net-zero economy.

Governments should arm themselves with comprehensive analysis on the technical options and the economics of pivoting to green hydrogen

Figure 3.3: Government funding for hydrogen is skewed towards supporting production

Federal, state, and territory government specific funding for hydrogen announced up to 15 May 2023



Notes: 'Production, logistics, or demand' refers to when funding can be for any of these activities. 'Other' includes funding for infrastructure, facilitative policy, and programs to support workforce development and R&D. 'Procurement' includes procurement of assets, investment in infrastructure, and agency resourcing. Funding captured here is announced but not necessarily committed.

Source: Grattan analysis of data from CSIRO (2023).

to replace fossil fuels. They should also make sure they understand the production scale required for an Australian facility to be internationally competitive. That way, a decision to support the continued operation of a distressed facility can credibly be conditional on it reorienting towards cleaner production that is sustainable in the long-term without subsidies.

Finally, governments should not assist companies that aren't prepared to make the same commitment that governments have: net-zero emissions by 2050 or earlier, interim targets, and capital allocated to back these up.

3.9 Don't try to compete with the US Inflation Reduction Act

The US has introduced the Inflation Reduction Act (IRA). This climate-focused legislation includes A$520 billion in programs and funding to accelerate the US transition to net zero.

The act increases and extends support for renewables, and introduces a number of new credits to support early-stage technologies such as green hydrogen, as well as energy storage and carbon capture and storage. It provides projects with production tax credits up to US$3 per kilogram of hydrogen.

In May, Australia's Energy and Climate Change Ministerial Council discussed the accelerating global competition to develop new clean energy industries, in the wake of the IRA and investments from the EU and Canada among others. The ministers agreed to work together to make Australia a renewable energy superpower, including through refreshing the National Hydrogen Strategy as evidenced by the current review.

The IRA is a grand political bargain secured by President Biden in a Congress that was highly unlikely to support other, more market-focused policies to tackle climate change. Australian governments can and should be more nuanced.

First, Australia will be better served by a strategy that combines climate and industry policies, focuses on our competitive advantages, and is coordinated across governments as described in this submission.

Second, Australian governments should be cautious before concluding that the best way to mitigate supply chain risk is to subsidise local manufacturing. The best place to begin is to explore diversifying supply, stockpiling, signing agreements with friendly allies to allow access to goods, commodities and services, or switching to products, practices, or technologies that are less vulnerable to supply chain disruptions. Otherwise, Australia may find itself propping up uneconomic industries for no material increase in security, just as happened for car manufacturing.

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