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The next industrial revolution

Transforming Australia to flourish in a net-zero world

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Overview

Australia's industrial sector faces transformative change to meet global and domestic emission reduction targets. Our current policies are not up to the task. A 21st Century industry policy to deal with a 21st Century problem can underpin Australia's successful transformation to a world-leading energy superpower. This report presents the case for, and describes, such a policy.

Australian industries that extract resources and add value through manufacturing currently contribute more than $76 billion to GDP and employ 1.1 million people. But they also contribute about 30 per cent of our domestic greenhouse gas emissions. And the emissions from our exported coal and gas – double Australia's total national emissions in 2020 – add to the climate responsibilities of other nations. A serious global commitment to net-zero emissions has profound economic, social, and environmental implications for Australia.

The scale and pace of change represents an industrial revolution in three parts. First, there are activities such as coal mining that will be essentially incompatible with a net-zero economy. Then, there are activities such as steel-making that may be able to transform through economic, low-emission technologies. And, there are activities such as low-emission extraction and processing of critical energy minerals which are insignificant today but where Australia could capitalise on globally significant comparative advantages.

Many industry sub-sectors share two common challenges. They currently lack commercially viable abatement pathways. And they face re-investment decisions within the next 30 years that, taken wrongly, could lock in emissions for an extended period.

Australia's industry policy today is a mix of direct grant schemes with poorly articulated objectives and ill-structured scope, and ineffective regulatory policies. Both are routinely open to lobbying by vested interests.

Australia needs an overarching policy framework with consistent, targeted policies linked to clear goals, developed and executed in sustained collaboration with industry. The Federal Government has a clear economy-wide target for 2030 and 2050. It should set a near-term emissions reduction goal and emissions budget for the industrial sector.

The Federal Government should review and adjust current policies and programs so they work together. It should lower baselines under the Safeguard Mechanism at a rate consistent with a sectoral goal, and make no exemptions. And it should establish an industry future fund to prevent industrial emissions lock-in for Safeguard facilities. Existing industry assistance – like ARENA, the CEFC, the NAIF, EFA, and the new National Reconstruction Fund – should give priority to export-oriented industries that will grow in a net-zero global economy. Finally, the Federal Government should phase out or restructure any programs that encourage expansion of fossil fuel extraction or consumption.

State governments should establish embodied carbon performance standards for all construction, to underpin demand for low-carbon commodities.

Transforming Australian heavy manufacturing and mining for strong growth and a highly profitable low-emissions future will have consequences for the regions, both positive and negative. Federal and state governments should establish, fund, and work with regional transition authorities and local communities to catalyse action on both the challenges and the opportunities at a local level. And state governments should establish sovereign wealth funds based on existing mining royalty regimes.

Recommendations

Set clear goals for emissions reduction in the industrial sector

- The federal government should clarify the share of the national 2030 and 2050 targets to be achieved by the industrial sector.

Make the Safeguard Mechanism more effective

The federal government should:

- Reduce baselines for existing facilities, consistent with the Climate Change Authority's advice on sectoral goals.
- Set stringent benchmarks for new facilities, to encourage low-emissions development and avoid locking in future emissions.
- Establish an industrial transformation future fund to share the risk of major capital replacements using very low or zero-emissions technology.

Align funding towards export-oriented net-zero growth

- Federal statutory funding agencies such as the Australian Renewable Energy Agency (ARENA), the Clean Energy Finance Corporation (CEFC), the Northern Australia Infrastructure Facility (NAIF), Export Finance Australia (EFA), and the National Reconstruction Fund should give priority to growing export-oriented industries that can flourish in a net-zero global economy.
- Statutory funding agencies should manage and disclose their climate risk in line with international expectations.
- Governments should set phase-out dates for programs and policies that encourage greater fossil-fuel extraction and use.
- Governments should review industry support programs and where necessary redesign them to avoid locking in higher emissions.

Support local demand for low-carbon commodities

- State governments should establish embodied carbon standards for buildings and construction.

Maximise the benefits of the transition for all Australians

- State and federal governments should ensure planning and environmental protection regulations meet community expectations about the impacts of industrial expansion and closure.
- State governments should establish sovereign wealth funds to manage additional royalties from the next minerals boom.
- The federal government should consider a windfall profit tax on gas and coal exports at times of extreme international prices.

Ensure the most affected regions are assisted

- The NSW and Queensland governments should establish regional transition authorities for the Hunter Valley and central Queensland respectively. All state governments should stand ready to do the same for other affected regions if required.
- For as long as coal mining lasts, the NSW and Queensland governments should direct royalties from coal into supporting these regions to diversify.
- The federal government should ensure regional policy is aligned with energy and industry policy.

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1 Big changes are coming to Australia's industrial sector

Heavy manufacturing and mining produce a third of Australia's carbon emissions. About 80 per cent of industrial emissions are produced by 213 big industrial facilities, which are the focus of this report.[1] Coal and liquefied natural gas (LNG) are the highest-emitting industries (Figure 1.1). Steel, aluminium, and cement are also very emissions-intensive.

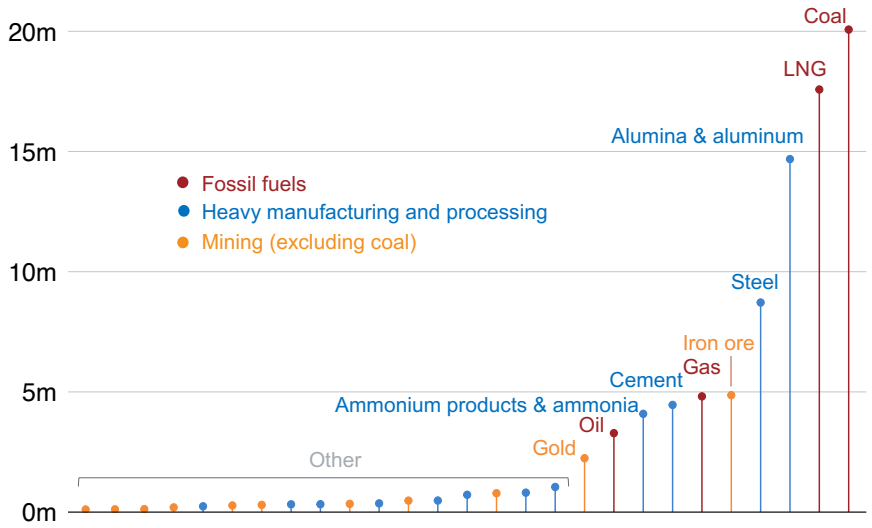
Australia and many other countries are committed to achieving 'net zero' – reducing their emissions as much as is technically and economically feasible and offsetting any that remain – by 2050 or earlier.[2] Moving to net zero will profoundly change Australia's industrial sector, pushing commodities into three groups. First are existing commodities that will have declining value in a net-zero economy, namely the fossil fuels shown in red in Figure 1.1.

Second are commodities that we currently use and will continue to need, but must be produced in fundamentally new, clean ways (namely those shown in blue in Figure 1.1). As these facilities age, owners will face difficult choices about whether to switch to new, lower-emissions technologies or lock in emissions for decades to come.

And third are new commodities that Australia does not currently produce at scale but will become enormous opportunities. Notably these include critical energy minerals – such as lithium, cobalt, and graphite – which will go into our batteries, solar panels, and electric

Figure 1.1: Coal and liquefied natural gas dominate Australia's industry emissions

Emissions (million tonnes of CO_2-e)



Notes: CO_2-e means tonnes of carbon dioxide-equivalent, which allows all emissions to be expressed in common units. Emissions in this and all subsequent charts are direct emissions (Scope 1). 'Other' includes zinc, copper, nickel, nickel products, paper, glass, ethylene, nitric acid, magnesium, bauxite, titanium products, silver, lead, uranium oxide, lime, limestone, and manganese ore. Several facilities were on multi-year monitoring periods under the Safeguard Mechanism and so did not report their net emissions in 2020-21.

Source: Grattan analysis of Clean Energy Regulator (2022a) data.

1. This subset includes all facilities reporting emissions under the Safeguard Mechanism, except transport facilities, electricity generators, and waste water facilities: Clean Energy Regulator (2022a). For full list of facilities included in this report, see Wood et al (2022).
2. For an in-depth discussion of the role of offsets in achieving net zero, see Wood et al (2021a).

cars.[3] Clean fuels such as hydrogen and ammonia can be added to this list.

Some regions, where fossil fuel extraction is currently the backbone of the economy, may face thousands of job losses as mines close. And some areas will have great economic opportunities due to their reserves of critical minerals and proximity to renewable energy.

No part of heavy industry and mining will be left unaffected: the coming changes are too big.

1.1 Some commodities are incompatible with a net-zero economy

Coal

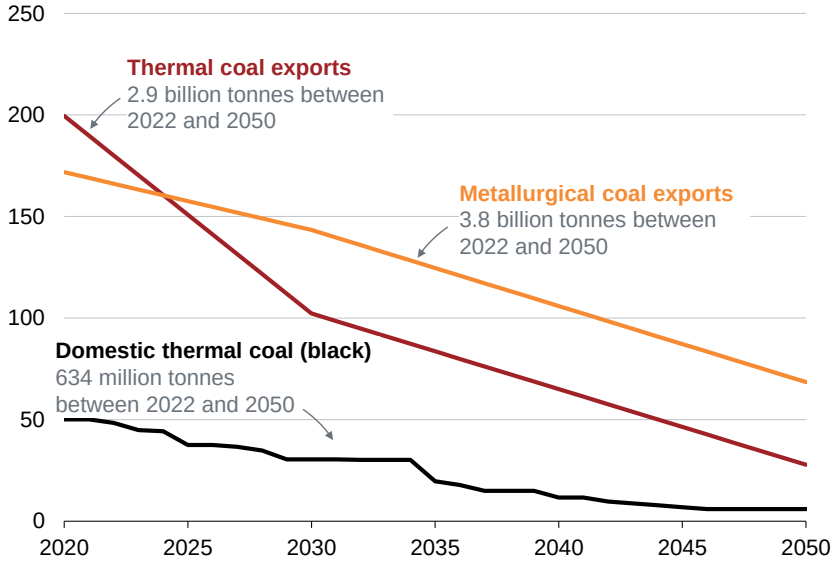
Coal has historically been a key contributor to Australia's economy and government budgets. In 2018-19, Australia's metallurgical and thermal coal exports were worth $70 billion.[4] The Queensland Government earned $4.3 billion from coal mining royalties that year, accounting for 7.8 per cent of its budget revenue.[5]

Of Australia's 57 highest-emitting coal mines, 27 produce metallurgical coal, 13 produce thermal coal, and 17 produce both. In 2020-21 these 57 mines emitted over 20 million tonnes of emissions, roughly double the total annual emissions from all Australian households.[6]

But demand for coal is falling in Australia and is forecast to fall across the globe (Figure 1.2). Demand for thermal coal for generating electricity will decline as it is replaced by renewable generation. The development and deployment of emerging green steel technologies will determine the rate of decline in demand for metallurgical coal.

Figure 1.2: Global and domestic demand for Australian coal could collapse

Tonnes of coal (millions)



Note: Domestic brown coal consumption not shown.

Source: Grattan analysis of IEA (2021a), DISER (2021a) and publicly available data on domestic coal-fired power station closure dates.

3. See CSIRO (2021) for further discussion of critical energy minerals.
4. DISER (2019, p. 14).
5. Queensland Government (2020).
6. Grattan analysis of Clean Energy Regulator (2022a) data.

If the world is to meet net zero by 2050, and assuming Australia maintains a constant share of global coal exports, the International Energy Agency (IEA) expects that total overseas demand for Australian coal will equal 6.7 billion tonnes between now and 2050.[7] Domestic demand for black thermal coal will equal about 634 million tonnes over the same period, and domestic demand for metallurgical coal will be negligible. All up, the amount of Australian coal needed to meet projected domestic and international demand will be 7.3 billion tonnes.

There are about 11 billion tonnes of probable or proven coal in reserves at currently operating mines in Australia.[8] Even though this coal will be of varying type and quality, Australia has 50 per cent more coal in reserves than are forecast to be wanted. And that is before accounting for the 31 coal mines that have been either committed or publicly announced.[9] Expecting that Australia will need much of this additional coal from the development pipeline is little more than a pipe-dream.

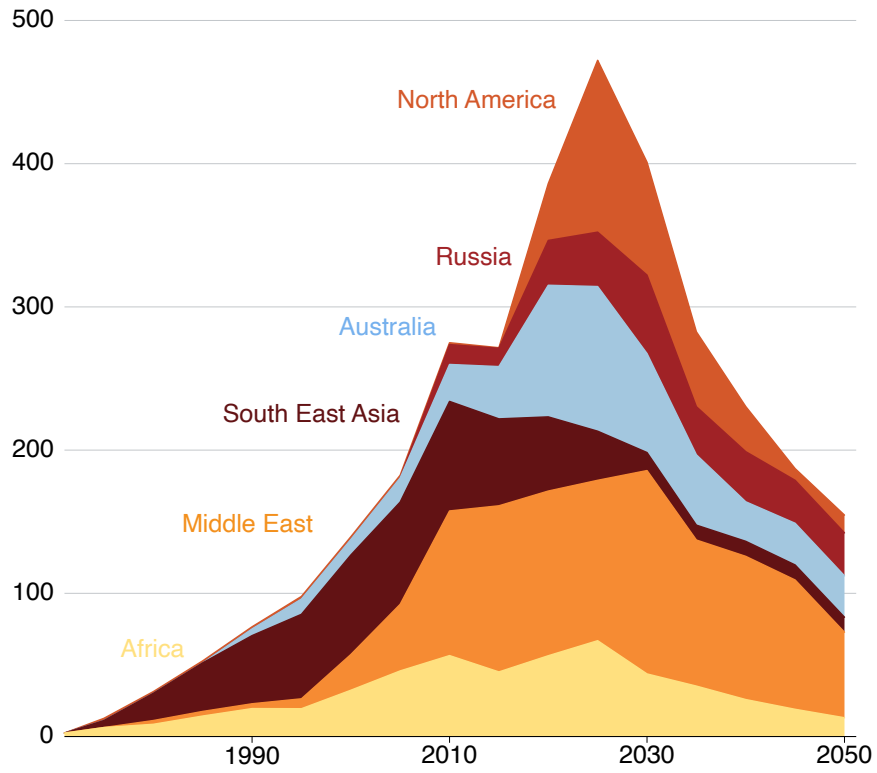
LNG

Global demand for LNG will also fall in a net-zero economy.

Australia exports three quarters of its natural gas as LNG, and in 2021 we were the world's biggest LNG exporter.[10]

Net zero will change how much LNG our trading partners want. The biggest LNG importers – China, Japan, the EU, and South Korea – all have net-zero targets. Japan, Australia's second-largest importer of LNG, plans to halve gas-fired generation by by 2030.[11] Investors are

Figure 1.3: LNG exports will fall in a net-zero world
Exports by region (billion cubic metres)



Note: 'Other' category excluded.
Source: IEA (2021b).

7. IEA (2021a).
8. Grattan analysis of publicly available mining data.
9. DISER (2021b).
10. Energy Quest (2022).
11. Morton (2021).

increasingly reluctant to back fossil fuels, with the number of emissions-intensity clauses in LNG contracts expected to increase.[12]

The IEA forecasts that after 2030, LNG exports will be dominated by countries with low production costs, such as Qatar.[13] Australian gas fields, including the North West Shelf, have declining supplies,[14] and expanding these fields would carry high up-front costs.

Figure 1.3 shows the projected share of LNG exports captured by six regions in a net-zero world. Australia and the Middle East are expected to export a similar amount of LNG up until 2030, but Australia's share of global exports is expected to decline between 2030 and 2050. The IEA forecasts that by 2050, the Middle East will export 59 billion cubic metres of LNG while Australia will export 28.9 billion cubic metres. Analysis by independent consultancy EnergyQuest suggests that Australia's LNG export reign peaked in 2021.[15] Other analysis suggests a slight decline to 2030, followed by a sharp one, with some projects already in the pipeline struggling to stay cash-positive.[16]

The war in Ukraine is certain to disrupt this picture and there is great uncertainty about the future of Russian gas. But even if Australia replaced some of Russian supply to Europe, the global trend in Figure 1.3 on the previous page will be the same. The same goes for coal: current price spikes reflect the current turmoil in the global energy market, not a long-term trend.

12. Emissions-intensity clauses refer to contracts which set metrics for emissions, for example requiring CO_2/tonne to fall below a set level.Source: Agosta et al (2021).
13. IEA (2021b).
14. Energy Quest (2022).
15. Ibid.
16. Investor Group on Climate Change (2022).

1.2 Demand for some commodities will persist but production processes will transform

We cannot live without some industrial products such as steel, cement, aluminium, and ammonia. To be viable in a net-zero world, these products will need to be produced cleanly.

Australia has two major integrated steel mills, five cement plants, four aluminium smelters, six alumina refineries, and eight facilities producing ammonia-based explosives and fertilisers. These facilities emit over 32 million tonnes of CO_2 per year.[17]

Steel and cement

Steel and cement are essential building blocks of every economy. They underpin the construction and transport sectors and have no obvious substitutes. Steel in particular will be needed in a net-zero world to build everything from solar panels to electric vehicles to transmission infrastructure.

Steel and cement are difficult to decarbonise. For steel, most emissions come not from burning fossil fuels, but as part of the chemical process of transforming iron ore to elemental iron. Similarly for cement, carbon dioxide is released in the chemical process when the limestone (calcium carbonate) is heated to make lime (calcium oxide). Steel and cement have been called the 'last mile of decarbonisation'.[18] This mile must be crossed to achieve our climate targets.

Some options already exist for decarbonising steel and cement – including using materials more efficiently, carbon capture and storage, and steel recycling. But significant emissions reductions rely on technologies that are not yet fully developed. In the IEA's 'sustainable development' scenario, 30 per cent of emissions reductions come

17. Grattan analysis of Clean Energy Regulator (2022a).
18. Dunn (2021).

from steel making technologies that are currently in demonstration or prototype stages.[19]

Aluminium

Demand for aluminium is expected to continue to grow steadily,[20] reflecting population growth and demand for aluminium in lightweight electric vehicles and solar panels. Between 2020 and 2030, aluminium demand could rise by 24 per cent.[21]

There are two main steps to producing aluminium – both emissions-intensive. Firstly, bauxite ore is refined to make alumina. Australia is the world's biggest alumina exporter. Second, alumina is consumed in a smelter to produce aluminium.

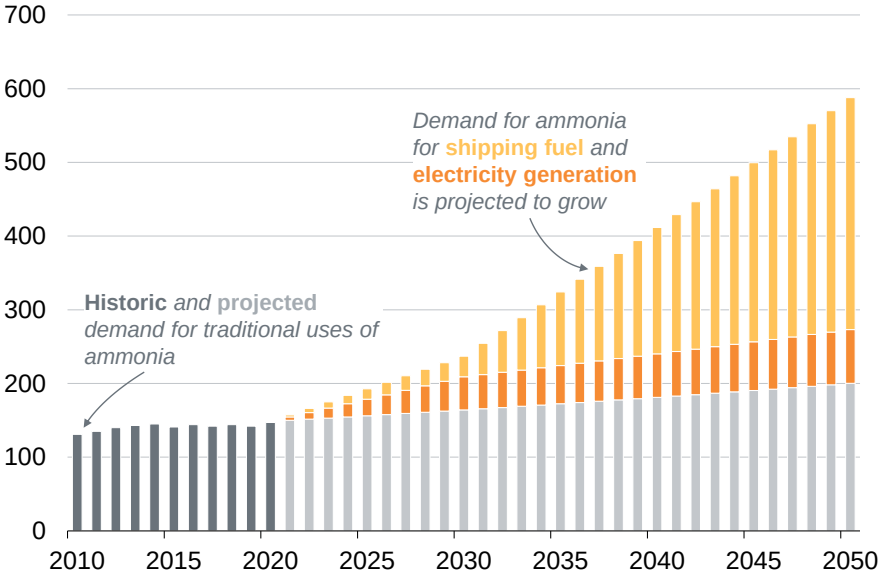
Decarbonising alumina refineries is at an early stage. ARENA has funded three trials by Rio Tinto ($500,000) and Alcoa (combined $20 million), to use renewable energy for alumina refining processes.[22]

Most emissions from aluminium production come from the electricity consumed by the smelter (70 per cent).[23] Many Australian smelters have made progress on switching their facilities to renewable energy sources. For example, the Tomago aluminium smelter in NSW, which produces 25 per cent of Australia's aluminium, has committed to switching fully to renewable energy by 2029.[24] But about 15 per cent of emissions are direct emissions, coming from the consumption of carbon anodes in the smelting process.[25] Dealing with these direct emissions is more difficult. Technologies are still being developed.[26]

Ammonia

Ammonia is an important feed-stock for the production of fertiliser and explosives. Today ammonia is made from natural gas, with carbon dioxide as a by-product. Green ammonia could, however, be made from renewable hydrogen.

Figure 1.4: Global demand for ammonia is projected to grow
Tonnes of ammonia (millions)



Sources: Statista (2022), IEA (2021b).

19. IEA (2021b).
20. Vass et al (2021).
21. Ibid.
22. ARENA (2021).
23. Vass et al (2021).
24. Macdonald-Smith (2021).
25. Mission Possible Partnership (2021).
26. For a discussion of emerging technologies, see Mission Possible Partnership (ibid).

Today about 150 million tonnes of ammonia are produced and transported annually.[27]

As with cement and steel, there will continue to be demand for ammonia. And demand is expected to grow because new uses for ammonia are likely to arise as the world moves to net-zero emissions (Figure 1.4 on the preceding page). For example, green ammonia can be used as a substitute for bunker fuel used in large ships. In 2018, the International Maritime Organisation pledged to reduce international shipping emissions by half by 2050. The IEA predicts that demand for green ammonia as a transport fuel will hit 28 million tonnes in 2030 and grow to 314 million tonnes by 2050.[28]

Ammonia can also be used as an alternative to methane for electricity generation, producing no CO_2 when burned. It can also substitute for up to 20 per cent of coal in a traditional coal generation plant.[29] Japan plans for 1 per cent of its electricity to come from ammonia by 2030.[30] The IEA predicts that global demand for ammonia to make electricity will reach 73 million tonnes by 2050.[31]

A third emerging use for ammonia is as a means to transport hydrogen cheaply (Box 1). This may add another layer of demand not captured in Figure 1.4 on the preceding page.

As with steel and cement, ammonia will only become a growth opportunity if it can be produced without emissions. The emissions from current ammonia production are released when steam is used to split hydrogen from natural gas. Hydrogen is then combined with nitrogen at high heat to form ammonia. But it is possible to use renewable electricity to make the hydrogen required in the process.

Box 1: Ammonia as a hydrogen carrier

Hydrogen, with all its potential as a clean fuel source, is difficult to transport. There are two ways to store and transport pure hydrogen – both are costly and technical. The first involves storing hydrogen as a compressed gas and transporting it in high-pressure tanks. Or, hydrogen can be cooled from a gas to a liquid. Hydrogen liquefies at -253℃. Cooling hydrogen to this level is energy-intensive and expensive.

Enter ammonia. Ammonia is one part nitrogen and three parts hydrogen. It liquefies at -33℃. And ammonia has a higher energy density than liquid hydrogen – meaning more energy can be stored in a given volume of ammonia than hydrogen. Moreover, the world has used ammonia for making fertiliser for decades, so the infrastructure for shipping it already exists.

This creates an opportunity to transport hydrogen more easily and cheaply. Once shipped, the ammonia molecule could be 'cracked' to extract pure hydrogen for other uses, such as in electric car fuel cells. Or the ammonia could be put to use directly, as fuel for ships or as a substitute for coal in generators. 'Cracking' hydrogen to get ammonia is not currently happening at scale but this will probably change with more research and development.

27. Statista (2022).
28. IEA (2021b).
29. Stocks et al (2021).
30. Japanese Agency for Natural Resources and Energy (2021).
31. IEA (2021b).

The world's second-largest ammonia producer, Yara, plans to build a clean ammonia plant in the Pilbara. The plant would use renewable hydrogen and is scheduled to begin production in 2023.[32] Australia's other large ammonia facilities have the chance to capture opportunities if they can similarly adapt.[33]

1.3 Owners of existing facilities have big calls to make

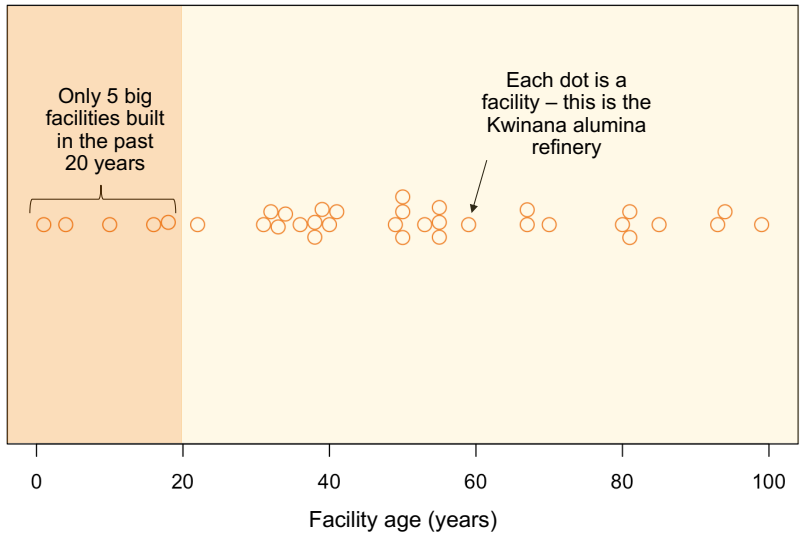
Industrial facilities have long lifespans. This means that the investment decisions that facility owners make in coming years will have big impacts on efforts to decarbonise. Figure 1.5 shows the age of Australia's large facilities, excluding mines. Only five major industrial facilities have been built since 2000, and the median age is 54 years.[34]

As facilities age, their owners must make major capital replacement decisions to keep the facilities operating. An aluminium smelter may need to replace or retrofit its electrolytic reduction pots, the key part of the smelting process. Cement plants might need to replace ageing milling equipment that is coming to the end of its operational life.

Each of these major capital investments holds the potential for large emissions reductions. For example, cement company Adbri is planning to reduce emissions by 20 per cent at its Kwinana plant through facility upgrades. This includes replacing 50-year-old cement milling equipment with new, energy efficient equipment.[35]

But, as Box 2 on the next page shows, the flip-side is that these capital upgrades can lock in emissions for decades – even if the upgrade significantly lowers the emissions intensity of production.

Figure 1.5: Most of Australia's big industrial facilities are more than 20 years old



Notes: Data exclude mines. Data not available for CSL, Phosphate Hill, Liberty OneSteel Laverton, Orora Glass Plant. Birkenhead Operations (140 years old) excluded from data set.

Source: Grattan analysis of Clean Energy Regulator (2022a) data and public information.

32. Yara (2021).
33. One of these facilities, at Gibson Island in Brisbane, has announced it will cease conventional production at the end of 2022, but is exploring opportunities for 'green' ammonia production with renewable hydrogen. Source: Incitec Pivot (n.d.).
34. Grattan analysis of Clean Energy Regulator (2022a) and public data.
35. Adbri (2020).

1.4 Some emerging commodities will leap in value in a net-zero world

The third group of industrial products will be those which Australia does not currently produce at scale, but which present major economic opportunities. This group includes critical energy minerals such as lithium, cobalt, and nickel.

Traditional minerals – notably iron ore, bauxite, and copper – are an important source of export income for Australia, worth $179 billion in 2020-21. This revenue is dominated by iron ore, which constitutes 85 per cent of mineral exports by value, followed by bauxite/alumina at 5 per cent and copper at 4 per cent.[36] Demand for traditional minerals will continue and could increase in a net-zero world. For example, steel (derived from iron ore) and rare earth minerals will be used in wind turbine towers, aluminium to frame and anchor solar panels, and copper for transmission and distribution networks.

The energy transition will require much larger quantities of minerals and metals that have traditionally been mined only in small quantities, such as lithium, vanadium, graphite, and cobalt for batteries, silicon for solar panels, and manganese and rare earths for power electronics. It takes six times the quantity of minerals to construct an electric car as a conventional car.[37]

Demand for critical energy minerals is expected to grow dramatically (Figure 1.6 on the following page). Global demand for lithium is expected to grow by up to 41 times by 2040.[38] The value of both the nickel and cobalt markets is expected to be 30 times higher than now

36. Department of Foreign Affairs and Trade (2022).
37. IEA (2021c).
38. IEA (2021b).

Box 2: Port Kembla steel mill

BlueScope's steel mill at Port Kembla in NSW was opened in 1928. The lining of the mill's blast furnace will reach the end of its design life by 2026.

BlueScope has announced that, for technical and economic reasons, it will reline the currently mothballed No. 6 Blast Furnace, rather than switching to a lower-carbon option such as an electric arc furnace.[a] The $1 billion reline will prepare the blast furnace for another campaign of up to 20 years.

The company is aiming to reduce the emissions intensity of its steel-making activities by 12 per cent by 2030, directing $100 million towards environmental efficiency improvements to the new blast furnace.[b]

The blast furnace component of an integrated steelworks such as Port Kembla's accounts for about 70 per cent of the facility's emissions.[c] This means that from the reline in 2026, 70 per cent of the Port Kembla mill's emissions will be locked in until a suitable low-carbon alternative technology is available.

BlueScope says that if viable new technology emerges, it could transition before the relined furnace reaches the end of its design life.

The Port Kembla steelworks is just one example of how investment decisions in the coming years will have big flow-on effects for emissions in the future.

a. BlueScope (2021).
b. BlueScope (2022).
c. Birat and Maizières-lès-Metz (2010).

by 2040.[39] In 2050, the cobalt market is expected to be worth US$214 billion, making it the biggest of the critical minerals.[40]

These three minerals are particularly promising for Australia. Australia has 27 per cent of the world's lithium, 22 per cent of nickel, and 21 per cent of cobalt (Figure 1.6).[41]

Australia may also have the opportunity to move up the value chain to make the end-products the world will need. This could be economical where minerals processing is energy-intensive (notably nickel processing), because Australia has abundant low-cost wind and solar energy.

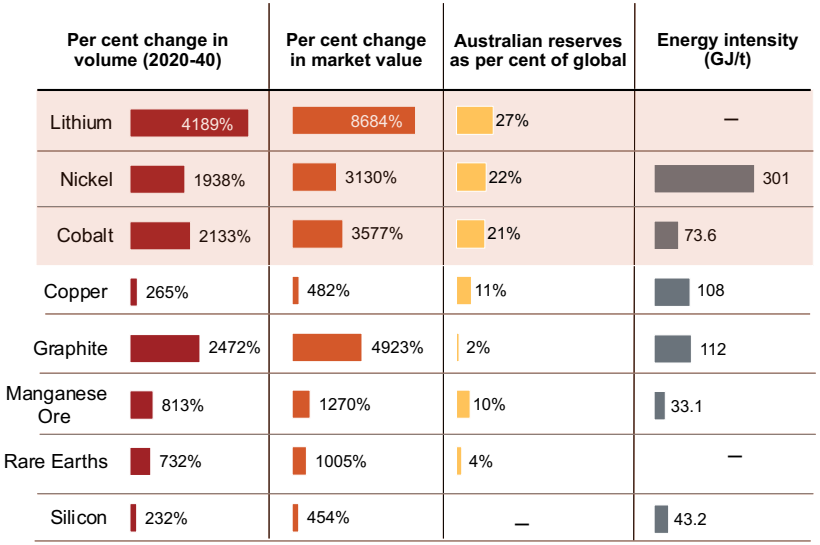
1.5 Most of these changes will play out in the regions

A handful of Australia's big industrial facilities are located in cities – such as the Oceania Glass factory in Melbourne – but most industrial activity takes place in regional Australia. It will therefore be the regions that have to contend with the sweeping changes on the horizon for heavy manufacturing and mining.

Figure 1.7 on the following page shows the locations of industrial centres. Coal mines are heavily concentrated in central Queensland's Isaac and Mackay regions and in the Hunter Valley of NSW.

Beyond coal, industrial clusters are dotted in regions across the country, including Newcastle and the Illawara in NSW and Bell Bay in Tasmania. Kwinana – a hive of industrial activity outside Perth – is home to a number of facilities, including a lime and nickel products factory, a silicon smelter, and a titanium dioxide plant. The Pilbara region contains most of the country's iron ore mines.

Figure 1.6: Demand for critical energy minerals could fuel the next mining boom



Notes: Energy intensity is the amount of energy required to produce a tonne of refined metal. Energy intensity of rare earths production varies. Energy intensity for lithium varies and the dominant form of production in Australia is more energy-intense than the dominant form of production in competitor countries. Dashes indicate unavailable data.

Source: Grattan analysis of IEA (2021c) (volume), IEA (2021b) (value) Geoscience Australia (2020) (share of global reserves), Surovtseva et al (2022) (energy intensity of graphite), Voet et al (2018) (energy intensity of copper, manganese, and nickel), Dai et al (2018) (energy intensity of cobalt) and Maldonado (2020) (energy intensity of silicon).

39. Ibid.
40. Ibid.
41. Geoscience Australia (2020).

Opportunities will also unfold in the regions, notably in critical energy minerals mining. Figure 1.7 shows the proven critical minerals deposits across the country. If Australia can tap into the market for critical minerals, these regions could become new centres of low-carbon industrial activity.

1.6 Structure and scope of this report

Structure

This chapter has described the transformative challenges and opportunities facing Australia in the next three decades.

Chapter 2 makes the case for a new industry policy for Australia through which governments and industry can transform the sector at the scale and pace required.

Chapter 3 identifies the deficiencies of current industry policy, noting the lack of clear goals for the sector, poor targeting of existing programs, insufficient funding, and the absence of a clear, over-arching framework.

Chapter 4 lays out a framework for a new policy, using a 'tool-box' of policy instruments to stimulate supply of and demand for low-emissions industrial products.

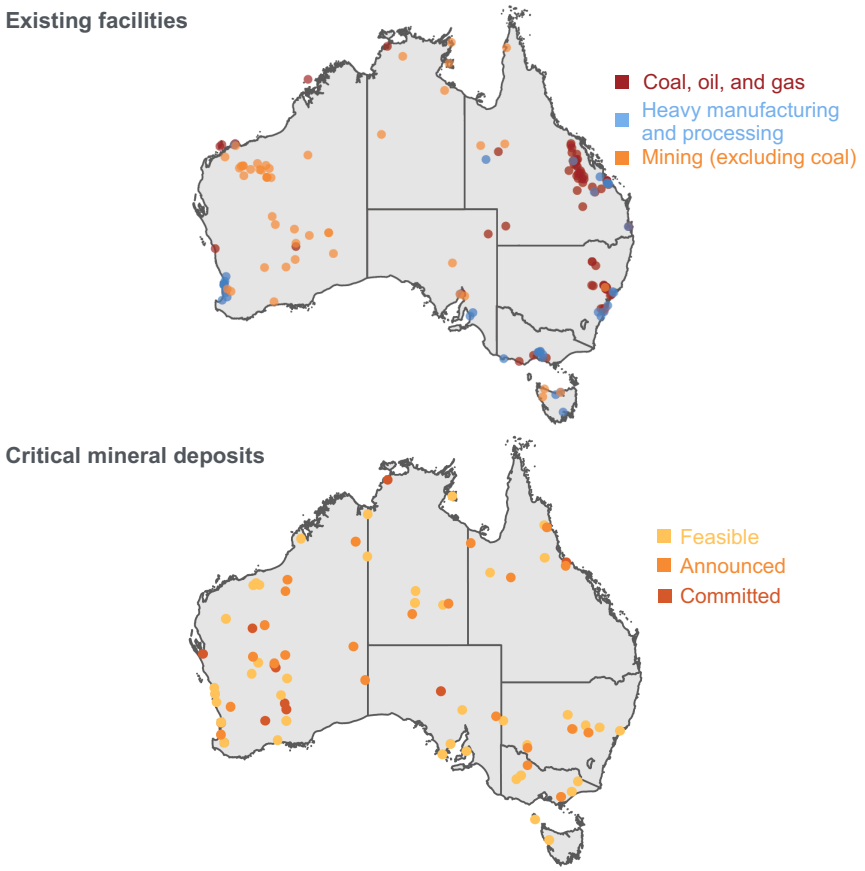
Chapter 5 makes recommendations for the regions, to ensure a transformed industrial sector benefits all Australians.

Scope

This report focuses on policy recommendations for existing heavy manufacturing and mining facilities that produce commodities and have significant emissions associated with that production.

Unless otherwise indicated, our data cover a subset of about 170 facilities that emit more than 100,000 tCO_2-e per year. These

Figure 1.7: Current and emerging industrial activity is concentrated in regional Australia



Note: Offshore oil and gas fields not shown on map.

Source: Grattan analysis of Clean Energy Regulator (2022a) and DISER (2021b) data.

facilities account for about 80 per cent of Scope 1 emissions from heavy manufacturing and mining.

Policy recommendations in this report exclude the following sub-sectors:

- Electricity generation, transmission, and generation
- Gas transmission and distribution
- Transport
- Specialised manufacturing.

This report also provides policy recommendations for future growth industries, such as critical energy minerals, ammonia, and steel. All of these have an existing industrial-scale base in Australia from which they can grow.

Green hydrogen is considered a potential future export growth commodity, and may play a role in decarbonising heavy industry in Australia too, as an input to decarbonise minerals processing and ammonia and steel production. But hydrogen is an infant industry and its potential growth path is less clear. While many of the industry policy recommendations in this report will apply to (and benefit) a hydrogen industry, hydrogen-specific recommendations are not included.

2 Australia needs a 21st Century industry policy

Governments use industry policy to alter the structure of an economy by encouraging resources to move into sectors that are perceived as desirable for future development.[42]

In the past, industry policy has been used to make markets more efficient, such as by correcting under-investment in research and development. Industry policy has also been used to direct resources to strategically important sectors to promote economic growth. This was the case with the IT transformation in the United States, where the government invested in the internet, GPS, and touchscreen technologies.[43]

To meet long-term emissions reduction targets, Australia's industrial sector must be transformed in fewer than three decades. A market mechanism – a carbon price – is the most effective and efficient way to drive emissions lower. But an economy-wide carbon price is politically beyond reach for now, and the market is not equipped to enact the transformation at the scale and pace required.[44] A 21st Century industry policy is needed.

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

First, markets do not generally provide adequate incentives for research and development of new technologies, because knowledge is often intangible, risky, and difficult to appropriate. Low-emission 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 to underpin their investments. Yet a carbon price is inherently uncertain because it depends on the decisions of governments. For both these reasons, investment in low-emission technologies is and will remain critically inadequate.

And third, there is a time imperative. Market forces are not good at managing structural transformations at high speed when the future is deeply uncertain. Moreover, the long-lived nature of industrial assets means that industry is particularly poorly suited to fast changes.

Australia needs a 21st Century industry policy to address these challenges. A new industry policy can firmly position Australia to capitalise on trade opportunities and boost our economy. Creating new employment and economic opportunities will be important to sustain support among the Australian people for the transition to net zero.

Industry policy requires sustained collaboration between the public and private sectors.[45] Australia has successfully used industry policy in the past. We should learn from that success to set a new strategic direction for the future.

2.1 Technology development

Technology will be essential for the economy to transform to net zero.[46] But without government intervention, technology will be developed sparingly and slowly.

42. Aiginger and Rodrik (2019).
43. Mazzucato (2019).
44. Wood and Mullerworth (2012).
45. Australian Industry Energy Transitions Initiative (2022).
46. Tagliapietra and Veugelers (2020).

When a market player develops a green technology, other firms can use this knowledge without sharing the costs ('technology spillover'). As a result, firms have little incentive to invest in research and development. Technology spillover is even more relevant for clean energy technologies because they tend to be particularly complex and uncertain, and therefore more costly.[47]

Given the market alone will not drive these breakthrough innovations, the government must have policies to do so.

2.2 Early-mover investment

Along with breakthrough innovation, the market will need huge investment to transition to net zero. This includes investment in facilities which produce new green industrial products and investment in existing facilities transitioning to cleaner production. It also includes investment in infrastructure which supports these facilities, such as solar and wind farms, as well as traditional infrastructure like roads and ports.

Many of the key technologies needed to decarbonise are already known. The IEA estimates that almost half the cumulative emission reductions needed to achieve net-zero emissions by 2050 come from technologies that are at the demonstration or prototype stage.[48] These technologies need investment to become commercially viable.

The problem is that these technologies are expensive and uncertain, and therefore unattractive to investors. The BlueScope example from Chapter 1 illustrates this point. The company found that 'emerging green steel technologies, whilst promising, are not yet ready for large-scale implementation in the timeframes required'.[49]

47. Ibid.
48. IEA (2021b).
49. BlueScope (2021).

At the moment, the incentives for low-emission investment are low. For one, investing in fossil fuels is cheap. This is because the price of industrial products fails to capture the environmental costs that come from producing emissions.

In addition, government subsidies for fossil fuels work directly against the objective to lower emissions. An example is the recent $7.5 million government grant to the Beetaloo Basin in the Northern Territory to confirm the size of the gas reserves.[50]

Investing in low-emissions capital is more expensive, and early investors face higher costs than followers. The technology cost noted above is part of it. Finance costs are higher for technologies that are new and not well understood. Early movers get little reward for paying higher costs for green investments. Many low-emissions industrial products are materially the same as emissions-intensive ones. Green steel and 'black' steel will look and feel the same, and will largely have the same properties.

Early movers cannot bank the full value of projected higher long-term revenues from low-emissions industrial products, because government policy on climate change is unreliable.[51] The profitability of green investments is affected by ever-changing political factors, such as the level of ambition to phase out fossil fuels. Consumer preferences are also uncertain: many consumers are not yet willing to pay a premium for a green commodity.

The risks of green investment are high. A carbon price would help divert investment to emerging green industries, but pricing carbon at a high enough level is difficult and politically unacceptable in Australia at present. The next best option is an industry policy where the government plays a role in directing investment toward opportunities in low-carbon assets and industries.

50. Pitt (2022).
51. Aiginger and Rodrik (2019).

2.3 The time factor

Markets struggle to take a long-term view when faced with emerging uncertainties such as climate policies and their impact on future demand for products. Market players often seek to maximise short-term profits. For example, resources businesses have continued to invest in fossil fuels, following short-term price signals, despite the world generally heading towards a low-carbon economy. Time-based emission-reduction targets (such as net zero by 2050) are necessary but not sufficient to provide effective price signals for low-emissions investment.

Short-sighted investment decisions are particularly dangerous in the industrial sector because of the long-term nature of industrial assets. Heavy manufacturing is a slow moving beast. Industrial facilities have long lifespans: 40 years for a typical cement plant, 35 years for a steel mill, and 30 years for a petrochemical plant.[52] If facilities replace their capital with the same high-emissions assets, they risk locking in their emissions for decades.

Managing the transformation of multi-million-dollar assets to low-emissions technologies and preventing emissions lock-in requires taking a long-term view now. Delays to transition will only make the transition more costly.[53]

2.4 Arguments against industry policy

Critics of broader industry policy focus on two arguments. 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,[54] and that governments should not pick winners but should rely on market forces to determine the winners.

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.[55]

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 selecting a direction the economy should head in and then choosing not the 'winners' but the 'willing' – companies that are willing to transform to carbon-neutral.[56] As in any investment portfolio, failure of some 'bets' is expected. The key is to stop supporting the losers.[57] 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.[58] Similarly, using a broad range of interventions such as recoupable grants, loans, underwriting, and equity allows governments to share in the upside from the 'winners'.[59]

The solution to the second concern – rent seeking – is better institutional design. Here, governance structures are critical.[60] A clear set of targets, milestones, and procedures of accountability and transparency is needed.[61] The group administering the funding elements of industry policy should be at arms length from government, like the Australian Renewable Energy Agency (ARENA).

52. Sato et al (2021).
53. Wood and Ha (2021).
54. Aiginger and Rodrik (2019).
55. Rodrik (2014).
56. Mazzucato (2019).
57. Hallegatte et al (2013).
58. Tagliapietra and Veugelers (2020).
59. Rodrik (2014).
60. Aiginger and Rodrik (2019).
61. Tagliapietra and Veugelers (2020).

Australia can look to the electricity sector to see industry policy effectively implemented.

2.5 Australia has already implemented 21st Century industry policy successfully

The electricity sector is the only part of the Australian economy where policy has successfully brought about transformation away from carbon-intensive production.[62]

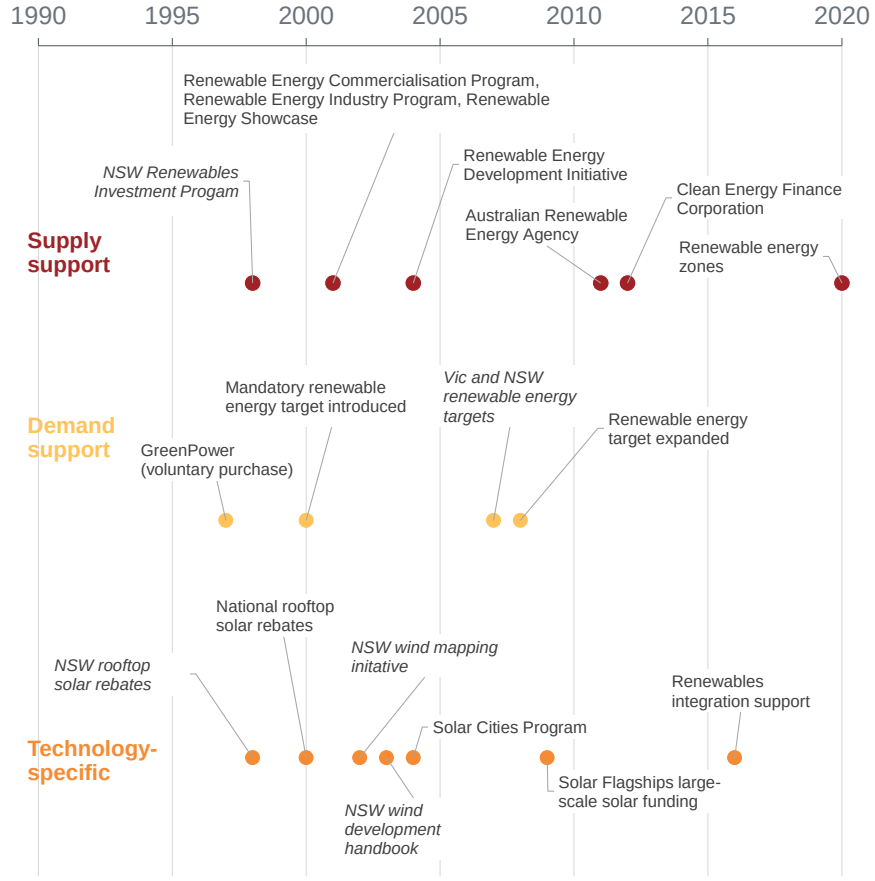
Transformation of the Australian electricity system by building a renewable energy industry has all the components of 21st Century industry policy: policies and programs to stimulate supply, targeted support for technology-specific market failures, and market-based policies to underpin demand for 'greener' electricity. While this combination came about 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 about 29 per cent in 2020.[63]

The key policies that developed the renewable energy industry are summarised in Figure 2.1.

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. Whether solar, wind, biomass, or geothermal, technology 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 matured and grew, in the first decade of the 2000s, governments recognised that grant funding was no longer the best way to share risk on renewable energy projects. The Clean Energy Finance

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 2022 is shown.

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

62. Noting that this transition has not been without issues, and is not complete.
63. DISER (2021c). Figures include hydro power built before 1997.

Corporation (CEFC) was established to crowd in private sector finance for renewable generation by providing loans and equity. As described in Section 2.4 on page 19, this involved picking the 'willing' – those who were happy to take part of the risk – rather than 'winners'. 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.[64]

The more successful driver of demand was the Renewable Energy Target. When introduced in 2000, it aimed to achieve an additional 2 per cent of electricity coming from renewables by 2008, by making it mandatory for electricity retailers to purchase a percentage of renewable electricity each year. At the time, this represented a doubling of post-1997 renewable energy production.[65] Additional state-based targets were introduced in 2007, and the national target was expanded in 2008 to 20 per cent of electricity by 2020 – a goal that was achieved in 2019.

This approach echoes the idea of tilting the playing-field towards a desired goal[66] (in this case, more renewable energy, achieved by allowing only renewable energy generators to benefit), but uses the power of markets to determine who the 'winners' should be.[67]

64. SEDA (2002).
65. Parliament of Australia (2000).
66. Mazzucato (2021, p. 207).
67. The Renewable Energy Target also shows that it is not easy to forecast in advance who the 'winners' will be. Modelling in 1999 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 (2022b).

There are some differences between the electricity sector and heavy manufacturing, however. The transformation of electricity also involved a shift from large centralised production to smaller decentralised production, which enabled faster learning. The heavy manufacturing sector is unlikely to make the same shift, meaning the transition will be 'lumpier' (and riskier) and the learning cycle slower. Nevertheless, Australian policy makers have valuable experience to draw on when designing policy for the industrial sector.

Today, the policy of choice for expanding renewable energy generation is for state and territory governments to enter power purchase agreements with developers of solar and wind farms to underpin their financial viability. These contracts are being complemented through the creation of renewable energy zones, which are designed to facilitate construction of transmission lines to connect the privately-owned renewable generators to the grid.

2.5.1 Lessons from renewable electricity for industry policy

In retrospect, the development of renewable electricity in Australia looks smooth. In fact, it was a fraught and contested process. Many early-stage technologies failed: Australia has no commercial large-scale geothermal electricity, wave power, solar thermal electricity, or biomass generation.

Poor implementation slowed industry development: the rooftop solar industry suffered particularly from stop-start subsidies across the decade 2000-2010. Poor co-ordination between state and federal policies (often arising from frustration on one side with lack of action on the other) created inefficiencies and over-subsidisation of some technologies.[68]

68. For instance, state-based feed-in tariffs encouraged higher rooftop solar uptake, which skewed renewables investment away from (cheaper) wind energy.

Politicking also played a role: the Renewable Energy Target was, for a while, a political football, and as a consequence investment froze; and the Australian Renewable Energy Agency and Clean Energy Finance Corporation have both been threatened with closure at different times.

Today, governments are grappling with the outcomes of success as they try to figure out how to build and manage a grid with a high level of renewable generation and deal with closures of coal-fired electricity generators.

Nevertheless, four lessons can be drawn from what did work. First, governments should fund early stage technology development, and be prepared for failures. And they should stop when failure becomes evident.

Second, policy needs to evolve as technology matures, as shown above where supply-side support moved from grants to loans and equity to government contracting.

Third, relying on enlightened consumers to pay more for green products is not sufficiently 'bankable' to underwrite investment. A market-based instrument that spreads a small amount of extra demand across as many consumers as possible is a better approach.

And fourth: poor co-ordination between state and federal governments can result in inefficient subsidies.

3 The current approaches aren't working

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.

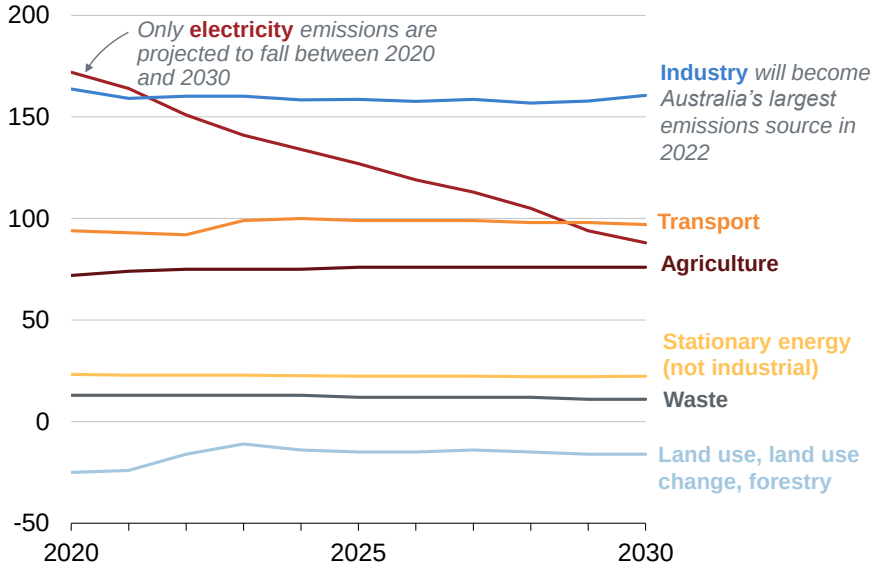
The new approach – of choosing goals and focusing effort on achieving them – is only faintly visible. The rhetoric is there from both sides of politics, but the policy to transform the economy in less than 30 years has emerged from neither.

There are numerous policies and programs, but no over-arching framework that organises them. Clear goals have not been set for the industrial sector, targeting of existing programs is (with some exceptions) poor, funding is insufficient to match rhetoric, 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.

Figure 3.1: Industrial emissions are not projected to decrease this decade

Emissions (millions of tonnes of CO_2-equivalent)



Note: Industrial emissions comprise all Scope 1 emissions from industrial processes, all stationary energy emissions except those from the commercial and residential sectors, and all fugitive emissions except those from gas pipelines and networks.

Source: Grattan analysis of DISER (2021d).

3.1 No clear goals

The Federal Government has whole-of-economy emissions goals (43 per cent below 2005 levels by 2030, net zero by 2050) but has ruled out economy-wide policies to get there, implying policy will be implemented sector by sector. The states are taking a similar approach. As yet, governments have not articulated sectoral goals outside of state-based electricity targets, so it is unclear how much each sector is expected to achieve by when.

The Federal Government's most recent emissions projections (Figure 3.1 on the preceding page) include little if any reduction in industrial emissions by 2030, which in turn implies very steep reductions to achieve net zero by 2050. But companies in the sector can only guess at what the trajectory is, and this makes it difficult for them to plan capital replacement cycles, expansions, and new facilities.

Before the 2022 federal election, Labor committed to use the Coalition's Safeguard Mechanism to reduce industrial emissions in line with a target of net zero by 2050. The details of how this will be achieved by the new Labor Government are yet to be worked through.

Big-ticket initiatives that support the transformation of the industrial sector have vague or outdated goals. For instance, the previous government's signature Modern Manufacturing Initiative aimed to 'within two years: create the business environment to support manufacturing jobs and encourage new investment'[69] – a goal that is difficult to quantify or to know when it is achieved. The new government's Future Made in Australia initiative aims to 'create jobs, boost vital skills by investing in education and training, bring industry expertise back onshore, and supercharge national productivity'[70] – again difficult to quantify. The Northern Australia Infrastructure Facility aims to 'provide financial assistance to the states and territories and other entities for the development of northern Australia economic infrastructure'[71] – a goal that links performance to deploying cash rather than the economic impact of infrastructure.

Initiatives such as the Australian Renewable Energy Agency (ARENA) and the Clean Energy Finance Corporation (CEFC) have goals that reflect market failures that were current at the time they were established – 'improve the competitiveness of renewable energy technologies; and increase the supply of renewable energy in Australia' (ARENA),[72] and 'facilitate increased flows of finance into the clean energy sector' (CEFC)[73] – but because the agencies successfully built markets to achieve these aims, the goals now act as a constraint rather than a guide as both agencies turn attention to other sectors.

Within the 255 programs that federal and state governments have established to support business in the industrial sector, assistance for research and development is the dominant objective, followed by assistance for equipment, vehicles, or tools (Figure 3.2 on the next page). Only a small number of programs target switching towards clean energy or using energy more efficiently (classified as 'environmental sustainability' in Figure 3.2); or target export market development.[74] The manufacturing sector (and the activity of manufacturing) has by far the largest number of programs.

3.2 Very little targeting of net-zero advantage

In Chapter 2 we outlined how 21st Century industry policy needs broad programs that target market failures across multiple sectors, complemented by narrow programs that focus on just one sector. Examining the objectives of the 700-plus programs listed on business.gov.au reveals many of the former, and very few of the latter.

Table 3.1 on the following page shows a breakdown of state and federal programs that support business. Most are offered to more than one sector, and for programs available to mining, manufacturing, and gas industries, only a few are specific to those sectors.

69. DISER (2020).
70. Albanese (2022).
71. NAIF (2022).
72. ARENA (2011).
73. CEFC (2012).
74. Grattan analysis of DISER (2022a).

Table 3.1: Breakdown of programs that support business

	Federal	State
Total number of programs available	238	275
Available to the manufacturing sector	148	150
Available to the mining sector	104	134
Available to the gas sector	111	141
Available only to the manufacturing sector	31	12
Available only to the mining sector	1	4
Available only to the gas sector	2	0

Notes: As at 18 February 2022. Excludes natural disaster response programs, COVID-19 programs, programs announced in the 2022 federal budget, commitments made by either party during the 2022 federal election campaign, and state programs announced after 18 February.

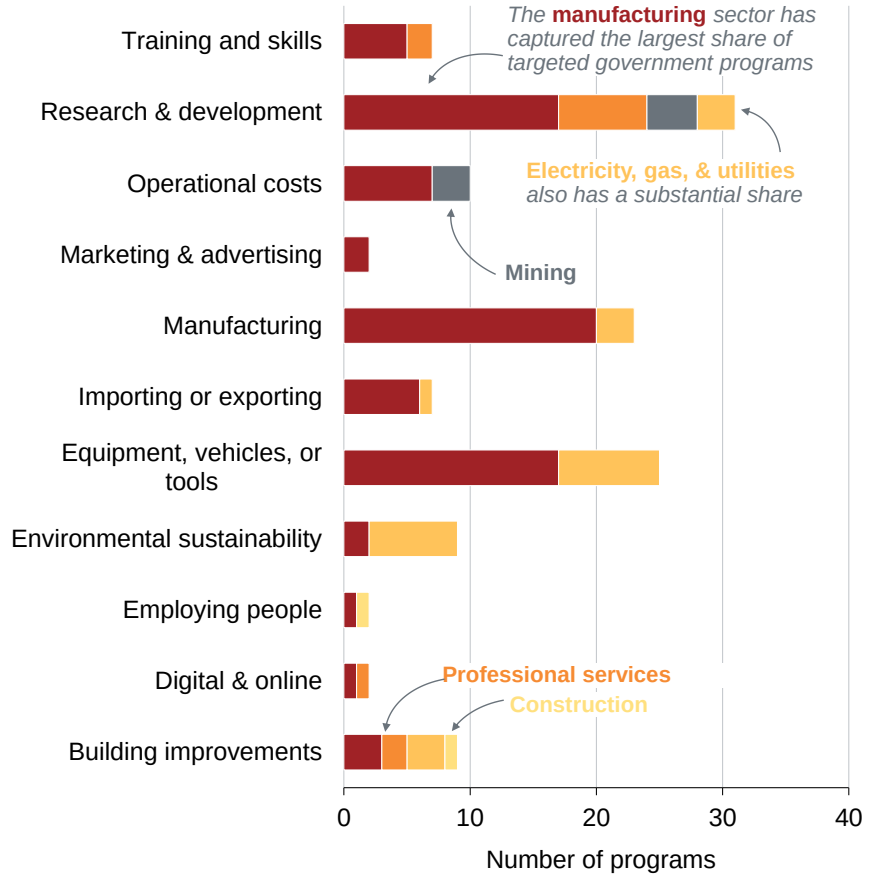
Source: Grattan analysis of DISER (ibid).

Unsurprisingly given the number of available programs, there is no clear evidence of strategic focus on areas of comparative advantage: program descriptions include vague terms such as 'new technology' or 'opportunities' but few phrases that mention a specific activity or market.[75]

There are 43 programs available for manufacturing and no other sector, but only five of these show any level of targeting – the large grants programs for the Modern Manufacturing Initiative.

The idea behind the Modern Manufacturing Initiative – focused support for areas of comparative advantage – is sound. But there's a long way to go before this ideal is realised. The results of the first grant rounds look more like what it was meant to replace: scatter-gun grants to a wide range of companies. The Federal Government committed in 2020 to review and refine its existing programs to better align them with the

Figure 3.2: Most government assistance is targeted at research and development, and the manufacturing sector benefits most



Notes: Manufacturing is both a sector and an activity. Some programs have more than one objective, and 15 (not shown) have no stated objective in the Federal Government's grants database.

Source: Grattan analysis of DISER (2022a).

75. Grattan text analysis of program descriptions from DISER (2022a).

Modern Manufacturing Initiative and improve targetting,[76] but as yet this has not happened.

3.2.1 Both too much and not enough money

Most current programs focus on financial assistance via grants: of the 255 programs available to the industrial sector, 189 provide grant funding, 18 provide subsidies or rebates, and 6 provide loans, with the remainder providing advice, tax incentives, or sponsorship.[77] For programs where grant size is capped, most grants are less than $5 million (Figure 3.3).

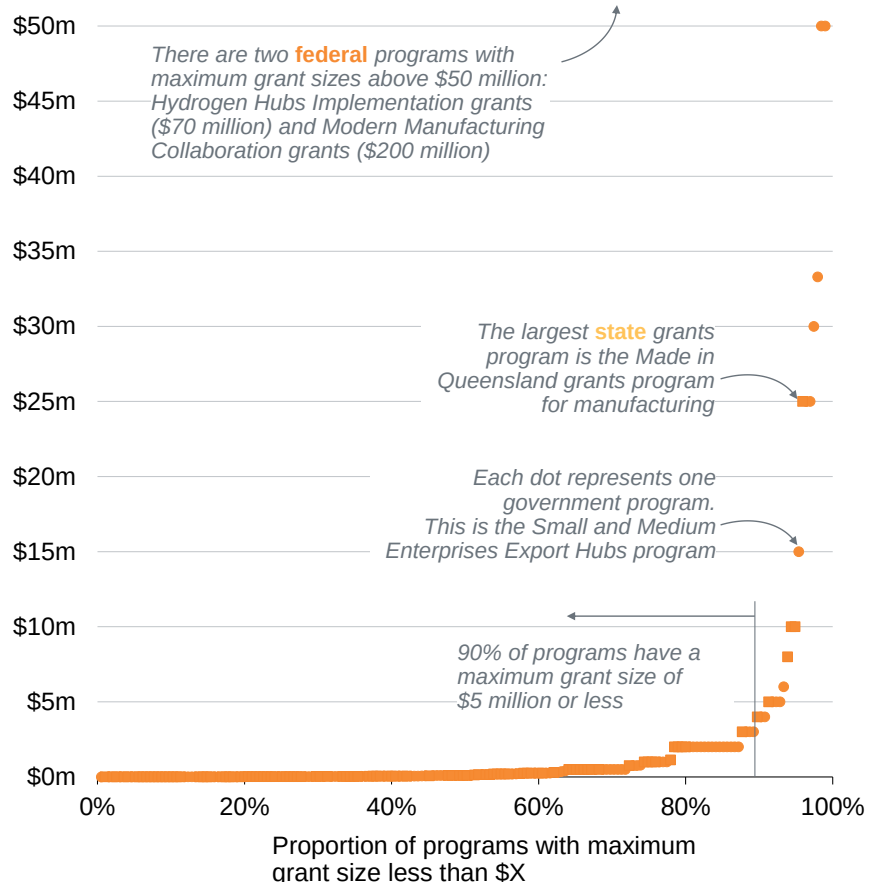
Presumably these programs have been established to address identified market failures; and the grant size is appropriate to the problem. But these programs are not going to be sufficient to attract the private capital needed to transform the sector, particularly not heavy industry where the capital investment needed to transform facilities is likely to be in the billions of dollars. Even for new industries such as battery manufacturing, investment is minor compared to what is required: establishing battery manufacturing in Australia is estimated to require between $17 billion and $23 billion in capital between now and 2030 to be competitive. Battery-related R&D investment to date is $300 million.[78]

3.2.2 Little support for demand

In Section 2.5 we made the case that industry policy should promote demand as well as supply. Australia's transition towards renewable energy is a textbook example. Successive governments at state and federal levels subsidised the capital cost of new generation; and at the same time, the Renewable Energy Target guaranteed demand for

Figure 3.3: Most grants programs available to the industrial sector provide very small grants

Maximum grant size ($)



Notes: Includes state and federal programs listed in the Federal Government's grants database as at 18 February 2022. Excludes COVID and disaster response programs, programs announced in the 2022 federal budget, and commitments made by either party during the 2022 federal election campaign.

Source: Grattan analysis of DISER (2022a) data.

76. Andrews (2020).
77. Grattan analysis of DISER (2022a).
78. Accenture (2021a).

electricity with a 'green premium'. Over time, as capital costs fell and the guaranteed demand increased, the green premium decreased. Now, electricity costs for renewables are moving towards parity with traditional generation.

Using this successful approach for the industrial sector will require policies that support demand for commodities where a transformative production process creates a green premium. But currently, there are very few policies at state or federal level that support demand for 'green commodities'. The NSW Government has grants available for hydrogen users, and federal funding for hydrogen hubs can include support for demand (although no hubs funded so far has significant demand). There are no programs or policies to support demand for green ammonia, green steel, green cement, low-carbon glass, or green metals.

One difference between transforming the electricity sector and transforming the industrial sector is the role of exports and imports. Australia does not export electricity, nor do local producers face competition from imports. Supporting demand for 'green' commodities requires thinking about local demand, international demand, and international supply.

3.3 Some policies encourage higher industrial emissions

It is inefficient and wasteful of public money and private capital to stimulate the creation of greenhouse gases while at the same time attempting to stimulate decarbonisation. Similarly, it is inefficient and wasteful to continue supporting industries which produce commodities with diminishing markets in a net-zero world. Yet current polices in Australia are doing both.

A good example is the Olive Downs coal mine in Queensland. This mine will add about 609,000 tonnes to national emissions each year.[79] Development of the mine was underwritten by the Northern Australia Infrastructure Facility (NAIF), with a $175 million loan. This amounts to subsidising the production of emissions at $8.18 per tonne.[80] At the same time, the Federal Government is also underwriting emissions reductions at $17.35 per tonne through the Emissions Reduction Fund.[81] About $10.6 million of government underwriting is tied up in the Emissions Reduction Fund each year just to stop the emissions from Olive Downs increasing Australia's overall emissions.[82]

Current subsidies for gas include underwriting (through the NAIF and Export Finance Australia (EFA)), infrastructure provision (such as the NT Gas Industry Road Upgrades program), and exploration for new resources (the Beetaloo Cooperative Drilling program). At state and territory level, Western Australia and the NT provide subsidies for exploratory drilling.

As we showed in Chapter 2, there are sufficient reserves of coal in existing coal mines to meet Australia's likely share of world trade in a net-zero world. While the future of gas is less certain, what is clear is that its long term role is as a residual fuel – the fuel that (on current knowledge of technologies and their economics) looks like it will supply the very last percentage that renewables cannot.

These probable trajectories for coal and gas demand show that there should be no further government support for expanding production of either. Such support would amount to subsidising stranded assets and

79. Grattan calculation based on Olive Downs estimated annual production of 15 million tonnes of coal, the Federal Government's standard emissions factor for fugitive emissions, and average combustion emissions for Queensland coal mines in 2019 from AGEIS.
80. Based on annual emissions above and reserves of 527Mt: Pembroke (n.d.).
81. Clean Energy Regulator (2022c).
82. 609,000 tonnes per year at $17.35 per tonne.

decommissioning costs. It is time to phase out assistance to coal and gas production.

3.3.1 There is nothing to stop transfer of carbon risk to governments

The above examples amount to transferring the financial risk arising from exposure to declining markets for fossil fuels from companies to governments.

The Federal Government's financial institutions – the CEFC, the NAIF and EFA – face a particular risk as private finance begins reducing its exposure to fossil fuel investments: they could find themselves being asked to fill the gap. In the past nine months there have been several calls for the Federal Government to underwrite coal exports because insurance is becoming more difficult to access.[83]

The CEFC is partially protected from this risk by its Act. But action is required for the NAIF and EFA, and any future funding bodies established by the new government. These institutions could be required to implement (at least) APRA's *Prudential Practice Guide CPG 229 Climate Change Financial Risks* and carbon risk management in line with that proposed by the International Financial Reporting Standards Foundation. This would bring them into line with practices of international investors, making it easier for those investors to participate in co-funded projects in Australia.

3.3.2 Most programs were not designed for a net-zero economy

Direct subsidies for fossil fuel production and consumption are only part of the problem.

Many current programs and policies could inadvertently push emissions up because they were designed before governments committed to net zero. For example, grants under the Modern Manufacturing Initiative could increase industrial emissions if they encourage the expansion of emissions-intensive industries. Subsidising oil refineries for fuel security purposes also locks in a pattern of emissions from these refineries.

Incomplete implementation of the Safeguard Mechanism has allowed new facilities to start production without a constraint on their emissions. Overall, industrial emissions covered by the Safeguard Mechanism have risen since its inception,[84] despite the policy's objective being to prevent that rise.[85]

Beginning with their largest programs, governments should immediately begin reviewing policies that assist the industrial sector and where necessary redesign them to avoid locking in higher-emissions processes and practices. New programs should be designed with achieving net zero in mind.

83. Ker (2022).

84. Wood et al (2021b).
85. Hunt (2016).

4 What governments should do

Australia needs 21st Century industry policy that sets a clear emissions-reduction target, 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.

Many of the necessary policy tools already exist, and need only a few tweaks to make them more effective. These include the Safeguard Mechanism, and the major federal funding facilities such as the Northern Australia Infrastructure Facility (NAIF), the Australian Renewable Energy Agency (ARENA), Export Finance Australia (EFA), the Clean Energy Finance Corporation (CEFC) and the new National Reconstruction Fund. There are some gaps, particularly in bringing forward investment in low-carbon refurbishments of existing facilities, and supporting demand for 'green' commodities.

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

4.1 Make the goal clear

Large businesses in the industrial sector have largely grasped the need to get to net zero: 74 per cent of facilities currently reporting their emissions are controlled by a company with a net-zero goal. The vast majority of these companies (97 per cent) have an interim (pre-2050) goal as well.[86] But to plan their own pathways to net zero, business is asking for guardrails: clarity on the emissions-reduction goal for the sector, and assurance that while the mix of policies may change, the goal will not.

The limited detail available on the new government's policy implies that emissions from large industrial facilities will fall from about 140 million tonnes in 2021 to about 103 million tonnes in 2030.[87] Clarifying an absolute emissions goal for the sector would provide context for industrial facility owners as they begin planning for the capital investment decisions this decade.

Government needs to provide a clear medium-term goal for the sector, linked to the economy-wide goal of 43 per cent below 2005 levels by 2030.

4.1.1 Track progress against emissions, jobs, and exports

Although it is common to refer to an emissions target at a point in time (e.g. 2030 or 2050), the real target for a country, or indeed the world, is limiting cumulative emissions over a period of time. This is because emissions accumulate in the atmosphere over time, and have a cumulative effect on the climate. For example, Australia's previous 2030 target was referred to as 26-to-28 per cent below 2005 levels, which means limiting cumulative emissions between 2021 and 2030 to between 4.8 billion tonnes and 4.9 billion tonnes.[88] In effect, this is an emissions 'budget' – a total amount of emissions allowed between two points in time.

Progress in reducing emissions in the industrial sector should be tracked against a sectoral emissions budget as well as a point-in-time target. This budget would represent the sector's share of overall effort

86. Grattan analysis of publicly available information on ownership of facilities subject to the Safeguard Mechanism.

87. Reputex (2021, p. 8). Note that modelling for the new government's policy covers all facilities subject to the Safeguard, whereas this report focuses on heavy manufacturing and mining only.

88. DISER (2021d, p. 3).

to reach 2030, 2035, and 2050 national targets. And it would link the industrial sector's aims to national goals.

Governments and oppositions, state and federal, have dual objectives with regards to industrial emissions: achieving climate targets *and* preserving and creating jobs; reducing emissions here *and* creating new export markets to reduce emissions abroad.

Tracking progress towards emissions goals should also track the relationship between emissions reductions and these other factors. This could mean tracking tonnes of emissions per direct job, tonnes per dollar of export value, or tonnes per dollar of gross value-add. But governments should not set targets for the sector in these terms. It is possible for emissions intensity of jobs, exports, or gross value-add to fall, while absolute emissions rise, if these factors grow faster than emissions fall.

Grattan Institute has previously recommended relaunching and empowering the Climate Change Authority with a formal remit to advise on emissions budgets, track Australia's progress towards net zero, and advise governments on new policies or adjustments to existing policies to build momentum over the coming decades.[89]

In addition, the Federal Government should ask a revitalised Climate Change Authority to track how quickly the emissions budget for the industrial sector is being used up, and report this publicly. The Authority should also regularly review how well policies are working, and advise government on potential changes to stay within the budget.

As state governments are also taking a sector-by-sector approach to emissions reductions, they should also develop sectoral goals, and metrics to measure them, and factor these into design of their industry policies.

89. Wood et al (2021c).

Sectoral goals do reduce flexibility to achieve emissions reductions across the economy at the least cost. But governments at state and federal levels have chosen to take a sector-by-sector approach to emissions reductions. Making sectoral progress will build momentum and confidence that the task of reaching net zero is possible, even if this comes at the price of flexibility and cost minimisation. Once we are moving, it will become easier to move faster.

4.2 Use the Safeguard Mechanism to improve existing facilities

The Safeguard Mechanism (see Box 3 on the following page) was originally designed to constrain the growth of industrial emissions so that they did not outweigh emissions reductions elsewhere in the economy.[90] This was an appropriate policy aim at a time when Australia's nearest target was to reduce emissions by 5 per cent against 2000 levels by 2020. But 'constraining the growth' is not a strategy to reach net zero. It is time to revamp the Safeguard Mechanism so that it can provide a strong carbon investment signal to invest in low, zero, and negative emissions technology.[91]

The Federal Government has committed to lower the Safeguard Mechanism Baselines at a rate consistent with a 5 million tonne reduction in covered emissions each year.[92] At the time of publication, little detail on the mechanics was available. To maximise the effectiveness of the Safeguard as a tool to reduce emissions and transform the industrial sector, the following principles should be included:

- Use tradeable credits to access the most economic emissions reductions. This allows for greater ambition.

90. Hunt (2016).
91. BCA (2021), p. 41.
92. Reputex (2021).

- Where facilities are trade-exposed, do not shield or exclude them from compliance. Exclusions and shielding will increase the cost of achieving the same emissions reduction outcome, and push effort onto other sectors of the economy such as agriculture and households.[93] If the government wants to provide assistance with structural adjustment, this should be done outside the Safeguard – for example, through the National Reconstruction Fund.
- Implement the new entrant benchmarks to provide a low-carbon investment signal for new facilities and major refurbishments (Box 3).
- Monitor how many facilities are falling below the 100,000 tonne threshold, and adjust the threshold downwards as the policy succeeds.

4.2.1 Prevent lock-in by new facilities and refurbishments

The next mining boom must be net zero

In Chapter 1 1 we noted the potential for a second mining boom in Australia, driven by global demand for minerals used in net-zero technologies such as batteries, wind turbines, solar panels, and electric cars.

Energy used in the mining sector comes from diesel (41 per cent), gas (33 per cent), and grid electricity (22 per cent).[94] If the next mining boom is powered in this way, Australia's net-zero target is unlikely to be met.

Broader uptake of renewable technology in mining could be boosted by a stringent new-entrant benchmark, and declining Safeguard baselines

93. Shielding local production from competition also results in a weak and uncompetitive industry, the opposite of what industrial policy aims for: Rodrik (2014).
94. ARENA (2017a). These figures include coal mining.

Box 3: The Safeguard Mechanism

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.

Facilities that exceed their baselines have several options. They can apply for a multi-year monitoring period, so their compliance is assessed on average over multiple years rather than annually. Under some circumstances, they can apply for a new baseline that accommodates expanded production. Or they can purchase and surrender Australian Carbon Credit Units (ACCUs) to offset their excess emissions.

The Safeguard has provisions for new-entrant benchmarks: special baselines representing best-practice emissions intensity that should apply to new facilities and significant expansions and replacements. However, successive ministers have failed to implement this measure, and as a result, new facility baselines represent average practice.

The Federal Government has committed to reform the Safeguard Mechanism so that baselines decline over time, pushing facilities to reduce their emissions. At the time of publication, the rates of decline and the details of compliance were yet to be established. The government has also committed to review the integrity of ACCUs.

(see Section 4.2 on page 30). Ongoing government support to improve and commercialise batteries and energy storage technology for 24-hour power will also assist.

Get the best emissions and economic outcomes from refurbishments

As outlined in Section 1.3 on page 12, Australia's industrial facilities are ageing, and will face significant capital replacement decisions in the coming decades. Each of these decisions can potentially lock in patterns of energy use and emissions for many more years.

Implementing the new-entrant benchmark provision contained in the Safeguard would require significant expansions and replacements of existing facilities to meet much lower emissions intensities of production, minimising lock-in of emissions.

But, the lowest-emissions option for replacements may not be the most economic. To mitigate the risk of locking in long-term emissions, the Government should establish an Industrial Transformation Future Fund to close the risk gap for low-emissions technology used in major refurbishments and replacements. As we outlined in *Towards net zero: Practical policies to reduce emissions in the industrial sector*, an off-budget future fund could supply up to $10 billion in capital to bring forward investments in lower-emissions refurbishments and replacements for existing facilities.[95]

95. Future funds are investments that provide an income stream which the government then uses to support policy. The investment phase would by managed by the Australian Government Future Fund, and disbursement of the returns could be done through an existing body such as the Clean Energy Finance Corporation. See Wood et al (2021b).

Box 4: Net-zero mining

Demand for minerals will accelerate as the global economy moves to net zero. Australia has large reserves of some of the minerals that are expected to grow significantly in volume and value.

Capturing these markets using current mining practices and technology will risk Australia's net-zero goals. Development of new mines needs to be less emission-intensive than current practice, and the energy used needs to trend quickly towards zero emissions.

Decarbonisation will mean switching to renewable energy, but the ease of doing so will vary depending on the metal and mineral as well as the location. Mines connected to the grid already have access to renewable energy. Remote mines use diesel or gas to power extraction equipment, ore transport, and ore processing. Emissions reductions in remote mines via a switch to renewables will be easier where gas or diesel are used to provide electricity to power equipment, rather than supplying heat.[a]

Using a high percentage of renewable energy in remote mining operations requires overcoming the 24-hour-power barrier, by optimising mine design, energy storage, and electricity network design. Pilot projects in Western Australia, such as the De Grussa Copper Mine at Peak Hill, and the Alinta Chichester power station and network at Mount Sheila, proved the concept, and many other miners are now investigating greater use of renewables.[b]

a. ARENA (2017a).
b. ARENA (2017b) and ARENA (2019).

4.3 Support export-led net-zero growth

4.3.1 Early-stage technology support is well established

Policy to stimulate early-stage technology development for a net-zero industrial sector is well established. Governments are investing in R&D and demonstration projects for new solutions, through measures such as hydrogen hubs and green metals R&D. There is a good mix of broad programs (such as ARENA's Advancing Renewables program and the Co-Operative Research Centres program) available to all areas, and targeted programs with clear goals, such as the funding prioritised through the previous government's Low Emissions Technology Statement.

These initiatives should be reviewed to ensure they are oriented towards net zero and are not funding projects or technologies that increase emissions or lock in fossil fuel assets.

4.3.2 Manage carbon risk to attract capital

The critical next step for a net-zero industrial sector will be to move from laboratory and demonstration scale to industrial scale.

Much of the capital required to transform the sector will come from private investment. As we outlined in *Towards net zero: Practical policies to reduce emissions in the industrial sector*, there will be a risk gap for first-of-a-kind and first-in-country transformation of industrial facilities. Making concessional finance available is one way to share this risk.[96] The CEFC, provided it has access to enough funds and can prudently manage the risk, would be the ideal vehicle, and could aim to make between 5 and 10 'big bets' on big net-zero industrial facilities. A green steel flagship project would be one such opportunity. Depending on its other priorities and final design, the National Reconstruction Fund may also play this role. The NAIF could also be used.

An emerging risk is competition for international capital. While Australia is generally considered an attractive investment destination, it is falling behind on climate risk disclosure, which investors use to decide where to invest in net-zero investments. The Federal Government acknowledged this risk in 2021,[97] and rightly said its commitment to net zero was part of mitigating the risk. ASIC has followed up with guidance for directors and boards.[98]

But the rest of the world is moving fast, and the international standard for developed countries is quickly becoming mandatory disclosure of climate change risk, with comprehensive communication to investors, consistent with the framework outlined by the International Financial Reporting Standards Foundation.Confusion-to-clarity-IGCC

Mandatory disclosure of climate risk is increasingly preferred by investors. Voluntary disclosure tends to be inconsistent between companies, and can have gaps, omissions, and lack information about underlying assumptions.[99]

Brazil, the European Union, Hong Kong, Japan, New Zealand, Singapore, Switzerland, and the UK have implemented mandatory disclosure.[100] Brazil is Australia's nearest competitor for iron ore exports. Between them, the other countries that have implemented mandatory disclosure are the source of half of foreign investment in Australia.[101]

96. Concessional finance is finance provided at below-market rates. This might include a lower interest rate on a loan, a discounted equity position, or acting as a guarantor against default: The World Bank (2021).
97. Frydenberg (2021).
98. Armour (2021).
99. Investor Group on Climate Change (2021), p. 4.
100. TCFD (2021a), p. 5.
101. Grattan analysis of Department of Foreign Affairs and Trade (2021).

To ensure Australia is not at the back of the queue for capital, the Federal Government and regulators should bring Australian regulations and guidance into line with international best practice:

- ASIC should update regulatory guidance for listed companies in line with the Task Force on Climate-related Financial Disclosures (TCFD), to establish clear regulatory expectations on disclosure of material climate-related risk.[102]
- APRA should update the Climate Change Prudential Practice Guidance for regulated entities in line with International Financial Reporting Standards Foundation recommendations, to establish regulatory expectation on disclosure of material climate-related risk.
- Federal Treasury should review whether the current legislative framework on disclosure is consistent with the TCFD framework.

As outlined in Section 3.3.1, the government should impose similar conditions on its own financial agencies.

4.4 Close the 'green premium' gap

A 'green premium' is the difference in cost between a product that involves emitting carbon in its production and an alternative that does not.[103] Whether for increasing activity in areas of strategic advantage, or for reducing emissions from the production of traditional commodities such as cement, steel, and aluminium, transforming the industrial sector will involve customers paying a green premium for industrial outputs.

Green premiums can be reduced through scale (making more of a product is usually cheaper per unit of product), innovation (improving and optimising production processes), and by pricing carbon. The green premium may never disappear, but must also be weighed against the cost of not paying it – which is the cost of climate change itself.

Most climate policies, no matter what sector, aim to reduce green premiums over time, so that low- or zero-emissions options become the default.

In Chapter 2 we showed how successive federal and state governments from 1999 onwards brought about the transformation of the electricity sector through a mix of market-based instruments, grants, and market rules, which acted on both production and consumption of renewable electricity. To replicate this success for industrial commodities, policy needs to encourage more supply of green commodities by risk-sharing on new technology. Policy should also build demand for these commodities.

4.4.1 Supporting demand will close the green premium gap

Underpinning demand for green commodities is essential. There is a persistent gap between the number of consumers who say they are willing to pay more for a green product, and those who actually do.[104] Just as relying on consumer preferences for green electricity never raised the percentage of renewables beyond 2 per cent, relying on enlightened consumers to prefer green commodities is unlikely to be a good strategy to bring about the swift and transformative change the sector needs if Australia is to reach net zero and benefit from others doing so too.

Policy to underpin demand, however, is more complicated than for electricity. Industrial commodities are exported (meaning demand is

102. The TCFD defines 'climate-related risk' as encompassing the risks to a business from a changing climate, and the risks from a transition to a lower-carbon global economy: TCFD (2021b).
103. Gates (2019).
104. Mortimer (2020).

a function of global markets) and imported (meaning import substitution needs to be considered in policy design). And Australia doesn't directly use every commodity it produces – some go elsewhere to be transformed into other products that may then find their way back to Australia via trade.

Government purchasing is not the most effective way for the federal government to support green commodity demand

Some national and sub-national governments have created demand for green commodities through government purchasing mandates. For example, the Biden Administration's Buy Clean Task Force uses the US Government's purchasing power to drive demand for lower-carbon materials such as concrete, steel, and aluminium.[105]

In 2020-21 the Australian Government purchased $25.7 billion in goods.[106] The largest single category of goods purchased was drugs and pharmaceutical products ($4.1 billion), followed by marine craft ($2.8 billion). The federal government spent $9 billion on building construction and support, maintenance, and repair services, but it is unclear how much of this was spent on goods and how much on services.

Direct purchasing by the federal government is unlikely to be sufficient to underpin development of a market for green commodities produced by heavy manufacturing, because the sorts of things it buys do not contain large amounts of these commodities.

However, the federal government does fund a lot of infrastructure, which uses commodities such as cement and steel. The previous government boasted of a pipeline of $120 billion of projects over 10 years.[107] But this funding is paid to state governments, who are responsible for procurement and contract management.

These infrastructure projects will be a significant source of demand for commodities over coming years. About 30 per cent of infrastructure spending goes on materials, most of it on steel and concrete.[108] The projects in the infrastructure pipeline are estimated to add between 7 million and 8 million tonnes to demand for concrete this year alone. Additional demand for steel is estimated to be 300,000 tonnes per year for the next three years.[109] Australia imports roughly one-third of the steel it consumes, with the rest being locally produced.[110] For cement, 9 per cent is imported and the balance is locally produced, but nearly half of the clinker consumed in the production process is imported.[111]

State governments could help build local demand through an embodied carbon construction standard

State governments probably have more capacity to underpin local demand for commodities such as low- or zero-carbon concrete, steel, aluminium, and glass, because they are responsible for funding projects – particularly infrastructure – that require these commodities. They also control the regulations that govern how these projects get built, such as planning legislation and building regulations.

One way to support local demand for green commodities would be to introduce an embodied carbon-intensity standard for construction. Such a standard would require developers of infrastructure projects to estimate the carbon emissions from the cement, concrete, steel, glass,

105. The White House (2022).
106. Department of Finance (2022).
107. Department of Infrastructure, Transport, Regional Development and Communications (2022).
108. Infrastructure Australia (2021, pp. 39, 58).
109. Ibid (pp. 58–59).
110. Smith (2021).
111. Clinker is a mixture of ground limestone, clay, and sand which is heated in a kiln and ground with gypsum to make cement: Cement Industry Federation (2022).

aluminium, copper, and other commodities they used in construction of infrastructure and buildings. Through planning regulations, state governments could cap the embodied carbon per unit (for buildings this could be per square metre of floor space; for roads, it could be per kilometre).

The NSW Government is designing an embodied carbon standard of (provisionally) 12 tonnes per occupant for residential construction.[112] Expanding a standard to all construction would allow for greater demand without pushing the standard to levels where it substantially increases costs. Other state governments could follow suit, and a nationally consistent approach could be achieved by implementing the standard through the National Construction Code.

A cap on embodied carbon could be lowered over time. Construction companies could choose between substituting materials to achieve the standard, or purchasing certified green materials with lower emissions. This would create a green premium for construction materials produced with low- or zero-emissions processes. Other governments could follow NSW's lead and establish standard factors for carbon content, to make calculations easy and minimise the cost to business. Imported materials would need carbon content verified to the same level of rigour as Australian producers.

The assurance of a higher value for green commodities would encourage Safeguard facilities that produce construction materials to favour cleaner production over offsetting to meet their declining baselines, and would provide an additional incentive for major refurbishments to use lower-emissions options and avoid emissions lock-in. For example, it might provide better returns for cement plants that switch from coal (cheap but emissions intensive) to natural gas (cleaner but more expensive).

Given that hydrogen is a front-runner to replace coal and gas to produce green steel and green cement, an embodied carbon standard could support local demand for hydrogen, focused on industries that are the most prospective long-term users.

An embodied carbon-intensity standard would support Australian production of commodities in a way that is consistent with WTO rules, whereas current practices requiring local content are not.[113]

Costs and measurement must be thoroughly understood

An embodied carbon standard may result in increased costs for construction materials. But as outlined above, there will be a green premium for greener commodities, and someone has to pay it. A standard spreads the green premium across a large number of consumers, so that everyone pays a little rather than one or two paying a lot.

Costs would depend on which materials were included, the relative size of the green premium for different materials, the extent to which material efficiency could be used, the construction and infrastructure pipeline, and (most critically) how stringent the standard is and how this changes over time.

These costs should be thoroughly assessed before committing to a standard. This should be done in the context of improving contracting and tendering practices within state governments, which contribute to Australian infrastructure mega-projects consistently costing more than equivalent overseas projects.[114]

Barriers to reducing embodied carbon in construction include (among many) lack of established standards, design guides, and tools; and

112. NSW Government (2021a),p. 12.

113. Local content requirements also increase costs: see Terrill et al (2021).
114. Ibid.

risk perception around the performance of low-carbon alternatives.[115] A successful standard will require considerable upfront work by governments to improve quantification and certification of embodied carbon, and industry capacity to measure and report. Supporting demonstration projects could improve risk perception. This work should be done well ahead of establishing a standard.

4.5 Maximise the chances of success

Using existing policies, and adding some new ones, will create a coherent framework to drive industrial transformation.

Maximising the chances of success hinges on avoiding some of the traps of traditional industry policy. There is a risk that enthusiasm and poor understanding of the extent of Australia's competitive advantage results in too much investment into 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.

4.5.1 Don't overreach on competitive advantage

Australia's advantage lies in its rich renewable resources in proximity to rich mineral resources, demand for which is expected to grow.

As outlined in Chapter 1, 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 clean, cheap energy gives Australia an advantage.

However, not all minerals present equal opportunities, and not every end use is a chance to manufacture.

Choosing whether to move up the value chain

Australia lost its advantage as a producer of metals when greater volumes of export (fossil) energy exposed Australian production to international prices.[116]

It made more sense to export raw resources, and allow others to value-add through processing ores and metallurgy. But as the world shifts away from fossil energy (which is relatively easy to import) to renewable energy (which is not), Australia's advantage may return.[117]

Australia could capture more value from growing demand for minerals by moving up the value chain from mining to processing to metallurgy (turning ores into metals) to product manufacturing. But moving up the value chain must not only be economic, it must take advantage of low- or zero-emissions energy. Metallurgy is more energy-intensive than mining (Figure 4.1 on the following page), and because most of this energy currently comes from fossil fuels, it is more emissions-intensive as well.

There has been considerable interest in going further along the minerals and metals value chain to derive more benefits from natural endowments by moving into manufacturing of products required for the energy transition.

> 'We make things in Australia. We do it well. We need to keep making things in Australia. And with this strategy, we will' – **Former Prime Minister Scott Morrison**[118]

115. CEFC (2021).
116. Garnaut (2019, p. 110).
117. Ibid (p. 112).
118. Morrison (2020).

> 'This is about Australia playing to its strengths and the Government strategically investing in areas of manufacturing where we know we have an edge and that can deliver the jobs we need' – **Former Industry Minister Karen Andrews**[119]

> 'Australia is blessed with natural resources, but . . . we're missing out on an opportunity to value-add and employ Australians in manufacturing' – **Prime Minister Anthony Albanese**[120]

Batteries are one such example: Australia has 50 per cent of the world market for the raw materials required for battery manufacture, but less than 1 per cent of the market for the next stages in the chain: metallurgy to turn ores into metals and then producing active materials; followed by cell manufacturing and assembly.[121]

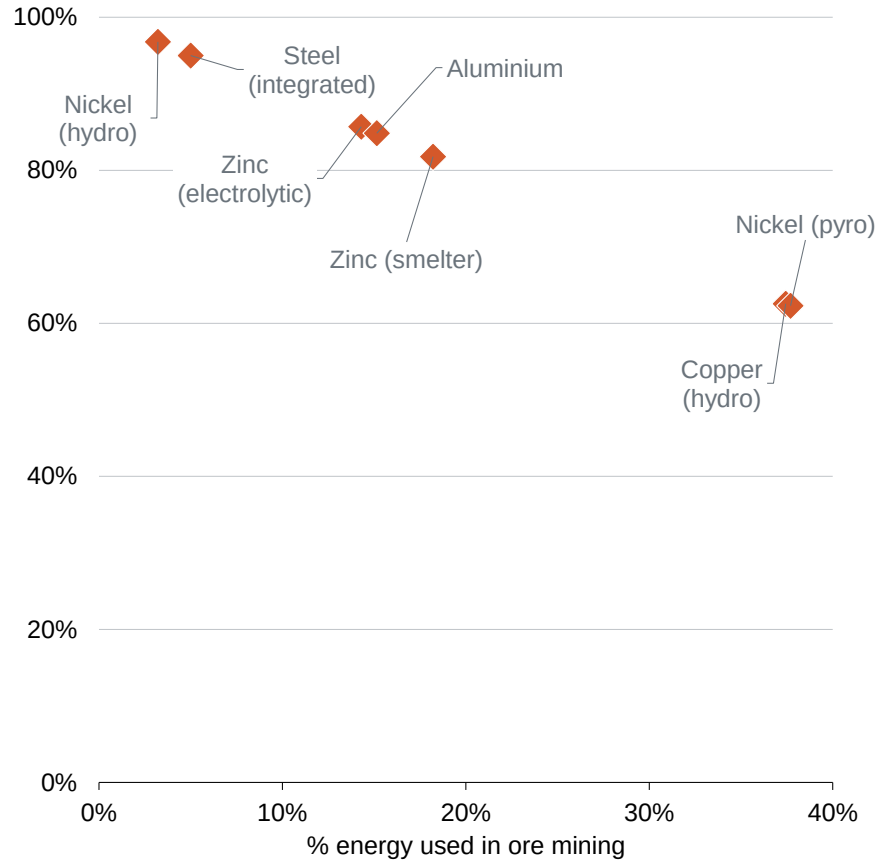
However, an abundance of raw materials does not necessarily translate into an advantage as a manufacturer. As Figure 4.2 on the next page shows, Australia's advantages in energy and materials are maintained when turning ores to metals and metals to active materials, but shrink on turning active materials to cells. In the case of energy, this is because energy is a smaller percentage of overall cost; for materials it is because one quarter of the material requirements at this stage (representing 20 per cent of input cost) would need to be imported.[122]

Moving beyond cell manufacture to battery assembly would be even less advantageous for Australia because at that stage, labour costs would make up a greater percentage of costs or the process would need to be highly automated, meaning the number of jobs included would be low.

Before governments jump straight to subsidising manufacturing of complex products that use Australian resources, they should make

Figure 4.1: Most of the energy used to produce metals is consumed in metallurgy, not mining

% energy consumed in metallurgical processes



Note: Hydro = hydrometallurgical extraction (using water to extract metal from ore); pyro = pyrometallurgical extraction (using heat to extract metal from ore).

Source: Grattan analysis of Norgate and Jahanshahi (2011).

119. Andrews (2020).
120. Albanese (2022).
121. Accenture (2021a).
122. Grattan analysis of Directorate for Internal Policies (2018) and Frith (2021).

a clear-eyed and rigorous assessment of other costs, such as tax, logistics, labour, and imported materials, compared to competitor countries, and whether it is reasonable to assume higher Australian costs can be outweighed by cheaper energy and access to component materials produced here.

Better understanding the hydrogen advantage

Governments have been keen to support the development of hydrogen production in Australia, and have claimed this support can transform manufacturing.

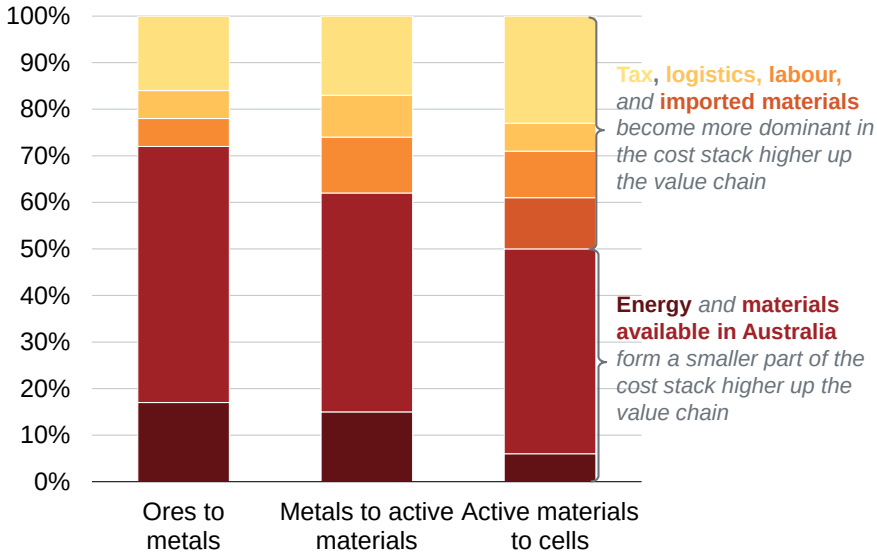
> 'We are accelerating the development of our Australian hydrogen industry and it is our ambition to produce the cheapest clean hydrogen in the world, transforming our transport, energy, resources, and manufacturing sectors' – **Former Energy Minister Angus Taylor**[123]

The reality is likely to be less exciting. 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.[124] In future, steel-making is potentially another large user of hydrogen.[125]

Gas-reliant manufacturers employ about 10,000 workers and make up just over 0.1 per cent of the Australian economy. 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.[126]

Figure 4.2: Australia's advantage reduces further along the battery value chain

% of battery unit cost by component



Source: Grattan analysis of Accenture (2021b) and Frith (2021).

123. Taylor (2021).
124. Wood and Dundas (2020), p. 25.
125. Wood et al (2020).
126. Wood and Dundas (2020), p. 25.

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 position governments and hydrogen exporters to better understand the competitor technologies for hydrogen, and thus get a realistic idea of future export market potential.

4.5.2 Avoid picking losers

One criticism of industry policy is that it involves governments 'picking winners'. Governments don't have unlimited resources, and targeted policies necessarily means that not everyone gets assistance. More important than not 'picking winners' is ensuring that the government is not propping up 'losers': industries that aren't economic and do not have a chance of becoming so.

There are three traps for governments to avoid: threats of job losses that coincide with a region or an election; claims that a 'pivot to green' will be possible in just a few more years; and claims that a facility or industry contributes to national security.

Regional jobs must be sustainable

Australian governments have a sorry track record of propping up uneconomic facilities in regional areas, and justifying this on employment grounds. For example, the owners of the Mount Isa copper smelter in western Queensland threatened to close it in 2011, in 2016, and again in 2020, co-incidentally timed with the Queensland election cycle.[127]

Each time the Queensland Government rode to the rescue, with $85 million in 2012, $15 million in 2016, and a multi-million-dollar undisclosed amount in 2020. The Queensland Government has also subsidised upgrades to the Mount Isa-to-Townsville railway, to facilitate exports, and the development of more electricity infrastructure. Over the period, global copper prices were on average 55 per cent higher than in the preceding 10 years.[128]

A similar story can be told about the Portland aluminium smelter in Victoria. A 2017 rescue package was estimated to equate to $200,000 per worker per year;[129] the most recent rescue package between $24,000 and $60,000 per worker per year.[130]

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 industrial facilities with the most potential to contribute to a resilient net-zero economy.

In particular, governments should not assist companies that aren't prepared to make the same commitment that they have: net-zero emissions by 2050 or earlier, and an interim target, with capital to back it up.

Beware claims of a 'pivot to green'

Some companies may approach governments seeking support to prevent a facility closing because the facility could, with changes in technology, pivot to producing green commodities. Some of these opportunities may be genuine, others may be rent-seeking.

127. Walker (2021), Coorey and Ludlow (2017), and Ignacio (2020).

128. Based on IMF quarterly commodity prices in $US per metric tonne. Source: Federal Reserve Bank of St Louis (2021).
129. Millar (2021).
130. Leitch (2017), McCrann (2021).

Governments should arm themselves with comprehensive analysis on the technical options for pivoting to green commodities well before facilities approach closure dates. 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 continued operation can credibly be conditional on reorienting towards cleaner production that is sustainable in the long term without subsidies.

National security

Car manufacturing in Australia had its roots in the idea that local manufacturing capability would be critical to national defence should Australia find itself in another war.[131]

Despite cars costing up to five times as much to make in Australia as elsewhere, this Cold War concern persisted as a reason to continue subsidising the industry right until its end. In 2008, the Industry Minister justified assistance to Ford on the grounds that 'you can't make a jet fighter without having a strong car industry'.[132] And in 2013 and 2015, industry submissions to Senate inquiries were still playing up links to defence capability.[133]

More recently, investment in critical minerals has been justified on national security grounds, amid concerns that China's dominance of parts of the supply chain endangers Australia's access to materials and products.[134] Some of these concerns may be justified. Where governments should be cautious is in jumping to the conclusion that the best way to mitigate supply chain risk is to manufacture something ourselves. Diversifying supply, stockpiling, signing agreements with friendly allies to allow access to reserves, or making an effort to switch to products, practices, or technologies that are less vulnerable to supply chain disruptions should also be explored.[135]

Otherwise, Australia may find itself propping up uneconomic industries for no material increase in security, just as happened for car manufacturing.

4.5.3 Stable policy, long-term assistance

The decision to renew, refurbish, or retire an industrial facility begins well before the end of its life. For example, BlueScope's blast furnace (Box 2 on page 13) will reach the end of its design life some times between 2026 and 2030. But the process to decide its future started in 2021.[136]

If governments want facilities to choose the lower-emissions option, then stable policy settings are essential. Stability does not mean unchanged policy, rather it means consistency in the rules, with future governments differentiating themselves on pace (for example, leaving the operational rules of the Safeguard Mechanism in place, but choosing to speed up or slow down the pace of baseline decline). The policies that transformed the Australian electricity market (see Figure 2.1 on page 20) show the power of this approach: the Renewable Energy Target has supported demand for 20 years, and the major funding agencies (ARENA and the CEFC) had their funding set out in legislation for 10 years.

Similarly, where government is sharing risk with industry through financial assistance, such assistance must be available over the same timeframes as decisions are made. This means moving away from three-year funding cycles linked to the budget forward estimates, and towards legislated funding delivered through independent statutory

131. Phillips (2013).
132. Carr (2008).
133. FCAI (2015).
134. Coyne (2022).
135. Hellyer (2020).
136. BlueScope (2021).

agencies, similar to the CEFC, the NAIF, and ARENA. This allows organisations to develop and maintain deep expertise in the sector and better tailor assistance to meet business needs. It avoids perceptions of pork-barrelling, and provides assurance of long-term commitment to the sector.

This approach does not constrain future governments – they can repeal or change legislation should they wish to change direction. But, it does place a higher bar on any decision to do so.

Robust and transparent decision-making

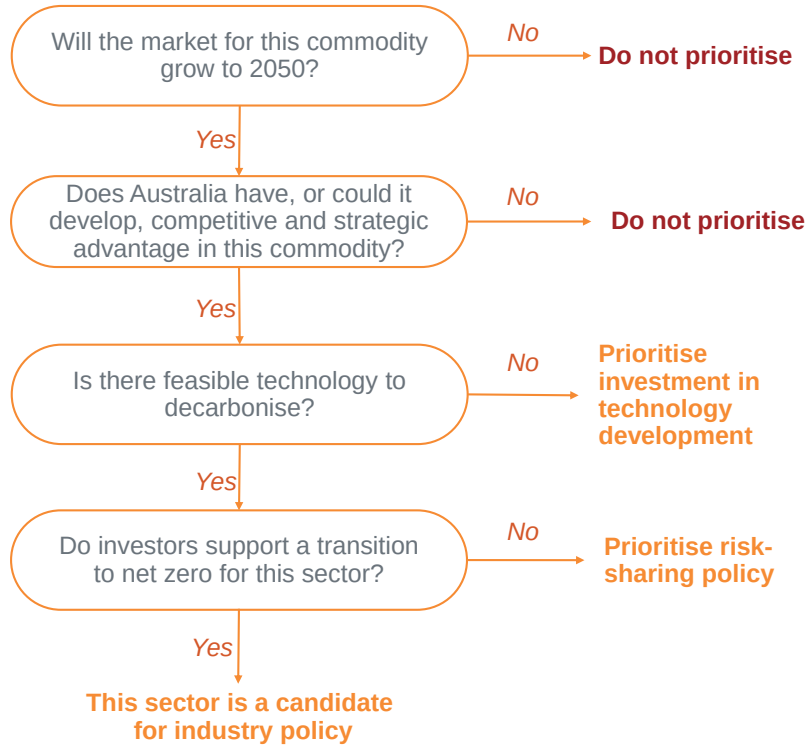
In Chapter 2 we outlined the importance of clear guidelines on when to 'pull the plug' and redirect support to more promising projects or firms. Statutory agencies should measure progress against consistent metrics linked to sectoral and national targets, and be prepared to withdraw quickly from failing projects. And when designing policy and choosing where to intervene, governments should also apply clear criteria, as summarised in Figure 4.3, to ensure policy prioritises the sectors that have the best chance of contributing to lasting prosperity, and does not waste public money and private capital on stranded assets and industries with no future in a net-zero economy.

4.6 Other recommendations to improve industry policy

Many recommendations from previous Grattan Institute reports are relevant to the broader story of transforming the industrial sector and should be acted on:

- Continue investments to reduce the cost of hydrogen
- Recommit to energy market reforms to allow for faster, cheaper decarbonisation of the electricity system
- Expand state-based energy efficiency schemes to reduce emissions and save money for smaller industrial companies

Figure 4.3: How to choose which sectors get priority



- Plan for the end of gas
- Continue to fund early-stage technology development, using the Low Emissions Technology Statement or an equivalent to prioritise funding
- Establish catalytic organisations to co-ordinate infrastructure build for a transformed industrial sector.

These recommendations are discussed in more detail in *Flame Out*, *Start with Steel*, and the *Towards Net Zero* series, all available on the Grattan Institute website.

5 How to help the regions and protect the environment

The transformation of Australia's industrial sector is an industrial revolution against a deadline. The scale and pace of change required to achieve net zero by 2050 is unprecedented. If managed poorly, it will generate social opposition and political friction, which in turn will mean Australia does not capture the large potential benefits of the transition.

Delaying decarbonisation out of fear that it will be messy and difficult is fundamentally unjust to the people who will be most affected. Governments have agreed to the goal of net zero and the timeframe to achieve it. For governments to get the social and political licence for change – that is, the chance to put in place the policies required to capture economic opportunities associated with this transformation without risking political annihilation – they will need to pay attention to social equity and to environmental protection.

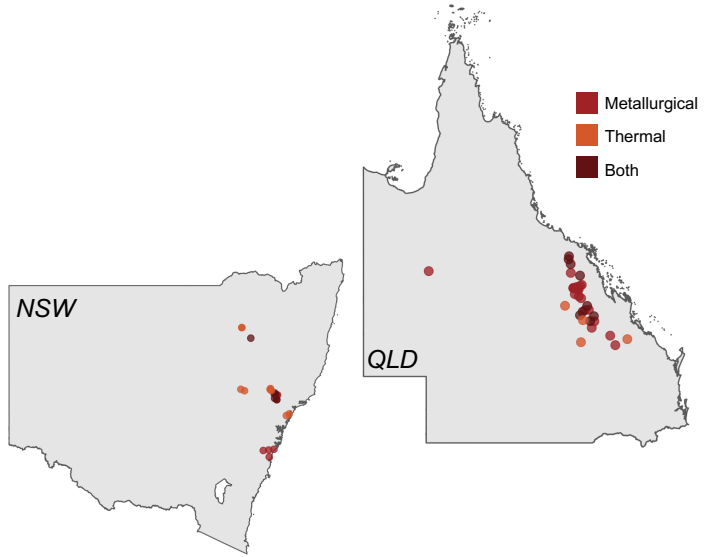
Governments should do three things to get and keep social and political licence for a net-zero industrial sector.

First, state governments should establish regional transition authorities in strongly affected regions, starting with the coal regions of central Queensland and Greater Hunter where 40,000 jobs are likely to disappear over the coming decades. These organisations would help these regions develop alternative economic activities to take over from coal mining. For as long as coal mining continues, the royalties from coal should be directed to diversifying the economic base of these regions.

Second, governments should reform royalty regimes for mining and establish sovereign wealth funds so that the benefits of the coming mining boom can be shared with future generations.

Third, governments should ensure environmental protection regulations that apply to industrial and mining projects are well funded, so that citizens aren't left with a degraded environment and Australia enhances its reputation with international commodity buyers focused on supply chain sustainability.

Figure 5.1: Australia's coal mines are clustered in Queensland and NSW



Note: Includes only coal mines currently subject to the Safeguard Mechanism.
Source: Clean Energy Regulator (2022a).

5.1 Strongly affected regions

The industry most immediately affected by the transformation of Australia's industrial sector will be coal mining.[137]

137. Coal-fired electricity generators, a sector also facing accelerated transition (see Wood and Ha (2021)), are often co-located with coal mines. The impact of the

Australia's coal mines are heavily concentrated in central Queensland's Mackay region and in the Hunter Valley of NSW (Figure 5.1 on the previous page). Within these regions, coal jobs cluster around four local government areas: Isaac and Central Highlands in Queensland, and Muswellbrook and Singleton in the Hunter Valley (Figure 5.2).

In Isaac, for example, more than 60 per cent of workers are directly employed in minerals and energy resources, and in Singleton 40 per cent. This compares to a national average of 1.7 per cent.

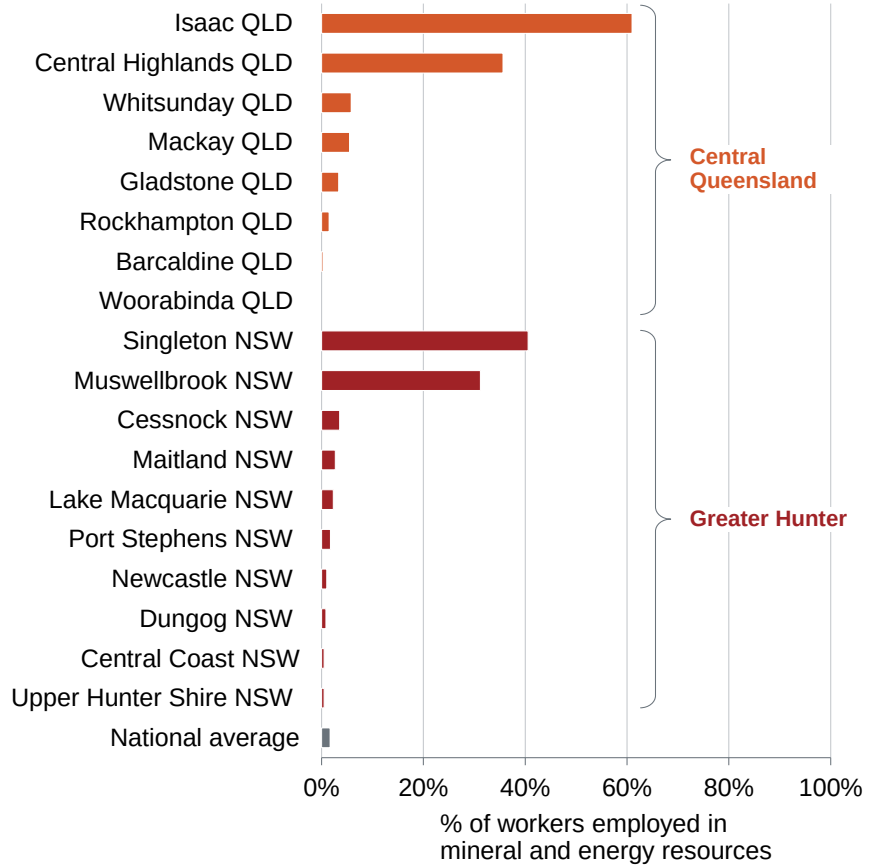
Figure 5.3 on the next page shows how NSW and Queensland coal jobs will decline as the reserves of existing mines are exhausted. As we noted in Section 1.1 on page 7, there are sufficient reserves in operating mines to meet Australia's likely share of world coal trade in a net-zero global economy. If currently operating mines are closed as their reserves are used up, and no new mines are built, there will be about 600 workers remaining in major coal mines by 2060.

There will be concentrated job losses in some particular years. In 2041 alone, 4,500 workers across Queensland and NSW will lose their jobs due to the scheduled closures of the Collinsville, Curragh, Jellinbah, Middlemount, and Appin coal mines.

These job losses will have knock-on effects for regional economies, from hospitality and retail to engineering and surveying. For example, the owners of the Dendobrium mine in the Illawara region of NSW have estimated it supports 11,000 indirect jobs.[138] In smaller regional towns, the loss of even 10 jobs can mean the local primary school has to lay off teachers, the bank closes, and the pub becomes unviable. In any region, unmanaged decline can lead to the loss of assets, skills, and

Figure 5.2: Four local government areas – Isaac and Central Highlands in Queensland, and Muswellbrook and Singleton in NSW – will bear the brunt of declining coal mining

Local government area



Source: ABS Census 2016, quoted in Regional Australia Institute (2019a).

energy sector transition on workers and regions is not within scope of this report, but many of the points raised in this chapter apply equally to the decline of coal-fired electricity. In some cases, such as Lithgow in NSW and Collie in WA, the decline of coal-fired electricity will have concentrated regional impacts.

138. Queensland Government (2021).

social capital. House prices fall, people move away in search of work, and communities fragment.

5.1.1 What coal communities are asking for

Central Queensland and Hunter communities already know and accept that this transition is coming:

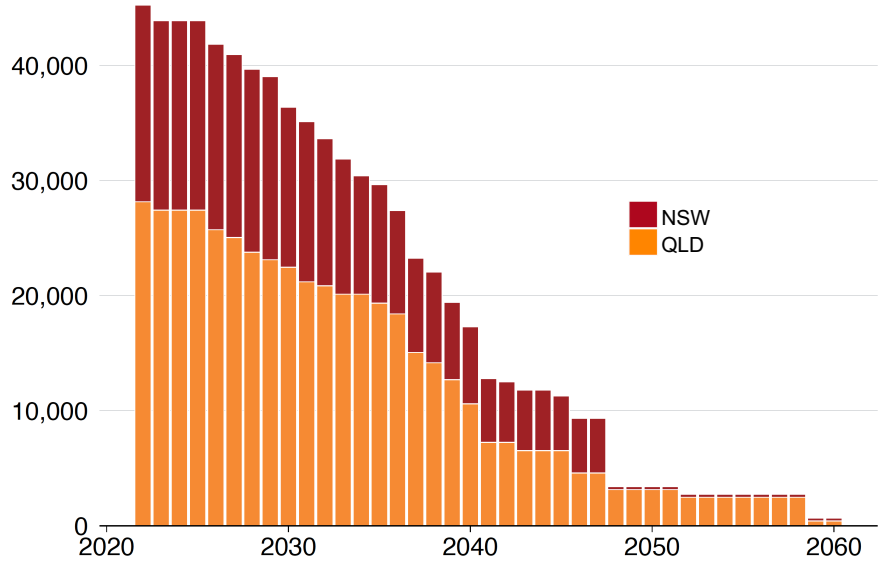
> Awareness has been heightened by the impacts of a range of external shocks including the ongoing COVID pandemic, increasingly frequent announcements of early coal plant closure dates, slowing long-term investment in thermal coal mining projects, shifting international demands for fossil fuels, the introduction of trade tariffs on carbon intensive exports, increasingly severe and frequent weather events exacerbated by climate change, and increasing global insecurity.[139]

But people in these regions are frustrated by the lack of clear processes to coordinate and plan across different sectors, state and federal government departments, and other groups with a stake in the transition. They want to be involved in these processes, and are concerned about what they say is a lack of leadership, commitment, and coordination at the federal level.[140] They want these processes to start now, because they realise that crunch points may come quicker than anticipated. One Hunter Valley resident summed up the feeling:

> Regional people can see a transition to a low-carbon economy is coming and want the Federal Government to stop pretending that they have any control over foreign contracts for coal. Regional communities want to be involved in determining their future. We're not asking for handouts. We want the Government to help us build sustainable, thriving, and diverse regional communities.[141]

Figure 5.3: Jobs from currently operating coal mines will decline sharply from the 2030s

Number of workers



Note: Includes only coal mines currently subject to the Safeguard Mechanism. Assumes employment in mines remains at current levels until closure.

Source: Grattan analysis of publicly available information on employment and remaining reserves for individual mines.

139. Cahill (2022).
140. Ibid.
141. Unnamed resident quoted in Cahill (ibid).

5.1.2 Some regions will manage, others may need help

It is commonly assumed that government will play a central role in instigating and leading the planning for this transition. Yet evidence from regions across the world that have been through a major industrial transition shows that locally driven transitions produce better results – though they do rely on government support.[142]

Generic regional economic development policies are unlikely to produce just transitions for communities. Communities need specific and tailored assistance that acknowledges local strengths and weaknesses.[143]

A region's capacity to withstand a major shock can be predicted (though not perfectly) using a regional resilience index comparing regional characteristics to a national norm.

Figure 5.4 on the next page shows a regional resilience index for the four coal-exposed local government areas in NSW and Queensland, their surrounding local government areas, and their nearest large industrial centre. Each part of the index is made up of measurable indicators that have been shown to affect how well a region responds to shocks. For example, the 'Demography' indicator is made up of population size, population growth rate, population density, population turnover, and senior and youth dependency ratios (the ratio of working-age people to those who are retired or too young to work).

High scores across these indicators suggest a region is likely to be more resilient. Low or mixed scores suggest it is likely to be less so.

Figure 5.4 on the following page shows that in Queensland, Isaac may be less able than Central Highlands to adjust to the shock of coal closures, although Isaac has some areas of strength which exceed even the nearest large industrial centre of Gladstone. In NSW, Muswellbrook looks less resilient than Singleton.

There are also significant differences between the NSW and Queensland coal regions' resilience indicators. The NSW regions score higher on measures of innovation that emphasise technical, scientific, or engineering developments through research. This suggests the region is more able to diversify through innovation. The Queensland regions score lower on infrastructure and essential services – these regions are further from railways, ports, major highways, and airports. This means they have less access to external markets and essential services that enable businesses in the region to compete in the wider economy and which facilitate new investment.

142. Atteridge and Strambo (2021a).
143. Ibid.

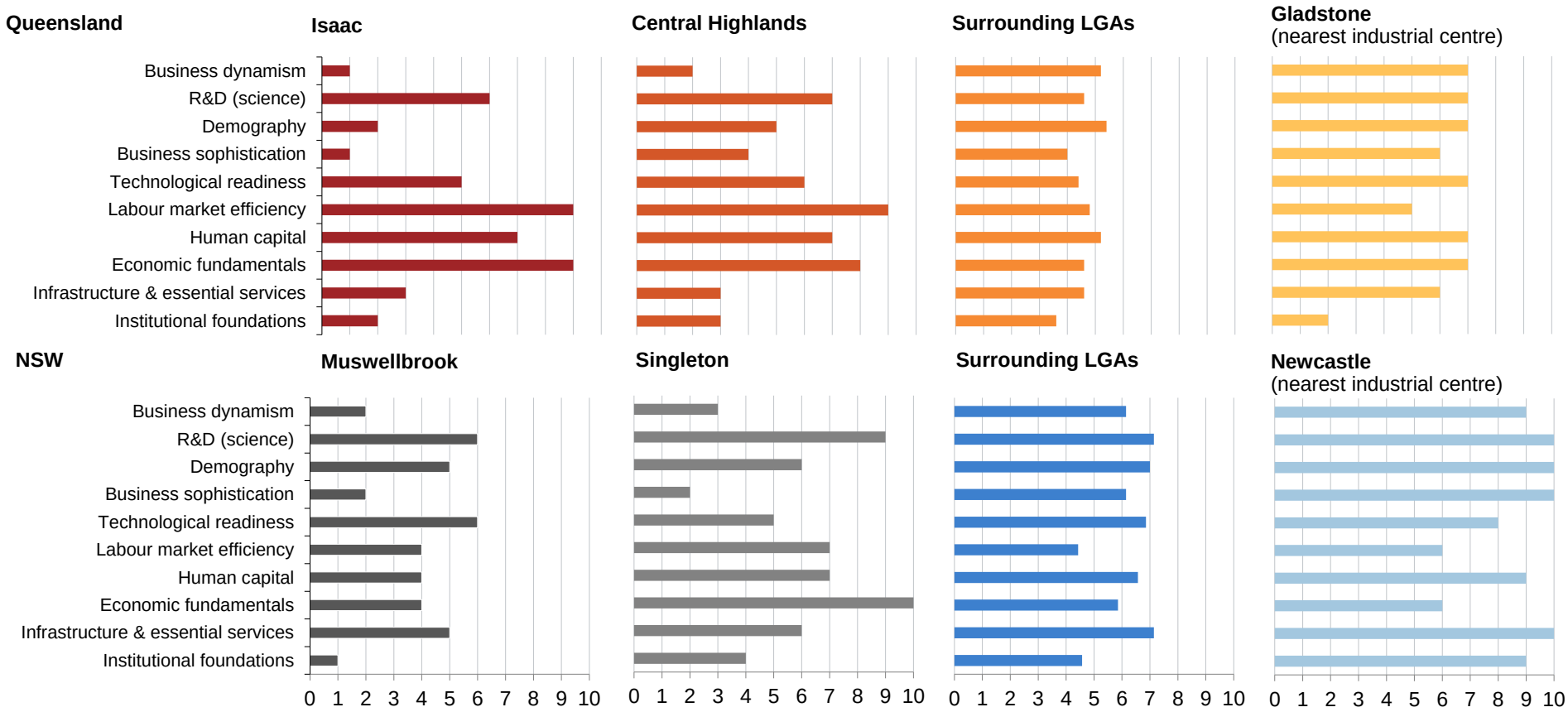
5.1.3 Australia can learn from previous shocks

The end of coal exports will not be the first time that an Australian region has been shocked by a major employer shutting up shop or the permanent decline of an export industry.

For instance, the Ravensthorpe Nickel mine in Western Australia closed in 2009, resulting in 1800 job losses,[144] reopened, then closed again in 2017, affecting 450 jobs,[145] and reopened again in 2019.[146] The end of the wool floor-price scheme in 1991 resulted in a permanent decline in Australian wool production to about half what it was in the 1950s and 1960s.[147] The decline and closure of BHP's steelworks in Newcastle between 1980 and 1999 displaced more than 10,000 workers and at the time was Australia's largest single deindustrialisation event (see Box 5 on page 49). And the Latrobe Valley in Victoria and the Collie region in Western Australia are going through a permanent shift away from coal-fired electricity right now.

144. ABC (2009).
145. Mordant (2017).
146. Ibid.
147. Abbott and Merrett (2019).

Figure 5.4: Coal regions score worse on factors that contribute to regional resilience
Score out of 10 for regional resilience indicator



Notes: LGA = local government area. Each indicator aggregates factors that contribute to regional competitiveness for the relevant local government areas. Indicators are then ranked Australia-wide and split into deciles. For example, a region that scores 8 for 'business dynamism' scores better on factors relating to business dynamism than 80 per cent of local government areas. For a full description of factors and indicators, see Regional Australia Institute (2019b).

Source: Grattan analysis of Regional Australia Institute (2019a).

Starting earlier is better

Preparation can help communities to weather shocks. The first closure of a power station in Victoria's Latrobe Valley brought home to workers at other power stations the reality that their jobs may have a limited lifespan, and to the community more broadly the need for planned closures (see Box 6 on the following page).[148] Similarly in Newcastle, the slow decline of the steelworks encouraged regional leaders and communities to look for diversification options a decade or more before the steelworks closed (see Box 5).[149]

Let the community lead

In both Newcastle and the Latrobe Valley, the most successful initiatives to improve regional economic diversity have been generated by the people and businesses of the regions, not state or federal governments. This bears out experience in regions in other countries: 'locally driven, bottom-up approaches to regional economic development planning appear to be more effective and correspond better to the needs of workers and citizens'.[150] Local leadership better understands the differences between regions, and allows for better targeting to improve regional resilience indicators.

The transition is long

It is easy to identify when a major industrial employer closes down; it is harder to identify when the ensuing regional economic transition ends. Following the significant job losses resulting from privatisation of the State Electricity Commission-owned power stations in the 1990s, the Latrobe Valley faced the shock announcement of the closure of Hazelwood power station in 2016 with just five months' notice. This

148. Whittaker (2021).
149. Atteridge and Strambo (2021b) p. 3.
150. Atteridge and Strambo (2021a).

Box 5: Lessons from Newcastle

From 1960 to 1980, the BHP steelworks in Newcastle employed about 14,000 people. During the 1980s profitability fell as competition from Asian producers rose. Despite significant restructuring and financial support from the Federal Government, in 1997 BHP announced that the plant would close in 1999.

The announcement galvanised action to diversify Newcastle's economic base. Former industrial land was rehabilitated. Reskilling and employment transition programs helped workers find new jobs. The NSW Government established an economic development strategy and a dedicated office to implement it. The Federal Government pledged funds to help establish new businesses. In the years after 1999, overall unemployment declined, and there were more jobs in smaller companies with higher value-add.

While more people were employed in high-skilled jobs than before the closure, more part-time, low-paid, and/or temporary jobs were also created (and many of them were in Hunter Valley coal mines). In essence, semi-skilled, well-paid, permanent, full-time jobs disappeared. Part of the environmental rehabilitation costs were transferred to the state government. Regional co-ordination has dropped away. And promised redevelopment, such as a container port, has not happened.

A major lesson from Newcastle is that most of the successful ideas that led to enduring change came from outside government. Government participation was more effective when it took a supporting rather than a leadership role. Another lesson is that it is difficult to sustain the enthusiasm and skills required to co-ordinate and implement change over a long period.

Sources: Drawn from Atteridge and Strambo (2021b).

Box 6: Lessons from the Latrobe Valley

The Latrobe Valley has been Victoria's principal electricity-producing area since the early 20th Century. The electricity generators there are Australia's most emissions-intensive. The region went through its first major transition when state-owned generators were restructured, which reduced employment in the electricity sector from about one-third of jobs in the region in the 1970s to one-tenth by 1990. Further job losses followed when the generators were privatised in the 1990s.

The power stations' limited future under a carbon constraint had been well-understood since the early 2000s, when unions, environmental organisations, local community groups, and local and state government representatives began convening discussions on the region's future.

But the end came quickly. The owners of Hazelwood Power Station gave only five months notice of closure in November 2016. Soon after this announcement, the Victorian Government established the Latrobe Valley Authority (LVA) to immediately assist affected businesses, workers, and their families, and to work with the region to support a longer-term transition.

Four major initiatives evolved: a Worker Transition Service, providing peer-to-peer advice on skills, training, personal finances, and job-seeking; financial support to workers and their spouses for retraining; a Worker Transfer Scheme for workers who wanted to remain in the electricity industry to transfer to other power stations; and a program to revitalise and diversify the region's economic base, including by establishing an 'economic growth zone'. Within this 'growth zone', new businesses creating jobs for ex-Hazelwood workers received payroll tax deductions and exemptions from state and local fees and charges for property purchases and business expansions.

The LVA does not have a large budget – its job is to facilitate access to and maximise the benefits of other government initiatives. The Authority's role will evolve with the community, as the region cycles through response to future shocks, recovery, and resilience. Since 2016, more power stations in the Latrobe Valley have brought forward their closure dates, and other challenges have emerged, including phasing out offshore oil and gas and the end of native timber harvesting.

Three key lessons emerge from the LVA experience. First, even though the announcement of Hazelwood's closure was sudden, the LVA was able to start work quickly because of 10 preceding years of work by communities, unions, and the state government to understand what might need to be done. The idea of a Worker Transition Service, for example, had been developed in 2011 when it was thought an impending carbon price would force all generators to close early.

Second, while the shock of the Hazelwood closure was short and sharp, changing a regional economy takes much longer. The LVA has been in operation for five years, long enough to have helped displaced workers into new jobs but not yet long enough to have fully reoriented the Gippsland economy. Full transition will require at least 10 years.

Third, there needs to be intense and long-term co-operation between the community, workers, companies, unions, and all three levels of government. A 'just transition' is not just governments' responsibility, and it does not end with jobs. Attracting and building new industries is hard work, as is maintaining the community and social fabric that makes a region worth living in.

Sources: Drawn from interviews with the Latrobe Valley Authority, Snell (2018), and Birrell (2001).

was followed by the 2021 announcement that Yallourn power station would close in 2028, four years earlier than previously planned. The remaining power stations are scheduled to close in 2045 and 2047, but could well close earlier.

Five years after Hazelwood closed, the Latrobe Valley Authority (see Box 6 on the preceding page) is still supporting displaced workers. The Authority's activities cycle through response (immediate assistance after closure), recovery (restoring economic activity), and resilience (longer-term planning and development to insulate against future shocks).

5.1.4 Government engagement is patchy

Currently, governments are happy to talk about the potential future opportunities in NSW and Queensland coal regions – from hydrogen hubs to renewable export superpowers to renewable manufacturing precincts. But the less glamorous, detailed work required to get there is harder, and government commitment is patchy. For example, there is little evidence that governments are thoroughly examining the factors that affect regional resilience.

The WA and Victorian Governments have been at the forefront of helping coal regions transition. The Victorian Government has established the Latrobe Valley Authority, and the WA Government has set up a division within the Premier's Department tasked with developing a transition plan to manage the closure of the Collie power station and associated mines, and invest in regional economic development.

The NSW Government has established an expert panel to advise on regional resilience grants to coal regions, but has not developed a strategic plan for getting the best out of these grants. It also has a hydrogen hub initiative for the Hunter, with up to $70 million funding.

The Federal Government has no dedicated programs for coal regions. It committed to consider Regional Development Precincts, but these seem to be aimed at agricultural rather than industrial regions.[151] Crucially, while the policy talks up the benefits of a transition to net zero for regions in general, it does not explicitly acknowledge the need to broaden the economic base of regions likely to feel strong negative effects.

5.1.5 What governments should do for strongly affected regions

Many factors affect how well a region can adjust to a change in economic circumstances. These include the strength of local institutions, infrastructure, and essential services, human capital, labour market efficiency, technology readiness, local economic diversification, and demography.

Each region is different. A single national approach will not work. A bottom-up process led by the communities themselves and facilitated by local and state government is needed to establish a clear vision and pathways for each region.

This will be an iterative process – no-one has perfect foresight. But as outlined in Chapter 4, clear goals, a toolbox of policies and programs that can be deployed at different times, and long-term commitment from governments to a consistent direction will allow regions to adjust to changing circumstances.

Following the lead of the Victorian Government, the NSW and Queensland Governments should establish regional transition authorities for the coal regions. The Queensland Government should maintain the flexibility to include regions strongly reliant on LNG at a later date should this be required.[152]

151. Australian Labor Party (2022).
152. LNG employs many fewer people than coal.

The Federal Government needs to make much better use of its regional policies, which currently are detached from the pressing issues facing coal regions. Building on its commitment to revitalise existing regional development structures such as the previous government's Regional Deals[153] framework, the Government should ensure that regional policy can help improve economic diversification in coal regions.

All the goodwill of grassroots organisers and companies towards building resilience in coal regions will be wasted without ministerial attention and commitment. There needs to be better coordination at both state and federal level between industry policy, energy policy, and regional development policy.[154] This could be achieved by establishing Cabinet committees for regional transition in the Federal, NSW, and Queensland Governments. A ministerial forum of state and federal ministers and the Australian Local Government Association, under the auspices of National Cabinet, could coordinate those committees.

Paying for the transition

None of this is costless. Following the announcement of the closure of the Hazelwood power station, the Victorian Government created a $266 million fund to assist the Latrobe Valley to move away from coal-fired power. And the costs of coal's decline will be unevenly distributed, as will the benefits of potential new and growing industries. This is particularly the case for the Queensland coal regions, where there is no immediate alternative employment nearby (Gladstone, the nearest industrial city, is five hours drive from the Isaac region).

As with deciding which industrial facilities to assist via industry policy design, described in Chapter 4, governments should not prop up activities in regions merely because these activities take place in regions. Regional resilience relies on a stable economic base, and if the private sector is not willing to allocate capital to regional activity, no amount of government assistance is going to create that stable base.

For as long as coal lasts, all or part of the royalties that state governments collect should be directed towards improving resilience and economic diversity in coal regions. The NSW Government has made a good start by allocating $25 million per year to the Royalties for Rejuvenation program for the Hunter Valley[155] – although this is only about 2 per cent of the $1.5 billion in coal royalties collected in 2019-20.[156]

Governments should start doing this now. If they wait until coal exports shrink dramatically and mine closures begin, the royalties will be too little to make a difference, and economic shocks will already be hurting the coal regions. As well, coal prices are at a record high, due to the war in Ukraine, and are delivering an unforecast royalty bonanza to NSW and Queensland. Those governments could start directing coal royalties towards regional resilience immediately, without having to reduce spending elsewhere in their budgets.

5.2 Sharing the benefits

To limit the impacts of climate change, governments here and overseas have imposed a net-zero deadline, which means many fossil-fuel-consuming assets will be replaced early. This will create

153. Regional Deals were agreements between federal, state, and local governments and business and community groups in a particular regional area. The Deals brought together all levels of government around a clear set of objectives for economic development, tailored to each region's comparative advantages, assets, and challenges, that reflect the priorities of that community. Regional Deals supported 'a place-based approach' by putting community-identified priorities at the centre. Source: Department of Infrastructure, Transport, Regional Development and Communications (n.d.).
154. Australian Industry Energy Transitions Initiative (2022).
155. Barilaro (2021).
156. NSW Government (n.d.).

a one-off boom in demand for the commodities that are used to produce those replacement assets. The coming boom in critical energy minerals, iron ore, and other 'green' export commodities will be akin to a super-cycle, the size of which will not be seen again once net zero is achieved.

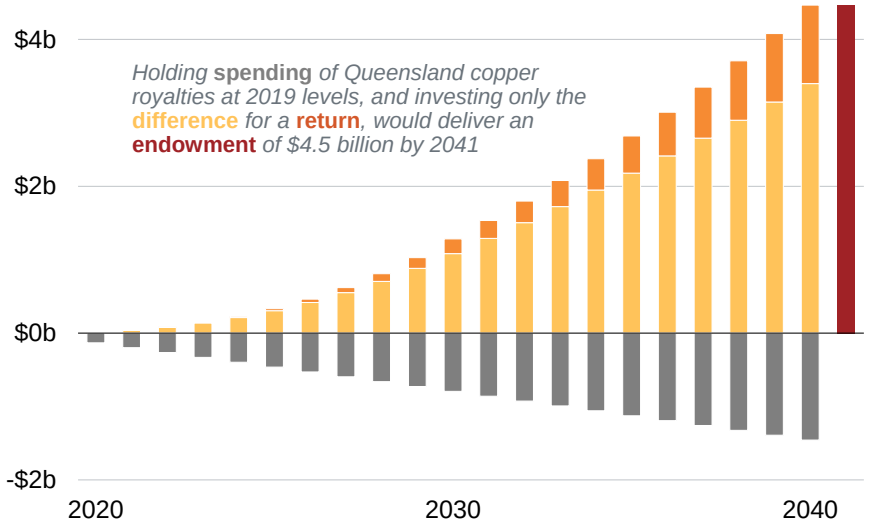
Resource booms create a challenge for governments: how much of the windfall gains should they spend, and how much should they save? Governments of resource-intensive economies are usually advised to save the windfall, at least in the initial years of a boom. Saving instead of spending keeps government spending smooth over time. It also reduces the risk that governments will run up future deficits when they are committed to a high level of spending and aren't willing to reduce services or raise taxes. And, it can be fairer to future generations to share some of the windfall with them.[157]

5.2.1 State governments should establish sovereign wealth funds now

State governments collect royalties from mining companies, linked to the price or volume of minerals. For example, base metals in Queensland such as copper, cobalt, nickel, and zinc have royalties of between 2.5 per cent and 5 per cent of value, depending on the annual average price.[158] The Queensland Government collected $499 million in royalties for minerals (other than coal, gas, and petroleum) in 2020-21.[159]

The expected growth in both volume and value of minerals in the coming decades will deliver growth in royalty income for those states where critical minerals are mined. Take copper as an example. Queensland miners produced 218,000 tonnes of copper in 2019,[160]

Figure 5.5: Increasing demand for copper will mean growing royalty payments for state governments
Australian dollars, cumulative (2019)



Notes: Assumes a steady royalty rate of 3.75 per cent of value, which is the mid-point of the minimum and maximum royalty rates for copper in Queensland. Volume amounts based on metal content of ores. Growth in volume and value consistent with IEA projections for net-zero scenarios. Sovereign wealth fund achieves a rate of return 5 per cent above the bond rate between 2019 and 2030 (consistent with the Commonwealth Future Fund), and 3 per cent above the bond rate thereafter. Inflation is 2.5 per cent. All dollars are 2019 dollars.

Source: Grattan analysis of DISER (2022b), IEA (2021b), IEA (2021c), Business Queensland (2022).

157. Minifie et al (2013, pp. 36–37).
158. Business Queensland (2022).
159. Queensland Government (2022).
160. DISER (2022b).

which attracted a royalty payment to the Queensland Government of about $300 per tonne.[161] The International Energy Agency estimates the world market for copper in 2040 will be more than double the 2019 market in volume, and four times more valuable. If Queensland miners maintain or expand their share of world copper trade, royalty payments to the Queensland Government will grow correspondingly.

It will be tempting for state governments to spend this money immediately. But it would be prudent to save at least some of the royalties bonanza, because booms can result in permanently higher prices, and public sector saving can smooth that adjustment.[162]

Sovereign wealth funds are one way to for resource-intensive economies to do this. Such funds take the proceeds of resource extraction (in this case, mining royalties) and invest them for medium-to-long-term returns. This spreads the benefits of resource extraction across several generations, and also to those who are not directly profiting from the boom.[163]

NSW already has a sovereign wealth fund (the NSW Generations Fund, or NGF) to manage inter-generational budgetary pressures and keep debt sustainable in the long term. The NSW Government has been diverting coal royalties to the NGF since 2018, and projects these royalties will contribute $42 billion to the fund over the period to 2060-61.[164]

Other states should establish similar funds. Figure 5.5 on the previous page shows an illustrative example for Queensland copper royalties.

161. The Queensland copper royalty fluctuates between 2.5 per cent and 5 per cent of the value of copper on the London Metals Exchange.
162. Minifie et al (2013, pp. 36–37).
163. Norway's sovereign wealth fund, for example, has been investing the proceeds from North Sea oil extraction since the 1990s, and the fund is now worth about US$250,000 per citizen. Most of the petro-states also have sovereign wealth funds.
164. NSW Government (2021b, p. 94).

The Queensland Government could continue to spend the same amount of copper royalties as it earned in 2019, and save the 'bonus' royalties from the net-zero mining boom in a sovereign wealth fund. If this fund earns an annual return of 5 per cent above the government bond rate between 2020 and 2030, and 3 per cent thereafter, then by 2041 Queenslanders would have an endowment of $4.5 billion from copper alone.

State sovereign wealth funds need not make Australia less attractive to mining investors. Royalty rates can remain unchanged – it's what governments do with additional royalty income that changes. To make the most of the additional earnings, state governments should not provide royalty holidays or discounts for new mines as a way of luring investors to their state. All this would do is skew investment towards mines that are less economic to develop in the first place.

The Federal Government seems unlikely to fix the petroleum resource rent tax, which is poorly structured and provides almost no revenue. However, at times of extreme international prices, it should consider a windfall profit tax on gas and coal exports above a fair return. The revenue could be directed to immediate fiscal repair, but there would be long-term strategic value in using it to part-fund the great energy transition described in this report.

5.3 Regional communities should not be left with a degraded environment

Regional communities host most of Australia's industrial facilities, and the people who live in these communities should not have to pay for this via a degraded environment. In Chapter 4 we noted the imperative of making sure development of new mineral resources does not add to Australia's emissions. But extra emissions are not the only environmental effects from new mines or from new industrial facilities more generally.

Poorly regulated industrial and mining development can pose a threat to water quality and availability, air quality, visual amenity, and biodiversity. The health effects of poor air and water quality have been a constant concern for people in industrial regions. For example, elevated lead levels in Port Pirie and Mount Isa;[165] air pollution in the Hunter Valley and Gladstone;[166] and water pollution from manganese and lithium mines in Tasmania and Western Australia.[167] The previous mining boom in the early 2000s caused localised but severe habitat loss and degradation,[168] as well as a larger threat to biodiversity from the cumulative impacts of extensive development.[169]

Australia has stricter laws to minimise environmental impacts from development than some competitor countries, and more regimented planning regimes. But our laws, and the bureaucratic processes associated with them, can still fall short of community expectations. When this happens, community opposition to new development can arise.

5.3.1 Governments should not be left with clean-up costs

Facilities that close can leave a degraded legacy, and often the cost of dealing with this is shifted onto governments.

For example, the Federal Government found itself responsible for decommissioning and rehabilitating the Northern Endeavour oil and gas platform north-west of Darwin after the owners declared bankruptcy. The clean-up could cost up to $1 billion.[170] At a state level, the NSW Government is spending $10 million a year to rehabilitate abandoned mines,[171] and bore part of the cost of cleaning up the former BHP steelworks site in Newcastle.[172]

As well as creating budget burdens and leaving host communities with a degraded environment, failure to properly clean up can also impose future costs by making it more difficult to reuse sites. The Westgate Tunnel project in Melbourne is a good example: the discovery of contaminated soil on the route caused a $3 billion cost blow-out.[173]

5.3.2 The time to strengthen environmental protection is now

Strong, trusted, and transparent environmental and planning laws represent prudent risk management. They reduce the chances that industrial transformation and new industries are stymied by bottlenecks at the approval stage. They give host communities more control over what happens in their neighbourhoods. They mean future generations will not be left with a degraded environment when the boom is over. And they protect future governments from future costs.

The Federal Government has shown leadership by introducing trailing liabilities and clean-up levies for offshore oil and gas while the industry is still profitable. State governments have responded to poor past practices on industrial contamination with strengthened laws, and the Queensland and NSW Governments have recently reviewed legislation on mining rehabilitation to make sure the money set aside for rehabilitation is adequate.

All levels of government should make sure they stay ahead of emerging industrial impacts on the environment and communities, rather than

165. Munksgaard et al (2010).
166. Nichols (2021), Layt (2021).
167. ABC Four Corners Program (2022).
168. State of the Environment Report (2016a, p. 36).
169. State of the Environment Report (2016b, p. 22).
170. Fitzgerald (2021).
171. NSW Government (2022).
172. BHP paid the NSW Government $100 million to be released from responsibility for the clean-up. The final cost was more than $110 million. Sources: Atteridge and Strambo (2021b), Hunter and Central Coast Development Corporations (n.d.).
173. Jacks (2021).

responding in an ad-hoc way to immediate disasters. This means planning for a future mining boom and for old industrial facilities closing down. And it means properly resourcing the planning and environmental assessment process.

It is short-sighted to argue that stronger laws will make Australia less attractive for new investment. International customers for commodities are increasingly concerned about the environmental and social impacts of supply chain activities. Tesla, for example, is giving priority to greener nickel for its batteries.[174] Other car-makers are seeking to eliminate environmental harm and human rights abuses from their cobalt supply chains.[175] International investors are increasingly concerned with environmental, social, and governance (ESG) performance and disclosure. Strong and transparent environmental protection and planning laws, in line with community expectations, and whose administration is properly funded, make investing in Australia more, not less, attractive.

Others will argue that protecting the environment should take precedence over new mining and industrial development. In areas of unique or particularly precious natural wonders, this may be the case. But the imperative for green industrial development is largely driven by the need to prevent the worst effects of climate change, by transforming the global energy system to net-zero emissions. Climate change itself will be just as devastating for Australia's unique ecosystems and species. It is not a pleasant or easy balance to strike, but it cannot be avoided.

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175. Noble (2019).

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