

# Downunder Digest

## Australia's 'green' opportunities and challenges

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- ◆ Australia's energy transition is underway – somewhat belatedly – presenting many opportunities but challenges too
- ◆ Investment is rising off a low base in 'green' metals, hydrogen and renewable generation capacity and networks
- ◆ However, the transition is disruptive and, combined with previous underinvestment, is lifting the local cost of energy

### Long pathway to being a renewables 'superpower'

We have previously outlined the big picture opportunities that Australia has to become a renewable energy 'superpower'. We have also noted that Australia was late to start the energy transition, which means there is even more substantial investment that needs to be made.

This report seeks to provide an update on the progress that is being made, albeit off a low base, and to outline some of the 'green' challenges and opportunities.

First, Australia still has significant strides to make in shifting the production of electricity. The share is rising but only 32% of Australia's electricity generation in 2022 was from renewables versus 47% from coal, which ranks Australia 26<sup>th</sup> out of 38 OECD economies. Likewise, EV adoption has been slow, accounting for only 4% of new motor vehicles sales, compared with 21% in Europe, 15% in the UK, and 8% in the US.

Second, there has been an increase in investment in capacity to produce many of the green metals and hydrogen, as well as strongly rising exports of lithium, albeit off a low base. Australia has the world's largest natural reserves of lithium, and ranks in the top five for a range of energy transition inputs, including rare earths, cobalt, and manganese, and exports key conventional metals, including copper, nickel and zinc.

The total of the value of 'green' commodity exports – largely lithium – has risen to an expected AUD20bn in 2022-23, up from AUD1bn in 2020, which is good progress but only accounts for c4% of Australia's total resource and energy exports over the past year, while exports of coal and gas summed to AUD249bn in 2022. Likewise, renewable investment rose to AUD6bn in 2022, equivalent to c5% of annual construction.

There are many other dimensions of the energy transition, including reducing mining-related emissions, grasping carbon-capture opportunities, modernising the capital stock to meet higher environmental standards, and reforms to legislation, such as the Safeguard Mechanism.

Policymakers have increased support of the energy transition recently, but more action is needed, as Australia is not on track to meet its emissions targets.

*This is a Free to View version of a report with the same title published on 17-Jul-23. Please contact your HSBC representative or email [AskResearch@hsbc.com](mailto:AskResearch@hsbc.com) for more information.*

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**Paul Bloxham**  
Chief Economist, Australia, New Zealand & Global  
Commodities  
HSBC Bank Australia Limited

**Jamie Culling**  
Economist, Australia, New Zealand & Global  
Commodities  
HSBC Bank Australia Limited

**Wai-Shin Chan, CFA**  
Head, Climate Change Centre; Head, ESG Research  
The Hongkong and Shanghai Banking Corporation Limited

**Heidi Tang**  
Associate, ESG Research  
The Hongkong and Shanghai Banking Corporation Limited

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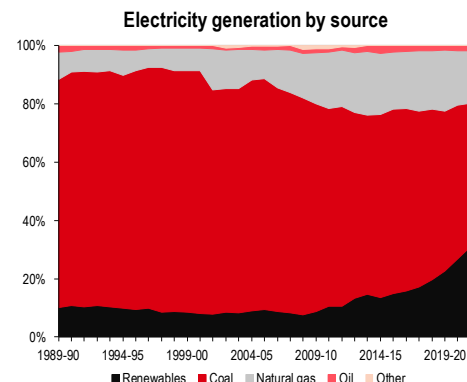
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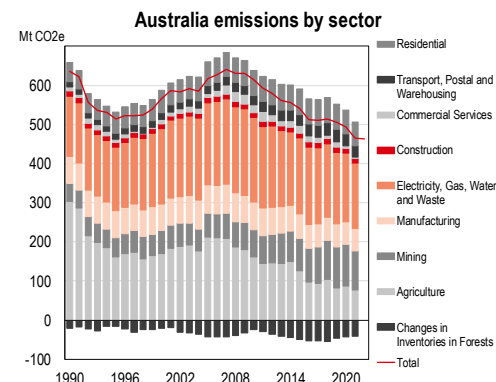
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### 1. Australia's energy transition has picked up pace in the past two years ...



Source: Department of Industry, Science, Energy and Resources, HSBC

### 2. ... helping contribute to reduced emissions



Source: Department of Climate Change, Energy, the Environment and Water, HSBC

## Australia's energy transition has picked up pace ...

Australia has had a slow start to the energy transition ...

... but multiple opportunities are now starting to be seized

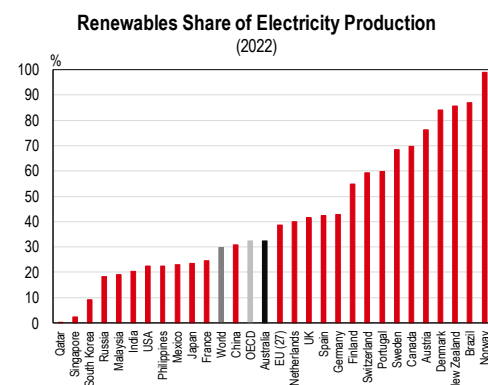
In recent history, Australia had hardly been a leader in the global energy transition. This has partly reflected Australia's role as a large exporter of fossil fuels, including thermal and coking coal, and liquefied natural gas. Also, locally, the energy market was quite carbon-intensive, while the politics, particularly from federal policymakers, had also been complicated and volatile.

This ultimately left Australia with a challenging starting point for the energy transition. However, it gave Australia ample opportunities, some of which are starting to be seized.

First, and foremost, are Australia's natural advantages when it comes to renewables. Second, is the shifting domestic and global policy landscape. Third, is the improved economics of renewables, particularly the falling costs of technology and the sharp spike in local energy costs through 2022. Finally, business investment in the energy transition has picked up.

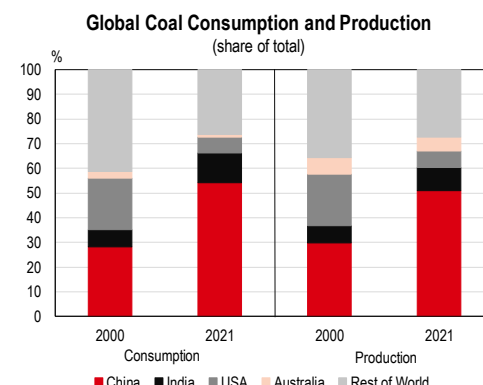
As a result, 2022 was a record year for renewables use in Australia's electricity generation, contributing 32% of total generation (Chart 1). This also contributed to a reduction in Australia's emissions over time (Chart 2). In 2022, it also saw Australia's ranking for the share of renewables in electricity production rise above the OECD average for the first time, though Australia still ranks 26<sup>th</sup> out of 38 economies across the OECD (Chart 3).

### 3. As of 2022, Australia is now above the OECD average for renewable electricity ...



Source: Our World in Data, HSBC

### 4. ... but it is still a large coal producer and consumer



Source: US Energy Information Administration

## ... but it is still not enough to meet its climate goals

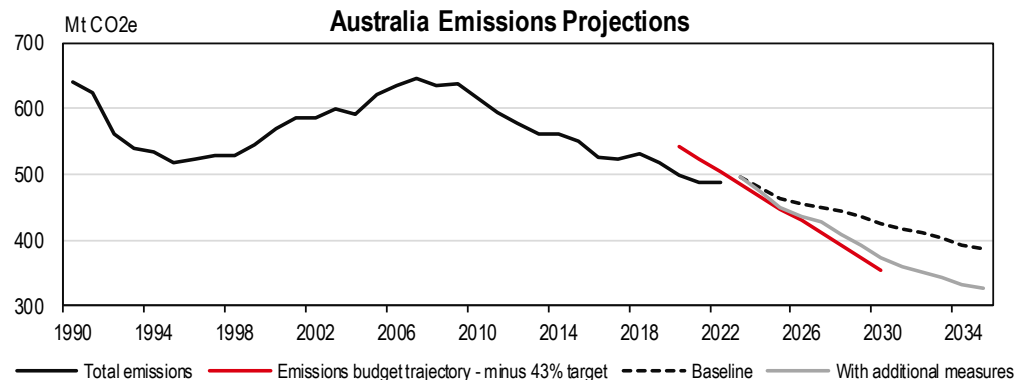
**Under Australia's current set of policies ...**

However, while more-rapid progress on the energy transition is now being made, it still may not be happening fast enough. Australia's reliance on coal is still an evident challenge, with coal contributing nearly 50% to local electricity generation in 2022, while Australia still contributed a relatively large share to global coal production (Chart 4).

**... its trajectory may fall short of reaching its 2030 emissions reduction goal**

Australia's climate policies still appear insufficient to reach its emissions targets, with emissions only 24.7% below 2005 levels in Q4 2022 (Chart 5). Australia has two main emissions targets: 1) by 2023, reduce greenhouse gas emissions by 43% below 2005 levels; and 2) by 2050, achieve net zero emissions. However, the latest baseline projections from the government's Department of Climate Change, Energy, the Environment and Water (2022) predict that Australia will not achieve its 2030 target, even with an assumption of 'additional measures' of mitigation that are still in consultation or design but not yet put in place.

### 5. Australia does not yet appear on track to meet its 2030 emissions target



Source: DCCEEW; HSBC

Note: The 'baseline' scenario includes existing federal, state and territory policies and measures, as well as policies under the Powering Australia Plan where there is enough detail to include them. The 'with additional measures' scenario includes announced policies that are subject to ongoing consultation and design, assuming reforms to the Safeguard Mechanism, and 82% renewable energy in Australia's electricity grids.

## Natural renewable endowments are a key opportunity ...

**Australia's geography offers ample renewable energy opportunities ...**

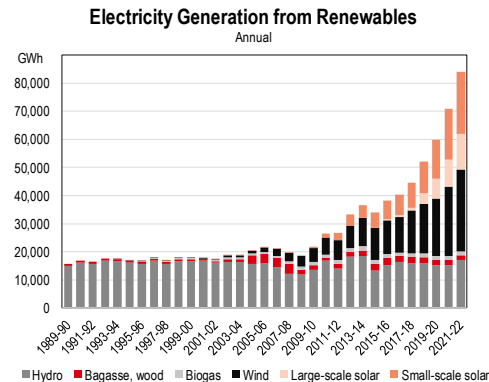
From a broader perspective, Australia has many energy transition opportunities that largely stem from its geography. These include a large land mass, lots of empty space, sunlight, wind and coastal areas. For example, Australia typically ranks in the top 10 countries for the most sunlight in a given year and also has some of the best wind resources in the world, particularly in the southern parts of the continent (Geoscience Australia, 2023). While development of some aspects of Australia's renewable resources is well underway, such as solar and hydro, others are still emerging, and progress has varied across the States and Territories (Charts 6-7).

**... with both hydro and wind already well-established ...**

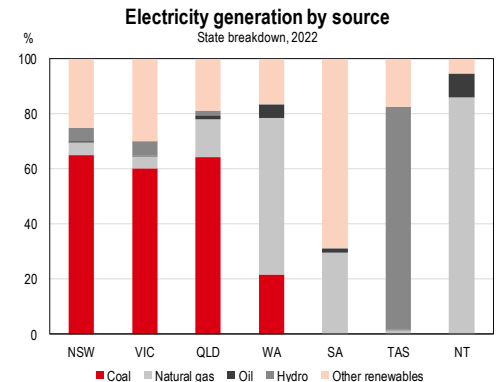
Hydro energy is Australia's most mature renewable technology and contributed almost all of Australia's renewable electricity between the 1980s and early 2010s. However, progress has stalled, reflecting that much of Australia's economically feasible hydro energy resource has already been harnessed, with more than 100 operating hydroelectric power stations (AREA, 2018; Geoscience Australia, 2023). In 2022, hydro only contributed 20% of Australia's total renewable electricity generation.

Wind power has been a key contributor to Australia's energy transition, gaining traction since the early 2010s, and contributed the most – around one third – to renewable electricity generation in 2022. Wind also still offers one of the largest potential areas for development, particularly by establishing offshore wind farms, following the passing of the Offshore Electricity Infrastructure Act 2021. At the end of 2022, 21 wind projects were under construction, with 50 GW worth of announced offshore wind projects (Clean Energy Council, 2023).

## 6. Wind, small-scale and now large-scale solar electricity generation picked up ...



## 7. ... though progress on renewables varies by state



... and Australia has led the world in small-scale solar adoption

Australia has led the world in small-scale solar adoption. In 2022, it was the first year the sector provided more than a quarter of total Australia's renewable electricity, reflecting that around 30% of homes now have rooftop solar PV (the highest uptake of solar, globally).

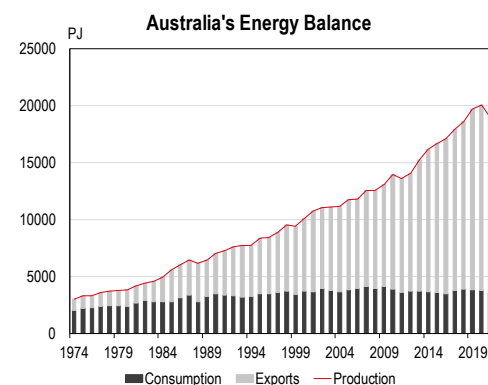
In addition, harnessing more solar energy is a key opportunity for Australia's energy transition. In particular, large-scale solar deployment has lagged, partly reflecting the previous lack of guidance at a federal government level. Likewise, further work is required to ensure energy stability, reflecting growing risks around the ability of local energy grids to handle loads.

## ... along with many inputs needed for the energy transition

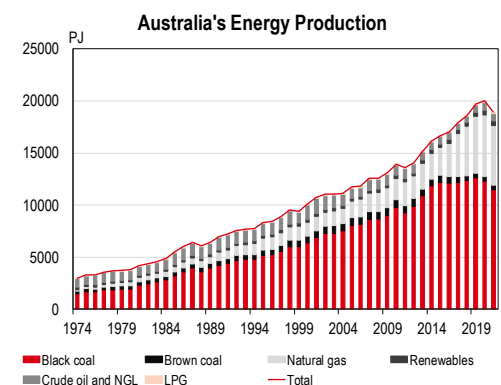
Most of Australia's energy production is exported overseas

A key near-term opportunity for Australia is to continue to supply energy to the global market, while increasing production and export of key renewable energy inputs. Australia is a net energy exporter, largely through the supply of traditional energy resources, such as coal and natural gas (Charts 8-9). Australia also has a significant proportion of the world's uranium resources (Table 10).

## 8. Australia is a key energy exporter ...



## 9. ... largely of fossil fuels



## 10. Australia's non-renewable energy resources

	Total Demonstrated Resources (2021, PJ)	% TDR Growth 2020-21	Production 2021	% Production Growth 2020-21	Resource Life 2021
Crude oil	4,546	-12.7	258	-14.0	18
Condensate	15,581	0.9	432	-1.5	36
LPG	1,155	-4.3	48	2.1	24
Shale oil	84,436	--	--	--	--
Conventional gas	187,839	-2.3	4,543	-1.1	41
Black coal	2,046,714	1.2	11,464	-6.9	179
Brown coal	3,247,899	0.0	430	1.2	7,553
Uranium	732,480	-0.7	2,138	-38.4	343
<b>Total</b>	<b>6,391,151</b>	<b>0.2</b>	<b>20,924</b>	<b>-9.7</b>	<b>--</b>

Source: Geoscience Australia; HSBC

While Australia's role as a global commodities and energy supplier is well-developed, a key opportunity is a growing role as a supplier of critical minerals (Table 11).

**Supplying critical minerals and inputs for the energy transition is a key opportunity**

Australia is well-placed to supply many of the critical minerals used in modern technologies, such as electric vehicles, battery storage, solar energy and wind farms. In fact, Australia is the largest producer of lithium, the third largest producer of cobalt, and the fourth largest producer of rare earths (Geoscience Australia, 2023).

Currently, Australia's renewables-related exports are dominated by lithium (Chart 12). The value of lithium exports is expected to be AUD19.5bn in 2022-23, a significant increase from the previous record of AUD5.0bn in 2021-22 (Resources and Energy Quarterly June 2023). While most of Australia's lithium is in spodumene form and almost all is exported to China, Australia is developing capacity to refine lithium domestically, producing lithium hydroxide to meet global demand for battery-grade lithium.

## 11. Australia's critical minerals resources

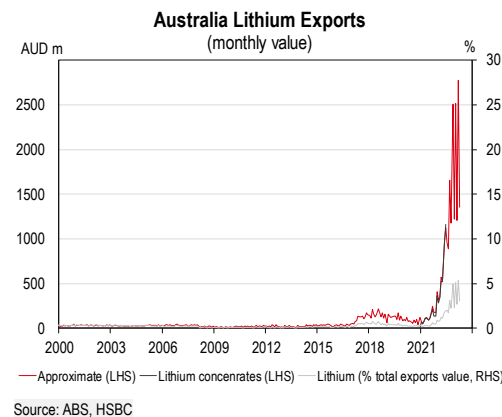
	Economic Demonstrated Resources (EDR)	World ranking for resources	Share of world resources (%)	Share of world production (%)
Bauxite	3,565 Mt	3	12	27
Cobalt	1,582 kt Co	2	20	3
Copper	100.07 Mt Cu	2	11	4
Gold	11,980 t AU	22	22	10
Graphite	7.97 Mt	8	2	0
Ilmenite	273.8 Mt	2	23	4
Iron ore	56,646 Mt and 26,497 Mt Fe	1	31	36
Lead	35.95 Mt Pb	1	40	11
Lithium	6,700 kt Li	2	29	53
Manganese Ore	277 Mt	4	9	11
Nickel	21.7 Mt Ni	1	23	6
Rare Earths	4.26 Mt oxide	6	3	8
Rutile	33.8 Mt	1	63	26
Uranium	1,227 kt U	1	32	8
Vanadium	8,110 kt V	2	31	0
Zinc	66.25 Mt Zn	1	27	10
Zircon	76.8 Mt	1	72	30

Source: Geoscience Australia; HSBC

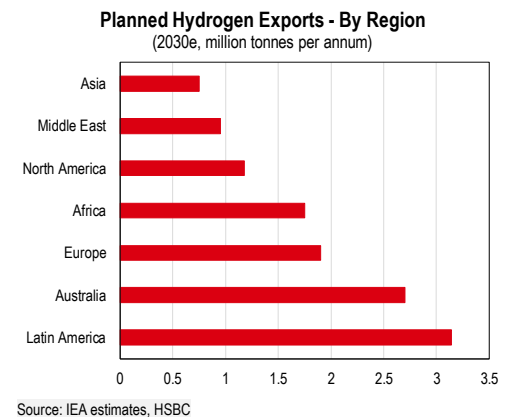
**Australia is the largest producer of lithium, but it is only 4% of resources exports**

However, while lithium production and export volumes are expected to continue to grow, it still only accounts for a small share of Australia's trade, with policymakers predicting lithium will account for c4% of total resources and energy exports in 2024-25. In contrast, Australia's iron ore and gas exports summed to AUD249bn in 2022, which dwarf those of lithium. As such, while the developments in 'green' exports are promising, in the near term they have more limited macro-economic implications.

## 12. Currently, Australia's renewables-related exports are largely lithium ...



## 13. ... but Australia has potential to become a global hydrogen supplier



### Hydrogen is also a key opportunity for Australia ...

Australia is also well-placed to become a major hydrogen producer for both domestic consumption and export. In 2022, Australia sent the world's first shipment of liquefied hydrogen to Japan. The National Hydrogen Strategy estimates that Australia has 262,000 square kilometres (3% of its land mass) of land that is highly suitable for hydrogen production, using renewable electricity, which would be capable of producing more hydrogen than the global demand predicted by the Hydrogen Council for 2050 (DCCEEW, 2023).

Australia's hydrogen industry is still small but has a large potential to grow (Chart 13). While Australia was the third nation to launch a hydrogen strategy in 2019, at least 30 nations have now released hydrogen strategies, with more in development, which Australia can tap into as hydrogen demand increases over time. For example, the European Commission in 2022 doubled the previous EU renewable hydrogen target.

### ... with Australia expected to be the largest hydrogen exporter by 2050

Australia is expected to be the world's largest hydrogen exporter by 2050 (IEA, 2022) and hydrogen could be worth up to AUD10bn each year to the economy (AREA, 2022).

## Renewables investment is rising off a low base ...

The acceleration of the energy transition in Australia has been reflected in a sharp pick-up in renewables investment. However, while the growth rate in investment has accelerated, the level of investment is still small. Partly, this has reflected Australia's slow start to the energy transition. While renewables investment is expected to continue to increase sharply, it is unlikely to meaningfully impact the macro-economic outlook until it reaches much higher levels.

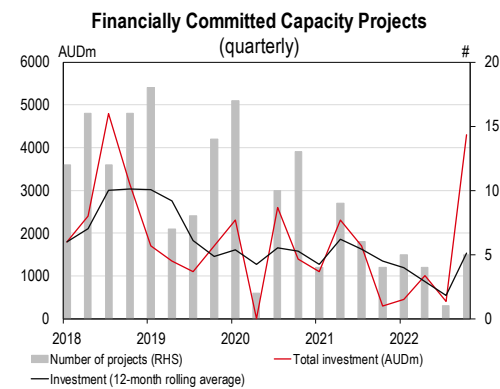
**“ Australia is deploying new large-scale generation – wind and solar farms – more slowly than needed to reach the 82 per cent target for renewable energy on the National Electricity Market.**

**Clean Energy Council, 9 March 2023**

### Renewable investment has increased in 2022 ...

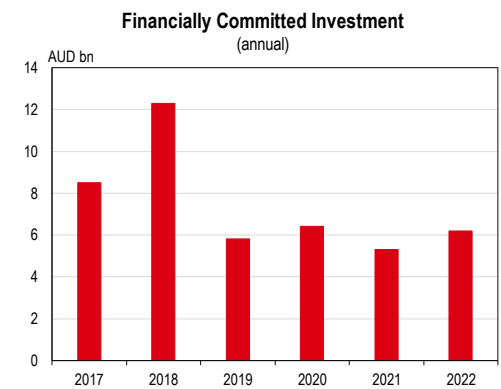
Investment in the clean energy industry rose 17% y-o-y in 2022 to AUD6.7bn (Chart 14). The final quarter of 2022 also saw investment in financially committed generation and storage projects reach AUD4.3bn, the second highest quarterly result since the Clean Energy Council started collecting data in 2017, which supported a 19% y-o-y increase in total investment on new financially committed capacity projects (Chart 15; Clean Energy Council, 2023).

#### 14. Renewables investment has trended lower between 2018 and 2021 ...



Source: Clean Energy Council, HSBC

#### 15. ...but ticked up in 2022, largely due to a sharp rise in commitments in Q4 2022



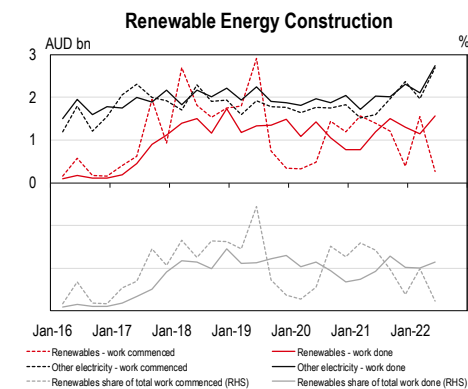
Source: Clean Energy Council, HSBC

... but from a low base, worth only c5% of engineering work done per quarter

Because of the Australia's slow start, the investment in utility-scale renewable energy-generating assets is not yet enough to warrant its own breakdown in some of Australia's official data sources, such as the quarterly engineering construction figures from the Australian Bureau of Statistics (ABS).

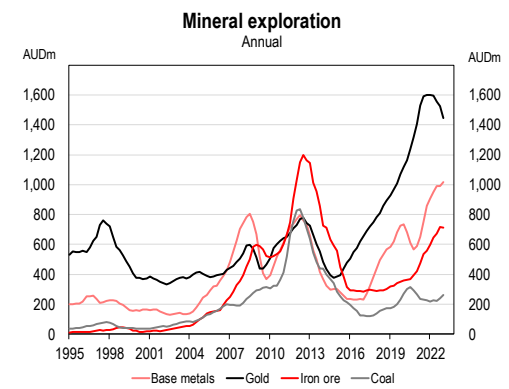
However, the ABS did release a snapshot in late 2022 that, similar to the data from the Clean Energy Council, showed the rate of renewable construction essentially stalled since 2018 (Chart 16). In addition, more work is still being done on traditional electricity construction, and renewables accounted for roughly 5% of engineering work done per quarter.

#### 16. Renewables-related construction largely stalled between 2018 and 2022 ...



Source: ABS, HSBC

#### 17. ... while base metals exploration has picked up



Source: ABS, HSBC

#### ... and critical minerals and resources investment is lifting as well

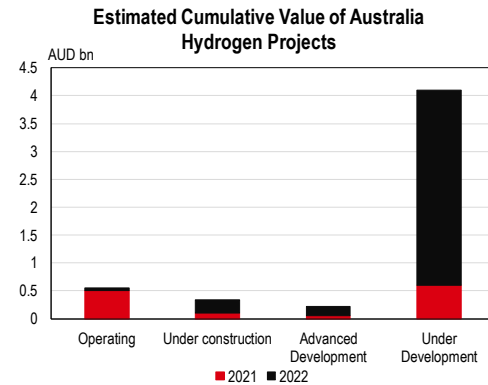
Minerals exploration has also been increasing ...

In contrast to direct renewables investment, minerals exploration has been increasing over time (Chart 18). As of December 2022, Australia had 81 major critical minerals projects in the pipeline valued between AUD30bn and AUD42bn. This is 10 projects more and around AUD12bn more funding than in 2021. Furthermore, there are around 55 advanced and investment-ready critical minerals projects.

Increasing Australia's exports to maintain its market position for critical and other energy transition minerals could add AUD71.2bn to GDP, while building downstream refining and processing capability and securing a greater share of trade and investment could generate AUD133.5bn in GDP (Department of Industry, Science and Resources, 2022).

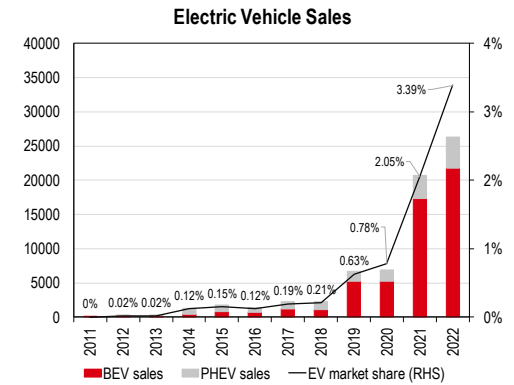


## 18. Hydrogen investment has picked up sharply in 2022, off a low base ...



Source: Department of Climate Change, Energy, the Environment and Water. Note: As at December 2022.

## 19. ... and EV adoption has risen, despite supply chain challenges



Source: Electric Vehicle Council, HSBC

... and there is a large pipeline of hydrogen-related investment

Hydrogen investment has also lifted (Chart 18). In 2022, more than 100 Australian green hydrogen projects, such as green ammonia and green methanol manufacturing, were announced, which is more than double the projects announced in 2021. Australia also has around 40% of all announced global hydrogen projects, with the Australian pipeline valued from AUD230bn to AUD300bn. The Commonwealth and State and Territory Governments have committed a significant amount of funding to hydrogen (Table 20). Most of the project announcements in this pipeline, however, are yet to reach final investment decisions.

## 20. Australian Government Hydrogen Investment

	Committed hydrogen-specific support (AUD)	Announced hydrogen-eligible support (AUD)
Commonwealth	1,589,377,972	27,057,000,000
ACT	130,000	12,000,000
NSW	3,264,100,000	1,300,000,000
NT	5,000,000	2,000,000
QLD	169,950,000	4,500,000,000
SA	682,090,000	150,000,000
TAS	280,200,000	4,600,000
VIC	97,735,000	2,168,800,000
WA	170,000,000	--
<b>Total</b>	<b>6.3 billion</b>	<b>35.2 billion</b>

Source: Department of Climate Change, Energy, the Environment and Water. Note: As at December 2022.

EV adoption has been slow but is also picking up pace

Australia currently lags behind the rest of the world – EV sales accounted for 3.8% of the national car market in 2022 – but it is increasing its adoption of EVs (Chart 19). In 2023, the government released its first National Electric Vehicle Strategy, outlining a framework for increasing the access to, and adoption of, EVs. The government is also expanding the rollout of charging infrastructure through the AUD500m Driving the Nation Fund and the National EV Charging Network – a national network of EV charging infrastructure installed at 117 sites on major highways at an average interval of 150km.

## A renewed renewables drive from fiscal policymakers

The election of the Labor government in May 2022 marked a clear shift in Australia's renewables outlook. Prior to that, the lack of policy coordination and support for the energy transition at a federal level was a key constraint and had contributed to Australia's 'slow start' and global reputation as a 'laggard'. This ultimately saw industry, households, and state and territory governments all lead Australia's energy transition in a somewhat piecemeal approach.



**The Labor government has provided a clear emphasis on the energy transition**

Now, the federal government has stepped up and provided a clearer focus on Australia's energy transition. The government has created the Department of Climate Change, Energy, the Environment and Water to help deliver on Australia's transition goals. Likewise, key legislative developments have moved forward under the government's 'Powering Australia' plan, including the Climate Change Act 2022, which enshrined in law Australia's emissions goals, and the reforms of the Safeguard Mechanism, designed to reduce industrial emissions (Table 21).

## 21. A selection of Australia's federal energy transition developments

	Information
<b>Department of Climate Change, Energy, the Environment and Water</b>	A new department has been established to deliver on the government's climate change and energy agenda and protect Australia's environment and water resources.
<b>Climate Change Act</b>	The Act: <ul style="list-style-type: none"> <li>• Outlines Australia's greenhouse gas emissions reduction targets of a 43% reduction from 2005 levels by 2030 and net zero by 2050</li> <li>• Requires the minister to prepare and table an annual climate change statement</li> <li>• Requires the Climate Change Authority to give the minister advice in relation to the annual statement and future greenhouse gas emissions reduction targets</li> <li>• Provides for periodic reviews of the operation of the Act</li> </ul>
<b>2022 Critical Minerals Strategy</b>	An update to the 2019 strategy. The objectives of the Strategy include stable supply, sovereign capability and regional jobs and growth. The plan outlines actionable policies, including international partnerships, government investment initiatives, research and innovation, and environmental and social governance standards.
<b>Rewiring the Nation</b>	This is a AUD20bn plan to deliver low-cost, reliable and clean energy via two under-sea transmission cables between Tasmania and Victoria, and fast-track Victoria's Renewable Energy Zones and offshore wind developments.
<b>National Electric Vehicle Strategy</b>	The Strategy provides a framework to guide future investment to support the switch to EVs in Australia, including: 1) national standards; 2) data sharing; 3) EV affordability; 4) remote and regional EV charging infrastructure; 5) fleet procurement; and 6) education and awareness.
<b>The National Reconstruction Fund</b>	This is a AUD15bn fund to provide finance for projects that diversify and transform Australia's industry and economy, with a focus on renewables and low-emissions technologies.
<b>Safeguard Mechanism reform</b>	Legislation for reducing emissions at Australia's largest industrial facilities, by setting limits – known as baselines – on the greenhouse gas emissions of these facilities. The Safeguard Mechanism was reformed in 2023 to ensure that covered facilities contribute appropriately.
<b>National Energy Transformation Partnership</b>	The partnership is a framework for national alignment and cooperative action by governments to support the smooth transformation of Australia's energy sector.
<b>Fuel efficiency standards</b>	Unlike most OECD economies, Australia did not have mandatory fuel economy standards, although voluntary standards have been in place since 1978. The government recently finished a public consultation to assist with developing the standards.
<b>Powering the regions</b>	This is a AUD1.9bn fund to support the decarbonisation of existing industries and the creation of new clean energy industries.

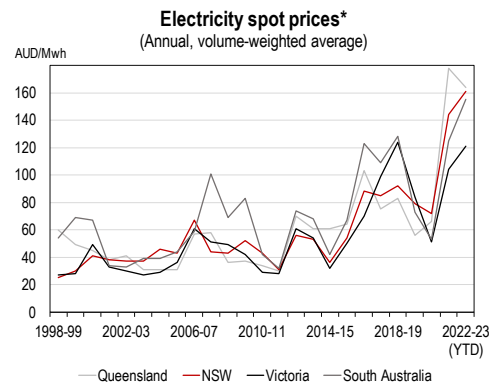
Source: DCCCEW; HSBC

## There are some challenges associated with the transition ...

**Higher energy prices in 2022 made renewables relatively cheaper**

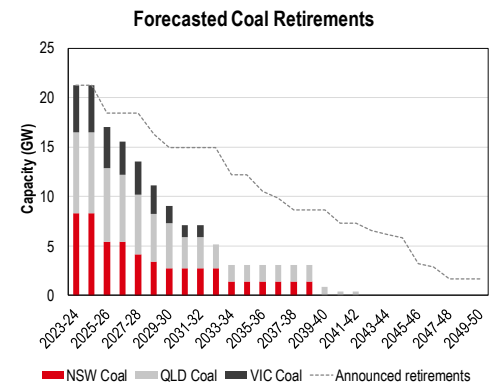
Sharply higher energy prices through 2021 and 2022 have been somewhat of a wake-up call for Australia (Chart 22). Even though Australia has abundant energy resources, it, nonetheless, faced an energy squeeze, with local electricity prices rising to new record highs. Higher fossil fuel prices lowered the relative cost of renewables and provide further incentives, particularly for consumers and businesses, to speed up the transition.

## 22. Australia has experienced an energy squeeze ...



Source: AER, HSBC. \*Note: Latest data point is year-to-date.

## 23. ... while the phase-out of coal is a key risk for total energy supply



Source: AEMO, HSBC

**There are some technical risks to the current energy infrastructure ...**

However, speeding up the transition comes with its own risks. Notably, policymakers are keen to avoid a worst-case scenario in the electricity market, which would see a shortfall in energy supply that leads to blackouts. For example, the role of the National Electricity Market (NEM) is to efficiently match when and where electricity is generated, with when and where it is needed. Coal-fired generation has provided a relatively stable base load; however, as the coal-fired power stations are decommissioned (e.g., Eraring, Australia's largest coal-fired power station, is now set to close in 2025, seven years earlier than expected), much more investment is needed in the firming capacity for dispatchable storage (Chart 23).

**... and reducing mining-related emissions also poses a challenge**

Some other challenging aspects relate to directly reducing emissions. Mining-related emissions, for example, pose a challenge, particularly as Australia ramps up its critical minerals investment. Australia's mining operations release methane, which has a much more harmful near-term impact relative to carbon dioxide, and IEA (2021) data showed that methane emissions for Australia could be more than 60% higher than federal government estimates suggest.

Carbon capture, utilisation and storage (CCUS) is arguably one of the technologies that can help reduce those emissions that cannot be avoided. In 2022, Australia announced its first two new offshore greenhouse gas storage permits in 14 years. However, while there is scope to scale up further, it is still unclear whether the benefits outweigh the costs, and the approach is generally viewed as encouraging further fossil fuel use. Notably for Australia, the operational CCUS projects in Western Australia have been expensive and generally failed to meet capture targets.

**CCUS and the standard of Australia's capital stock are two further considerations**

Another key challenge is updating Australia's capital stock for improved environmental standards and to enhance energy efficiency. From 1 October 2023, the energy efficiency changes in the National Construction Code will come into effect for new homes. However, established homes and building are a challenge. The government is developing measures in this regarding, including a National Energy Performance Strategy, and the Trajectory for Low Energy Buildings. The latter is a suite of measures to achieve net zero in Australia's building sector, including: 1) a residential disclosure framework; 2) a minimum rental requirements framework; and 3) an updated Nationwide House Energy Rating Scheme.

## ... and Australia is exposed to the impact of climate change itself

Australia is also particularly exposed to the impacts of climate change itself. For instance, Australia is expected to experience more extremely hot days, more heatwaves and more extreme fire weather over time, and Australia's hottest year on record, 2019, is likely to become an 'average' year (CSIRO & BOM, 2022). Australia is already experiencing sea level rises, which are expected to continue accelerating. In the near term, the emergence of El Niño in 2023 raises the risk of drier conditions, drought, and bushfires as the Southern Hemisphere emerges out of its winter months. El Niño could hamper some of Australia's rural commodities production, such as grains crops and livestock.

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Australia, given its geography, is exposed to the impact of climate change

Because of Australia's exposure to the impacts of climate change, some already existing critical infrastructure, including Australia's road, rail and telecommunications networks, will likely need to be re-built to resist extended periods of extreme heat, sea level rises and increasing frequency of storm surges.

In addition, there are also financial risks that are already emerging. For instance, in the insurance industry. More frequent or more severe weather events are expected to increase claims on damaged property and other assets. The Australian Climate Council has released a study that estimates that one in 25 of all homes and commercial buildings in the country will become effectively uninsurable by 2030.

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