QUEENSLAND TREASURY

Queensland’s Coal Industry and Long-Term Global Coal Demand

November 2022

Queensland Government

1.0 Introduction

In September 2020, Queensland Treasury published a paper titled *A Study of Long-Term Global Coal Demand*, which outlined key characteristics of the Queensland and global coal industries, including recent developments at that time. The paper outlined key findings from the International Energy Agency's (IEA) 2019 World Energy Outlook (WEO) about the long-term global outlook for coal and discussed the potential implications for Queensland's coal industry.

That paper highlighted that Queensland's coal industry continued to enjoy key advantages, including its geographic location and quality of its coal, compared with most of its global competitors. Therefore, under the main long-term scenario outlined in the IEA's 2019 projections (over the period to 2040), it was expected that international demand would support Queensland's coal exports over the coming two decades, with the long-term prospects for the State's metallurgical coal likely to be more robust than for thermal coal.

At that time, in late 2020, given the world was in the relatively early stages of the COVID-19 crisis, the paper included a short summary of key recent developments in the global economy and their potential impact on global coal demand in the short to medium term. The impacts of those factors were expected to be relatively short-lived compared with the underlying drivers of the long-term outlook outlined in the WEO.

Since that time, the global coal industry has experienced a period of unprecedented high coal prices and substantial changes in global trade of coal. These outcomes have been driven by a range of factors including: the impacts of the pandemic and the global response to it; supply-side disruptions and constraints, including significant weather events; introduction of China's informal ban on Australian coal imports; and significant geopolitical tensions, including the Russian invasion of Ukraine and related sanctions, resulting in substantial impacts on global trade and energy markets.

Highlighting the significant impact these factors have had on coal prices, the premium hard coking coal spot price peaked at a record US$670.50/t (A$924/t) in March 2022, while the premium thermal coal spot price peaked at a record US$457.80/t (A$675/t) in September 2022. These unprecedented high prices have led to substantial increases in the value of Queensland's coal exports and the revenues generated by the State's coal producers, with the export value of Queensland coal in 2021-22 reaching a record $71.8 billion, compared with $24.7 billion in the previous year.

In the context of these significant changes, the IEA has recently released its latest 2022 WEO, highlighting that '*the world is in the midst of its first global energy crisis*' which has '*stoked inflationary pressures and created a looming risk of recession, as well as a huge US$2 trillion windfall for fossil fuel producers above their 2021 net income*'.

The IEA outline updated projections, out to 2050, for energy markets, including coal, in the context of three scenarios, broadly consistent with the three scenarios outlined in the 2019 WEO.

Importantly, the 2022 WEO also includes detailed analysis and discussion around the long-term outlook and implications for global coal and other major energy-related industries in the context of the pathway for the global energy sector to reach zero net emissions by 2050.

Given the substantial developments in the global coal industry over the last two years, including the unprecedented price increases for both metallurgical and thermal coal, and the ongoing transition of the global economy to lower carbon emissions, Queensland Treasury has undertaken further analysis, as outlined in this paper, to provide an updated overview of the status of the Queensland coal industry and the potential implications of the IEA's long-term outlook for global coal demand.

2.0 Executive summary

Queensland's coal mining industry

- Recent ABS export data show that coal accounted for $71.8 billion, or 70% of the value of total Queensland resources exports, in 2021-22. The coal mining industry also supports activity in other sectors, including coal processing and the construction or expansion of mines and coal transport infrastructure.
- There were 54 operating coal mines in Queensland in 2021-22, with coal mining and related activity primarily based in the Mackay and Central Queensland regions.
- Queensland produced 276.5 million tonnes (Mt) of raw coal in 2021-22, resulting in 217.9 Mt of saleable coal (135.4 Mt of metallurgical coal and 82.5 Mt of thermal coal).

Recent developments in the Queensland coal industry

- The global coal industry has seen substantial volatility in coal prices over much of the last decade, including periods of sustained high prices, with unprecedented high prices seen over the period since mid-2021.
- The Russian invasion of Ukraine and subsequent sanctions on Russia have further disrupted global energy markets, which has driven coal prices to even higher record levels. The premium hard coking coal spot price peaked at US$670.50/t (A$924/t) in March 2022, while the premium thermal coal spot price peaked at US$457.80/t (A$675/t) in September 2022.
- These unprecedented high prices have resulted in significant increases in revenues and profits for many Australian and Queensland coal producers. In the 2022 WEO, the IEA noted the crisis has resulted in '*a huge US$2 trillion windfall for fossil fuel producers above their 2021 net income'* and '*high energy prices are causing a huge transfer of wealth from consumers to producers.*'
- Despite some decline in prices recently, coal prices have remained at elevated levels in the second half of 2022, resulting in coal producers continuing to receive extra-ordinary revenues compared with historical levels.
- In September quarter 2022, ABS data shows that the value of Queensland coal exports was $18.4 billion, up 75.3% from the $10.5 billion in exports in September quarter 2021. The continued high prices drove the value of Queensland's coal exports to a new record 12-month high of A$79.7 billion in the year ended September 2022.
- Queensland continues to offer an attractive environment for investment in coal, reflecting its numerous competitive advantages including its high-quality hard coking coal, proximity to the fast-growing Asian region, efficient supply chain, good infrastructure, and skilled workforce.
- Since mid-2022, there have been numerous announcements of substantial investments or acquisitions in the Queensland coal industry, providing a clear indication of coal producers' ongoing confidence and appetite to invest in Queensland.

WEO Report and IEA findings

- In September 2020, Queensland Treasury published the report *A Study of Long-Term Global Coal Demand* which outlined the findings from the IEA's 2019 WEO, which included projections of global coal demand and trade under three different scenarios out to 2040.
- The IEA has recently released its 2022 WEO, which outlines projections of long-term global coal demand, now extended out to 2050, under three scenarios: *Stated Policies Scenario* (STEPS, which looks not at what governments say they will achieve, but at what they are actually doing), the *Announced Pledges Scenario* (APS, which assumes that governments will meet all of the climate-related commitments that they have announced) and the *Net Zero Emissions by 2050 Scenario* (NZE, which works backwards from a defined outcome of global net zero CO_2 emissions by 2050).
- Under the **STEPS**, global coal demand is projected to remain near its historic peak for the first half of the 2020s but return to structural decline in the second half of this decade, to be around 10% lower by 2030. Following the decline in global coal use from 5,644 million tonnes of coal equivalent (Mtce) in 2021 to 5,149 Mtce by 2030, demand is projected to fall a further 25% to 3,828 Mtce by 2050, a cumulative decline of 32.2% from 2021 levels.

- Under the **APS**, global coal demand is projected to fall at a faster pace due to more stringent commitments on limiting use of fossil fuels. In particular, demand in advanced economies is projected to decline by 65% to 2030 as coal use in the power and industry sectors falls rapidly. Global demand for coal is projected to be around 20% below current levels by 2030 (4,540 Mtce) and down 71.4% (to only 1,613 Mtce) by 2050.
- Under the **NZE** scenario, coal demand is projected to be 45% lower by 2030, declining from 5,644 Mtce in 2021 to 3,024 Mtce in 2030. By 2030, thermal coal production is 50% below 2021 levels, while metallurgical coal is 30% lower. By 2050, these declines extend to 91% for thermal coal and 88% for metallurgical coal.
- Importantly for Australia and, in particular for Queensland, the decline in metallurgical coal production in these scenarios is less severe than thermal coal due to fewer readily available alternatives for the steel industry.
- The IEA highlight that, apart from the ongoing shift towards renewable energy, technological advances in coal and gas fired power generation will also likely cause further disruption to coal demand for power generation. Further, the IEA's long-term coal outlook depends on government policies and different assumptions about how these will develop. This means there is a wide variety of potential outcomes.

Potential implications for Queensland's coal industry

- In considering the potential implications for Queensland of the IEA's global and regional projections, it is important to understand the key factors likely to drive metallurgical and thermal coal demand in the State's key export markets in the Asian region.
- The State's traditional coal markets of Japan and Korea, along with strong growth in demand from China and India over the past decade, have been pivotal in Queensland achieving its current position in the global coal market.
- As such, ongoing changes in demand and technological developments in terms of steel production and electricity generation in these key trading partners are critical to determining the outlook for the Queensland coal sector.
- The IEA's projections highlight that the '*outlook for coal is heavily dependent on the strength of the world's resolve to address climate change*' but in all of the IEA's scenarios, global coal consumption falls by both 2030 and 2050. The IEA note that metallurgical coal demand is expected to decline '*much less*' than thermal coal.
- Under the IEA's STEPS, Australian coal production plateaus between 2021 and 2030, with a slight fall in domestic demand being partially offset by an increase in exports. Australian coal production remains at a similar level in 2050 to 2021.
- Under the IEA's APS, Australia's overall coal production falls by about 25% between 2021 and 2030. Metallurgical coal production remains steady, and Australia exports about 190 Mtce of metallurgical coal each year through to 2030.
- Thermal coal production falls by about 40% over the same period as demand declines quickly in key importing countries such as Japan and Korea. Australian coal production declines by 55% between 2030 and 2050, so that production is about one third of 2021 levels by 2050.
- There is a substantial degree of uncertainty inherent in the IEA projections and other key assumptions underpinning the analysis, given the long-term nature of the outlook in a global energy market that is facing ongoing change.
- However, as Queensland accounted for around 90% of Australia's metallurgical coal production in 2021-22 and given around 70% of the state's coal production in 2021-22 was metallurgical coal, Queensland's coal industry remains relatively well placed over the longer term compared with other jurisdictions that are much more reliant on thermal coal production and exports.
- Queensland's coal industry also continues to enjoy key advantages, including its geographic location and quality of its coal, compared with many of its global competitors.[1] Therefore, under the long-term scenarios outlined in the IEA's 2022 WEO, it is still expected that international demand should continue to support Queensland's coal exports over coming decades, in particular for the state's metallurgical coal producers.

[1] Minerals Council of Australia *Best in Class: Australia's Bulk Commodity Giants - Australian Export Thermal Coal: The Comparative Quality Advantages*, p 2 and Minerals Council of Australia *Best in Class: Australia's Bulk Commodity Giants - Australian Metallurgical Coal: Quality Sought Around the World*, pp 18-19.

3.0 Queensland's coal industry

3.1 Overview

ABS export data show that coal accounted for the majority of the State's resources exports in 2021-22, totalling $71.8 billion or 70% of the value of Queensland's resources exports.[2]

The coal mining industry also supports activity in other sectors, including coal processing and the construction or expansion of mines and coal transport infrastructure.

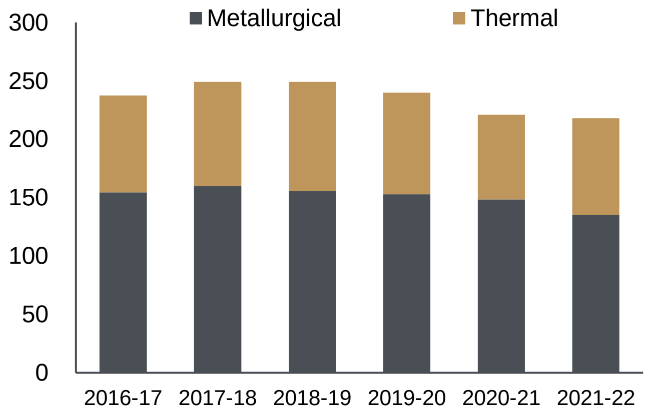
Data from the Queensland Mines Inspectorate show there were 37,970 workers in Queensland coal mines as of 30 June 2022.[3]

3.2 Production

There were 54 operating coal mines in Queensland in 2021-22, with coal mining and related activity primarily based in the Mackay and Central Queensland regions.[4]

Queensland produced 276.5 Mt of raw coal[5] in 2021-22, resulting in 217.9 Mt of saleable coal[6] (135.4 Mt of metallurgical coal and 82.5 Mt of thermal coal).[7]

Chart 3.1 Queensland Saleable Coal Production (Mt)



Source: Department of Resources *Coal industry review statistical tables*.

Queensland's largest metallurgical coal mines (in net output terms) in 2021-22 were: Goonyella – Riverside (14.5 Mt), Blackwater (10.8 Mt), Saraji (8.6 Mt), Caval Ridge (8.5 Mt), Lake Vermont and Peak Downs (both 8.4 Mt).[8]

Queensland's largest thermal coal mines in 2021-22 were: Rolleston (13.7 Mt), Clermont (10.9 Mt), Callide (7.6 Mt), Meandu (5.2 Mt), Ensham (3.9 Mt), Curragh (3.8 Mt) and Newlands (3.6 Mt).[9]

According to the December 2021 *Resources and Energy Major Projects* publication from the Australian Department of Industry, Science and Resources (DISR), there were 44 announced coal projects in Queensland, of which seven were expansions of existing projects and 37 were new projects. The majority of projects were at the feasibility stage (27) or publicly announced (13). DISR considered four projects as committed.

The committed projects identified by DISR were Bravus' Carmichael coal mine (which exported its first coal in late 2021), Anglo American/Mitsui's Aquila metallurgical coal mine (which commenced production in February 2022), Stanmore's Isaac Downs project (Stanmore reported construction activity for the project was '*largely complete*' in its *September 2022 Quarterly Activities Report*) and Shandong Energy's Hillalong coal project.

Section 4.4 provides further details on Queensland's coal investment environment.

3.3 Exports

The vast majority of coal produced in Queensland in 2021-22 was exported overseas, including 100.8 Mt of hard coking coal, 40.9 Mt of semi-soft coking/ pulverised coal injection (PCI) coal and 52.9 Mt of thermal coal (**Chart 3.2**).

Queensland is the world's largest seaborne exporter of metallurgical coal (i.e. hard coking + semi-soft coking/PCI). The State's top six destinations for hard coking coal in 2021-22 were India, Japan, Korea, the Netherlands, Taiwan and Vietnam, which combined accounted for 80% of the total volume of the State's hard coking coal exports.

Japan, India, Korea, Vietnam, Taiwan, and Brazil were the main export destinations for semi-soft coking/PCI coal in 2021-22, accounting for 94% of Queensland's semi-soft/PCI coal exports.

Japan, Korea, Vietnam, Taiwan, India and Indonesia were the State's top six export destinations for thermal coal, accounting for 93% of thermal coal exports in 2021-22 (**Table 3.1**).

[2] ABS *International Trade in Goods and Services (unpublished)*.

[3] Queensland Mines Inspectorate *Qld quarterly mine and quarry worker numbers at 30 June 2022*.

[4] Department of Resources *Coal industry review statistical tables*.

[5] Raw coal is coal which has been extracted from the mine but has not yet been processed.

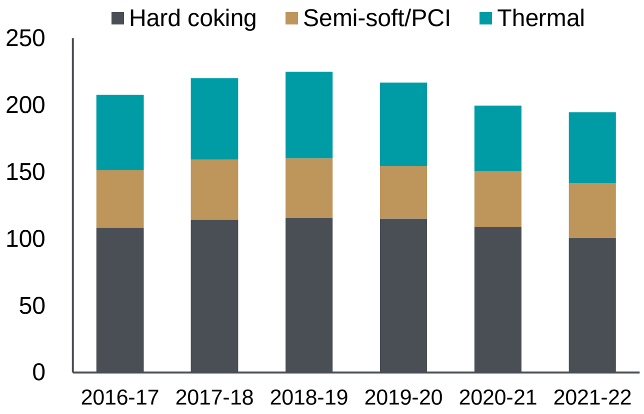
[6] Saleable coal is coal which does not require any further processing.

[7] Department of Resources *Coal industry review statistical tables*.

[8] Department of Resources *Coal industry review statistical tables*.

[9] Department of Resources *Coal industry review statistical tables*.

Chart 3.2 Queensland Coal Exports (Mt)



Source: ABS *International Trade in Goods and Services (unpublished)*.

China was previously Queensland's largest export market for hard coking coal. However, in October 2020, China began an informal ban on imports of Australian coal. Queensland's exporters have been successful in finding alternative destinations for Queensland's coal, with over 90% of tonnages lost to China offset by increased exports to other countries, including India, Japan, and Korea, by November 2021 (see **Table 5.3** for further details).

Table 3.1 Queensland's Major Coal Export Markets, 2021-22 (Mt)

	Hard coking	Thermal	Semi-soft/PCI[1]	Total
India	34.4	4.6	10.3	49.3
Japan	17.8	16.5	14.1	48.4
Korea	12.1	14.2	8.6	34.8
Vietnam	4.6	7.7	2.1	14.4
Taiwan	5.0	4.9	1.8	11.8
Netherlands	6.5	0.4	0.4	7.3
Indonesia	3.0	1.3	0.7	5.0
Brazil	3.4	0.0	1.5	4.9
Other	14.1	3.3	1.3	18.7
Total	**100.8**	**52.9**	**40.9**	**194.6**

1. Includes Queensland Treasury estimates of semi-soft/PCI exports by country prior to October 2021.
Sources: ABS *International Trade in Goods and Services (unpublished)* and Queensland Treasury.

3.4 Prices and profitability

The global coal industry has seen substantial volatility in coal prices over much of the last decade, with unprecedented high prices over the period since mid-2021.

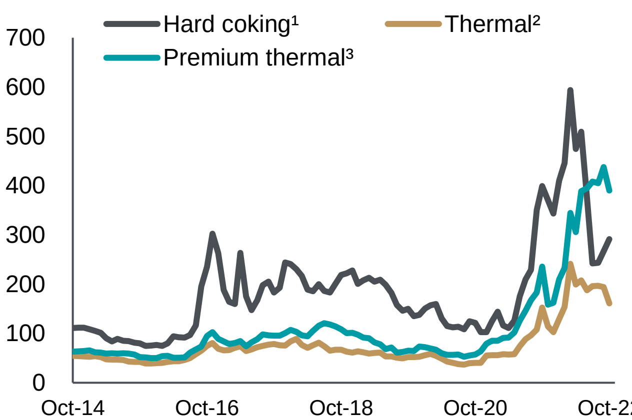
Coal prices experienced volatility over the five years prior to the COVID-19 pandemic. Policy changes in China resulting in lower coal production saw coal prices rise sharply in late-2016. Severe Tropical Cyclone Debbie in March 2017 disrupted vital Queensland coal infrastructure and drove another spike in hard coking coal prices.

Coal prices remained elevated for several years before declining global industrial production in 2019, resulting primarily from US-China trade tensions, drove a fall in global demand for coal. Subsequently, coal prices were trending lower prior to the onset of the COVID-19 pandemic.

Initially, the pandemic had limited effects on coal prices. However, numerous global supply disruptions, combined with a faster than anticipated recovery in global activity, saw coal prices rise sharply to record levels in the second half of 2021. The premium hard coking coal[10] spot price averaged US$399/t (A$540/t)[11] in October 2021, while the premium thermal coal[12] spot price averaged US$235/t (A$318/t) in October 2021.

The Russian invasion of Ukraine and subsequent sanctions have further disrupted energy markets, driving coal prices to even higher record levels (**Chart 3.3**). The premium hard coking coal[13] spot price peaked at US$670.50/t (A$924/t) in March 2022, while the premium thermal coal spot price peaked at US$457.80/t[14] (A$675/t) in September 2022.

Chart 3.3 Coal Monthly Spot Prices (US$/t)



1. S&P Global Commodity Insights HCC Peak Downs FOB Australia.
2. S&P Global Commodity Insights Newcastle 5,500 kcal/kg NAR 20% Ash FOB.
3. AME Newcastle 6,300kcal/kg GAR, FOB.
Sources: S&P Global Commodity Insights (©2022 by S&P Global Inc) and AME.

While prices have moderated in recent months, they remain elevated (particularly for premium thermal coal). This reflects the ongoing disruptions in the global energy market, and expectations that sanctions on Russian coal exports

[10] S&P Global Commodity Insights HCC Peak Downs FOB Australia.
[11] Converted to A$ using daily exchange rate data from the Reserve Bank of Australia via Refinitiv.
[12] AME Newcastle 6,300kcal/kg GAR, FOB.
[13] S&P Global Commodity Insights HCC Peak Downs FOB Australia.
[14] AME Newcastle 6,300kcal/kg GAR, FOB.

could remain in place for an extended period. The IEA noted '*there remain huge uncertainties over how this energy crisis will evolve and for how long fossil fuel prices will remain elevated, and the risks of further energy disruption and geopolitical fragmentation are high.*'[15]

These unprecedented high prices have resulted in significant increases in revenues and profits for many Australian and Queensland coal producers, as discussed further below and in Chapter 4 on recent developments in the Queensland coal industry.

In the 2022 WEO, the IEA made these key observations about recent developments:

> ***Russia's invasion of Ukraine has sparked a global energy crisis.***[16]
>
> ***The crisis has stoked inflationary pressures and created a looming risk of recession, as well as a huge US$2 trillion windfall for fossil fuel producers above their 2021 net income.***[17]
>
> ***High energy prices are causing a huge transfer of wealth from consumers to producers*.**[18]

The energy crisis has caused premium thermal coal prices to recently rise above premium hard coking coal prices. In the September 2022 *Resources and Energy Quarterly*, DISR noted this is '*an unprecedented situation*' and as a result '*metallurgical coal has begun to enter thermal coal markets in larger quantities.*'

DISR expect this trend to '*support metallurgical coal prices somewhat by removing excess supply from the market.*'

Within Australia, detailed ABS data on coal industry profitability[19] in 2021-22 is not due for publication until mid-2023. However, annual company reporting clearly shows a surge in profitability in 2021-22 and stronger share prices than the broader market.[20]

In addition to the price trends detailed above, two other key partial indicators provide some insights into the magnitude of the recent surge in profitability in coal production in Australia.

Specifically, the value of Australian overseas coal exports totalled $114.0 billion in 2021-22. This was almost triple (up 190.7%) the $39.2 billion exported in the previous year and 63.7% above the previous peak of $69.6 billion exported in 2018-19.[21]

In comparison, the ABS estimates the prices of input to coal mining in Australia rose 8.2% in 2021-22.[22]

[15] IEA *World Energy Outlook 2022*, p 29.

[16] IEA *World Energy Outlook 2022*, p 19.

[17] IEA *World Energy Outlook 2022*, p 19.

[18] IEA *World Energy Outlook 2022*, p 29.

[19] ABS *Australian Industry* data for 2021-22 is not expected to be released until mid-2023.

[20] BHP *Results for the year ended 30 June 2022*, Coronado Global Resources *2022 Half Year Results*, Glencore *2022 Half-Year Report*, New Hope *Preliminary Final Report for the year ended 31 July 2022*, Stanmore *2022 Half Year Results* and Yancoal *Half Year Financial Result 2022*.

[21] ABS *International Trade in Goods and Services*.

[22] ABS *Producer Price Indexes*.

4.0 Recent developments in Queensland's coal industry

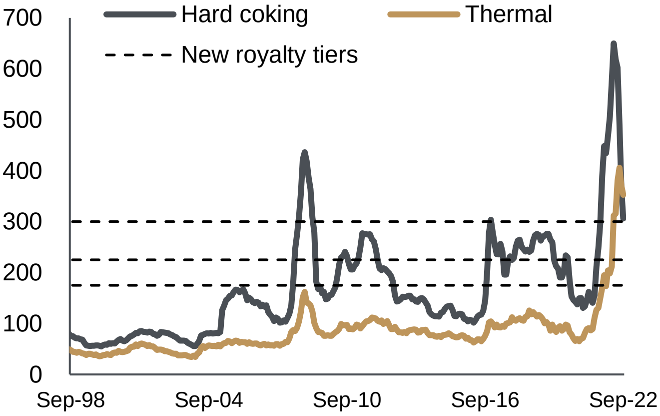
4.1 Impact of recent high prices on industry revenues

Preliminary ABS data show that the value of Queensland coal exports more than doubled in 2021-22, growing by A$47.1 billion to a record A$71.8 billion. This is despite Queensland's major coal[23] export volumes falling by 5.0 Mt over the same period.

The strong growth in export values has been driven by record high prices for all three major coal export types.

The monthly average export price of hard coking coal reached a record high of A$650/t in April 2022, while the monthly average export price of thermal coal reached a record high of A$406/t in July 2022 (**Chart 4.1**).

Chart 4.1 Queensland Coal Export Prices[1,2] (A$/t)



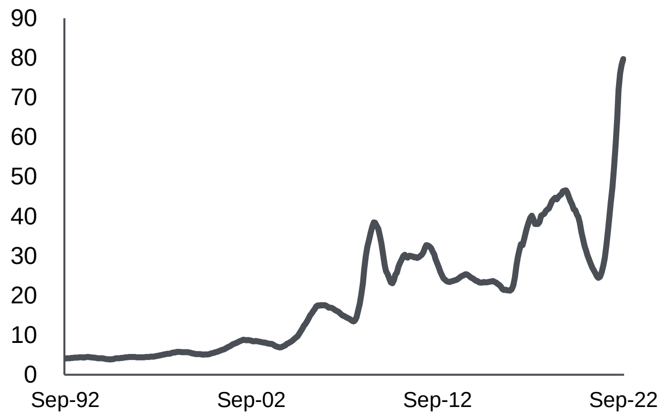
1. Monthly average.
2. Last six months of data are preliminary and should be treated with caution, particularly the most recent two months.
Source: ABS *International Trade in Goods and Services* (unpublished).

Despite some moderation recently, coal prices have remained at previously unexpected, elevated levels in the second half of 2022, resulting in the state's coal producers continuing to receive extra-ordinary revenues compared with historical levels.

In September quarter 2022, ABS data shows that the value of Queensland coal exports was $18.4 billion, up 75.3% from the $10.5 billion in exports in September quarter 2021.

The continued high prices drove the value of Queensland's coal exports to a new record high of A$79.7 billion in the 12 months to September 2022 (**Chart 4.2**).

Chart 4.2 Queensland Coal Exports[1,2] (A$ billion)



1. 12-month rolling sum.
2. Calendar year and financial year totals are ABS actuals. Individual months include Queensland Treasury estimates of semi-soft/PCI exports.
Sources: ABS *International Trade in Goods and Services* (unpublished) and Queensland Treasury.

4.2 Queensland's coal royalty framework

Queensland's coal royalties are designed to ensure all Queenslanders receive a fair and appropriate return on the use of the State's valuable and limited natural resources.

The royalty rate for coal is determined based on the average price per tonne of coal sold, disposed of or used in a royalty return period.

Between 1 October 2012 and 30 June 2022, the highest marginal royalty rate applicable to Queensland coal royalties was 15%, payable on that part of the average price per tonne exceeding A$150.

In the context of the exceptional surge in coal prices experienced across 2021 and 2022, with spot metallurgical coal prices reaching as high as around A$900/t, the previous royalty structure was not providing a fair return to Queenslanders during periods of such high prices.

In response, in the 2022-23 Queensland Budget, the Queensland Government announced the introduction of three new tiers to the coal royalty structure, with effect from 1 July 2022:

- 20% on that part of the average price per tonne that is more than A$175 but not more than A$225;

[23] Major coal exports includes hard coking, semi-soft/PCI and thermal coal.

- 30% on that part of the average price per tonne that is more than A$225 but not more than A$300;
- 40% on that part of the average price per tonne that is more than A$300.

The changes were made after almost a decade without any change to royalty rates or tiers, despite prices rising substantially over that time, from well under A$100/t in the 1990s, with an underlying persistent upward trend in prices over time.

However, based on unit export values over the 10 years to June 2022, monthly average hard coking coal prices have only been higher than A$175/t around half the time, while monthly average thermal coal prices have only been above A$175/t on a small number of occasions (and only during the recent period of exceptionally high prices).

Importantly, the new tiers will only result in any material increases in the royalty payable by coal producers during periods of relatively high prices.

When coal prices are in line with expected medium to longer term expectations, the new tiers are estimated to only make a marginal difference to the royalty payable per tonne and the effective royalty rate.

Further, given the marginal rate structure applicable in Queensland, where rates are only applied to the portion of the price above each threshold, the effective (or average) rate at all price levels is substantially less than the marginal rate applied in each of the new tiers.

For example, for high-quality hard coking coal, at the expected **medium-term** price, consistent with 2022-23 Queensland Budget assumptions, of US$160/t (A$213/t, at an exchange rate of US$0.75), the new tiers are estimated to add less than A$2.00 per tonne to the royalties payable by producers.

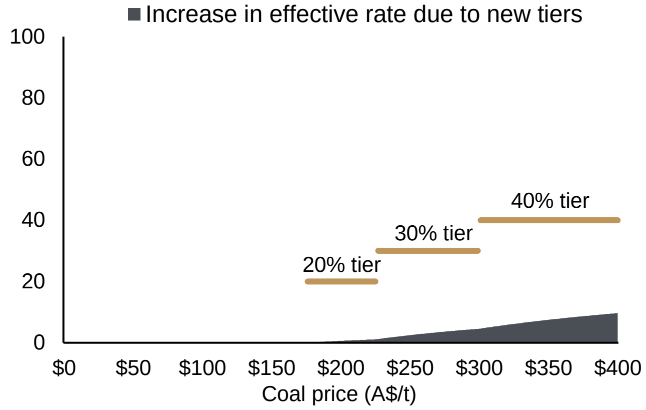
This represents only a marginal increase in the average rate per tonne from 10.7% to 11.6%. The application of existing allowable deductions would further reduce the royalty payable.

For thermal coal, prices in the **medium term** are expected to average below A$175/t, consistent with the assumptions outlined in the 2022-23 Queensland Budget.

At prices below A$175/t, no extra royalty is payable.

Chart 4.3 shows how the marginal structure of Queensland's royalty regime moderates the uplift in effective royalty rate due to the introduction of the new tiers, with a minimal impact on the effective rate, even at exceptionally high prices.

Chart 4.3 Increase in Effective Coal Royalty Rate (%)



Source: Queensland Treasury.

This highlights how the new tiers will only raise material royalty revenue at times when coal prices reach high levels, at which times coal producers will be supported by strong revenues.

As outlined above, in the periods preceding and immediately following the 2022-23 Queensland Budget, when the new tiers were announced, coal producer revenues were exceptionally strong, with the value of coal exports more than doubling over the year to June 2022 and remaining extremely strong in September quarter 2022.

This extra-ordinary revenue generated by coal producers highlights that the additional revenue received by coal companies during periods of high prices far outstrips the increase in royalties payable due to the new tiers.

For example, if the price received by a hypothetical coal producer increased from A$175/t (i.e. the point where the new tiers commence) to A$400/t, this would represent a A$225 increase in revenue per tonne (i.e. before royalties).

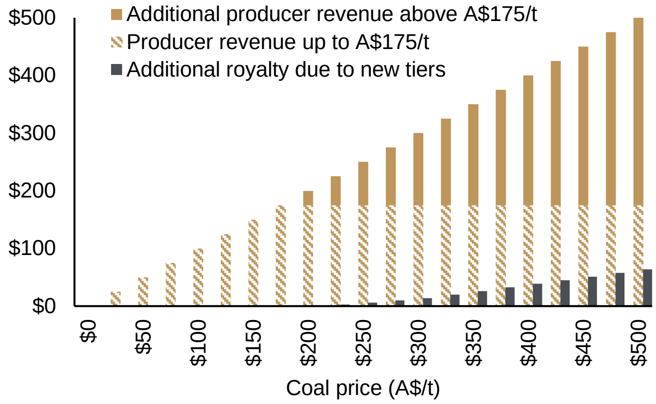
Comparatively, the royalty payable due to the new tiers would only increase by A$38.75/t.

Therefore, even at the very high price of A$400/t, the effective royalty rate[24], including the impact of the new tiers, is only around 22%.

Chart 4.4 outlines the total and additional revenue generated per tonne by coal producers at various prices, up to A$500/t, compared with the additional royalty payable due to the new tiers.

[24] Before the application of deductions, which would reduce the royalty payable

Chart 4.4 Revenue to Coal Producers and Royalty per tonne at different price levels (A$/t)



Source: Queensland Treasury.

Importantly, the increased return to Queenslanders received during future periods of high prices will help enable the provision of essential infrastructure and services to meet the needs of Queenslanders across all regions of the State.

4.3 Coal royalties in other jurisdictions

The progressive nature of Queensland's coal royalty regime means that producers only pay the higher royalty rates when prices are stronger, at which times coal producers are generating substantially higher returns, while lower royalty rates apply during periods of lower prices.

Comparisons of royalty regimes across jurisdictions are complex, given jurisdictions can levy royalties on different bases (e.g. price, volume or profit), and royalty regimes vary substantially in terms of how they are administered (e.g. nature of allowable deductions, scope of producers covered, etc.).

Indonesia, the world's largest exporter of thermal coal by tonnage, recently introduced new higher royalty rates for certain coal producers.

In April 2022, Indonesia introduced a range of changes to its coal royalty regime, including an increased marginal rate of up to 28% for prices over US$100/t.[25]

In comparison, at a price of US$100/t, Queensland's marginal royalty rate is only 12.5%.

Importantly, in Queensland a rate of only 7% applies to the part of the price under A$100/t, which is also substantially lower than the relevant rate applicable in Indonesia at lower prices for coal subject to the new rates (either 14% or 20% depending on the producer).

This means that the marginal and effective royalty rates for coal subject to Indonesia's new rates are substantially higher than in Queensland throughout the range of prices at which thermal coal would generally expect to trade. The effective rate for coal subject to Indonesia's new royalty rates is higher than in Queensland even until coal prices exceed US$300/t.[26]

In New South Wales, coal royalty rates are based on extraction process, with rates of 8.2% for open cut mining, 7.2% for underground mining, and 6.2% for deep underground mining.

By comparison, under Queensland's progressive coal royalty regime, where prices for coal are less than A$100/t, Queensland's royalty rates are lower than New South Wales other than coal mined deep underground.

Importantly, ABS export value data shows that Queensland's average thermal coal prices have been below A$100/t more than 80% of the time over the past 27 years.

Differences in the type, quality and price of coal produced across jurisdictions further complicates relative assessments, while royalties also need to be considered in the context of other broader tax and regulatory settings that apply to producers.

4.4 Queensland's coal investment environment

Queensland continues to offer an attractive environment for investment in coal, reflecting its numerous competitive advantages including its high-quality hard coking coal, proximity to the fast-growing Asian region, efficient supply chain, good infrastructure, and skilled workforce.

Following the release of the 2022-23 Queensland Budget, there have been numerous announcements of substantial investments or acquisitions in the Queensland coal industry, providing a clear indication of coal producers' ongoing confidence and appetite to invest in Queensland.

In July 2022, Whitehaven Coal advised investors the new royalties were '*not a material effect*' on its proposition for the Winchester South development.[27]

In relation to Winchester South and its Vickery development project in NSW, Whitehaven subsequently indicated to market in its 2022 Annual Report that it was '*progressing these development projects to be "shovel ready" so that*

[25] Government of Indonesia, '*Peraturan Pemerintah (PP) Nomor 15 Tahun 2022*' (Government Regulation Number 15 of 2022) (pp.15-20), 11 April 2022, accessed 16 November 2022.

[26] Based on an exchange rate of US$0.75, consistent with 2022-23 Queensland Budget forecasts.

[27] Whitehaven Coal, 'June Quarter 2022 Production Report Call 18 July 2022 – Transcript' (p.20), *Whitehaven Coal*, 18 July 2022, accessed 10 November 2022.

investment decisions can be made when appropriate hurdles are met'.[28]

Also in July 2022, Peabody Energy indicated its North Goonyella mine is still its '*best organic growth opportunity*' and a '*very high priority for [it] in the list of all of [its] projects…'*.[29]

Peabody gave practical demonstration of its confidence in the project by announcing, in November 2022, that it had approved US$140 million to redevelop North Goonyella, and that it expected the mine would *'…generate attractive returns at historical long term metallurgical prices'* with project returns *'estimated at 25%*'.[30]

In August 2022, Stanmore Resources agreed to buy the remaining 20% stake of the South Walker Creek and Poitrel coal mines from Mitsui & Co. for US$380 million. Stanmore noted that having 100% control allowed it to '*maximise value amongst [its] assets in the region*'.[31]

Further, in August 2022, as part of the Australian Government's Environment Protection and Biodiversity Conservation Act (EPBC) referral process, it was publicly announced that BHP Mitsubishi Alliance (BMA) continued to progress regulatory approvals for its Blackwater South Coking Coal Project.[32]

Similarly, in October 2022, further EPBC referral documents were released for public consultation, demonstrating that BMA also continued to progress approvals for its Peak Downs Continuation Project.[33] In both cases, BMA's referral documentation indicated production would continue for around 90 years.

In October 2022, Coronado Global Resources indicated in its quarterly report for September 2022 '*capital plans at the Curragh mine continue in accordance with existing expansion plans…*'. It further noted that '*planned growth activities continued with the completion of the Curragh North underground pre-feasibility study and the Z Pit expansion study'*, with the results of these studies under review and showing *'positive results'*.[34]

It was also reported in October 2022 that Magnetic South had completed acquisition of the Walton metallurgical coal exploration tenement, which was discontinued by the previous proponent in May 2022, with plans to restart exploration and assessment.

Magnetic South stated its '*plans for the development of high-quality steel-making coal have been energised by the Australian and Queensland governments' leadership on the clean energy transition*', with expansion in renewable infrastructure '*driving demand for steel*'.[35]

The new tiered royalty structure is not expected to have a significant impact on investment decisions since royalties are only materially higher when coal prices are very high and exceed medium term price expectations. In such circumstances, high coal prices will be generating substantially more revenue for investors.

However, this is not to say that all investment projects under consideration will necessarily progress. Resource investment decisions depend on a range of complex drivers that are more fundamental than the royalty regime.

At any one time, there is usually a large number of potential mining and resources investment projects under consideration. However, analysis of major project databases, such as those published by Deloitte Access Economics[36] and DISR[37], show that historically only a small proportion of these potential projects eventually progress to construction and become operational.

As noted in Chapter 3.2 above, of the 37 new coal projects identified in the pipeline in the DISR 2021 *Resources and Energy Major Projects* publication, only four were classified as 'committed'.

[28] Whitehaven Coal, 'Annual Report 2022' (p.5), *Whitehaven Coal*, 25 August 2022, accessed 10 November 2022.

[29] Peabody Energy Corporation, 'Q2 2022 Earnings Conference Call – Transcript', *SeekingAlpha*, 28 July 2022, accessed 10 November 2022.

[30] Peabody Energy Corporation, 'Peabody reports results for quarter ended September 30 2022 – Media release', *Peabody Energy Corporation*, 3 November 2022, accessed 10 November 2022.

[31] Stanmore Resources, 'Stanmore to acquire remaining 20% interest in SMC from Mitsui – ASX announcement', *Stanmore Resources*, 12 August 2022, accessed 10 November 2022.

[32] BHP Mitsubishi Alliance, 'Blackwater Mine South Coking Coal Project EPBC referral', *Australian Government*, 8 August 2022, accessed 10 November 2022.

[33] BHP Mitsubishi Alliance, 'Peak Downs Mine Continuation Project EPBC referral', *Australian Government*, 5 October 2022, accessed 10 November 2022.

[34] Coronado Global Resources, 'Quarterly report – September 2022' (p.9), *ASX*, 31 October 2022, accessed 10 November 2022.

[35] McCarthy J, 'Jellinbah founder revives Walton coal project', *InQueensland,* 17 October 2022, accessed 10 November 2022.

[36] DAE *Investment Monitor*. Available by Subscription. https://www2.deloitte.com/au/en/pages/economics/solutions/investment-monitor.html.

[37] Office of the Chief Economist Resources and Energy Major Projects Report https://www.industry.gov.au/sites/default/files/December%202021/document/resources-and-energy-major-projects-report-2021.pdf.

5.0 Global coal industry

5.1 Reserves

It is estimated that economically recoverable global coal reserves totalled 1,077 billion tonnes in 2020 (**Table 5.1**), with total global coal resources – both proven resources which cannot currently be exploited for technical and/or economic reasons, and unproven but geologically possible energy resources – estimated at 19,870 billion tonnes.

Table 5.1 Economically Recoverable Coal Reserves

	Hard coal[38]		Lignite[39]		Total	
	Mt	%	Mt	%	Mt	%
United States	218,497	28.9	29,910	9.3	248,407	23.1
Russia	71,719	9.5	90,447	28.2	162,166	15.1
Australia	75,428	10.0	73,865	23.0	149,293	13.9
China	135,475	17.9	8,250	2.6	143,725	13.3
India	106,015	14.0	5,031	1.6	111,046	10.3
Indonesia	24,059	3.2	14,746	4.6	38,805	3.6
Germany	-	0.0	35,700	11.1	35,700	3.3
Ukraine	32,039	4.2	2,336	0.7	34,375	3.2
Poland	22,464	3.0	5,752	1.8	28,216	2.6
Kazakhstan	25,605	3.4	-	0.0	25,605	2.4
World	756,200	100	320,462	100	1,076,662	100

Source: Federal Institute for Geosciences and Natural Resources (Germany) *BGR Energy Study 2021*.

As outlined in the table above, both global and Australia's potential coal reserves comprise a mixture of higher energy content hard coal, often referred to as black coal, and lower energy content lignite, often referred to as brown coal. Importantly, according to Geoscience Australia, 64% of Australia's economic demonstrated resources[40] of black coal is located in Queensland coal basins.[41] In contrast, nearly all of Australia's brown coal resources are in Victoria.[42]

5.2 Production

Global coal production was an estimated 7.889 billion tonnes in 2021, up 4.4% from the COVID-19 affected 2020 level but 1.1% below peak production in 2013 (**Table 5.2**).[43]

According to the IEA, '*investment in coal supply is set to rise in the immediate future in response to energy security concerns triggered by Russia's invasion of Ukraine, recent rebound in economic activity, and rising industrial output in emerging market and developing economies.*'[44]

Based on IEA estimates, Russia was the third largest coal exporter in 2021, behind Indonesia and Australia, exporting 226 Mt of coal (17% of total global trade).[45]

Table 5.2 Top 10 Coal Producing Countries (Mt)

	2013[46]	2021	Difference
China	3,749	3,925	176
India	610	793	183
Indonesia	490	576	86
United States	904	528	-376
Australia	458	470	12
Russia	326	429	103
Rest of the world	1,438	1,168	-270
World	**7,975**	**7,889**	**-86**

Sources: IEA *Coal 2021* and IEA *Coal Information 2016*.

5.3 Consumption

Global coal consumption peaked at 7,986 Mt in 2013, before falling by 5.9% over the next three years to 7,514 Mt in 2016. The decline was driven by a fall in thermal coal[47] consumption (down 409 Mt) and was primarily concentrated in China (down 353 Mt) and the United States (down 182 Mt)[48], reflecting China's coal industry reforms and policies to enhance air quality, as well as an ongoing decline in coal consumption in the US due to its rising natural gas production.

Between 2016 and 2019, global coal consumption recovered to 7,801 Mt, driven by a rebound in consumption in China (up 281 Mt) and strong growth from India (up 133 Mt). This growth was partially offset by a continued decline in consumption in the United States (down 129 Mt), reflecting continued diversification of power sources.

Coal consumption was severely impacted by the COVID-19 pandemic and resultant global economic contraction in 2020, falling 3.7% in the year. However, global coal consumption rebounded strongly in 2021, more than offsetting the decline in 2020, rising very close to its all-time

[38] Often referred to as 'black coal'. Defined by the Federal Institute for Geosciences and Natural Resources as coal with an energy content of greater than or equal to 16,500kJ/kg (ash free).

[39] Often referred to as 'brown coal'. Defined by the Federal Institute for Geosciences and Natural Resources as coal with an energy content of less than 16,500kJ/kg (ash free).

[40] According to Geoscience Australia economic demonstrated resources combines proved reserves, probable reserves, and economic measured resources and indicated resources, as defined by the *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves*.

[41] Includes the Bowen, Callide, Galilee, Ipswich, Laura, Maryborough, Mulgildie, Styx, Surat, and Tarong basins. Geoscience Australia, *Australia's Energy Commodity Resources: 2021 Edition*.

[42] Geoscience Australia, *Australia's Energy Commodity Resources: 2021 Edition*.

[43] IEA *Coal 2021* and IEA *Coal Information 2016*.

[44] IEA *World Energy Outlook 2022*, p 423.

[45] IEA *Coal 2021*.

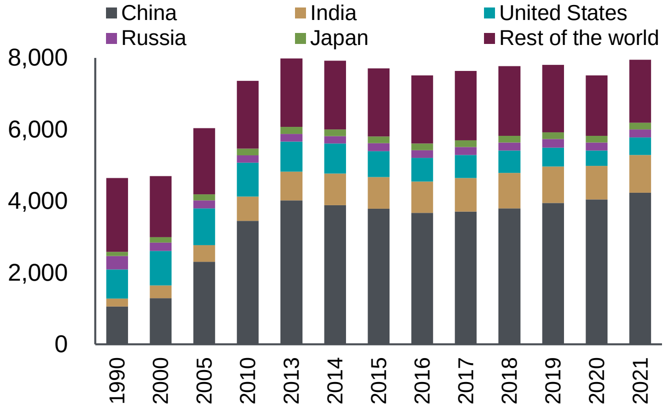
[46] Based on data from IEA Coal Information 2016 and may not capture any subsequent revisions from the IEA.

[47] Includes lignite.

[48] Data for China and the United States is total coal consumption.

high (**Chart 5.1**). According to the IEA '*coal-fired power generation reached a historic high in 2021, with China, India and Southeast Asia all setting new records.*'[49]

Chart 5.1 Global Coal Consumption[50] (Mt)



Sources: IEA *Coal Market Update July 2022*, IEA *Coal 2021*, IEA *Coal 2020*, IEA *Coal Statistics 2019*, IEA *Coal Statistics 2018, IEA Coal Statistics 2017* and IEA *Coal Statistics 2016*.

In 2022, Russia's invasion of Ukraine and resulting high gas prices '*have led to gas-to-coal switching in a number of markets*'[51] and caused '*a number of European countries to delay the retirement of coal-fired power plants, reconnect previously retired units to the grid, and to temporarily expand coal use to reduce natural gas consumption.*'[52]

For example, Germany passed the *Substitute Power Plant Maintenance Act* in July which imposes limits on natural gas use and locks in current coal capacity until March 2024. The Netherlands have permitted 4.5GW of coal-fired power plants to operate at full capacity until the end of 2023 (previously, operational capacity was limited to 35%) while the United Kingdom has asked several plants to extend their life beyond their planned closure in September 2022.[53]

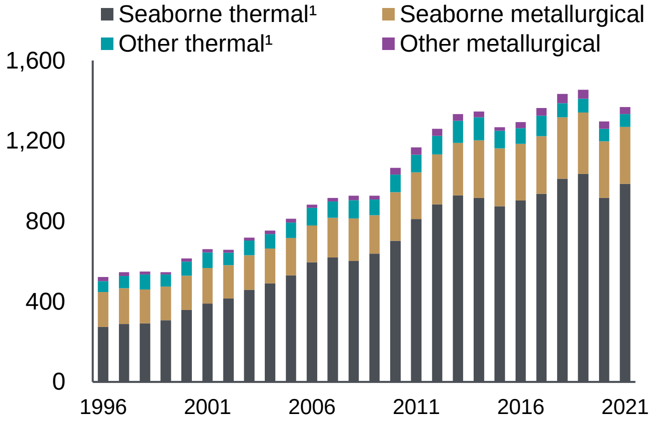
5.4 Global trade

In general, most major coal consuming countries have also historically been major coal producers. However, notable exceptions include Japan, Korea and Taiwan, countries that possess virtually no domestic coal resources.

As a result, Queensland (and Australia) has historically played an important role in providing a reliable supply of coal to these economies, which has been pivotal to their economic development.

Provisional data show world exports of coal in 2021 rose by 5.4%, to 1,368 Mt, rebounding from a 10.8% decline in the previous year (**Chart 5.2**).[54]

Chart 5.2 Global Coal Exports[55,56] (Mt)



1. Includes lignite.
Sources: IEA *Coal Statistics 2019, IEA Coal 2020* and IEA *Coal 2021*.

The seaborne market comprises the majority of global coal trade, with Indonesia being the world's largest seaborne coal exporter in 2021, followed by Australia and Russia.

Since 1996, seaborne trade has increased at an average annual rate of 4.3%, whereas trade using other modes of transportation has increased at only 1.1% per annum.

Due to geographical limitations in transportation costs, the seaborne coal market is broadly divided into two markets: the Atlantic and the Pacific (comprised of mainly Australia, China, India, Indonesia, Korea, and Japan).[57]

The rise of China and India as major coal importers led to a significant increase in global coal trade in the four years to 2013. This was particularly the case for metallurgical coal, where global trade increased at an average annual rate of 8.8% over the period, compared with an average of 0.6% per annum between 1996 and 2009.

Although global coal trade fell 5.8% in 2015, from its previous peak in 2014, it increased steadily over the four years to 2019 (prior to the pandemic), largely reflecting movements in China's and India's coal imports.

Global trade fell sharply in 2020 due to the COVID-19 pandemic, with imports falling 6.8%. The decline was driven by smaller imports from Europe (down 22%) and India (down 11%).

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[49] IEA *World Energy Outlook 2022*, p 411.

[50] Based on data from latest publicly available IEA data and may not capture any subsequent revisions from the IEA.

[51] IEA *World Energy Outlook 2022*, p 411.

[52] IEA *World Energy Outlook 2022*, p 415.

[53] Australian Department of Industry, Science and Resources, *Resources and Energy Quarter September 2022*, p 63.

[54] IEA *Coal 2021*.

[55] Because of timing differences, exports and imports data do not align perfectly.

[56] Based on data from latest publicly available IEA data and may not capture any subsequent revisions from the IEA.

[57] German Coal Importers Association.

Trade subsequently rebounded in 2021, as the global economy recovered, but total imports remained 4.7% below their 2019 levels.[58]

In the context of the overall level of global trade, Australia is a significant exporter of both metallurgical and thermal coal.

In 2021-22, Australia exported a total of 161.1 Mt of metallurgical coal, and 196.8 Mt of thermal coal.

Significantly, almost 90% of Australia's metallurgical coal exports originated from Queensland.

In contrast, of the 196.8 Mt of thermal coal exported from Australia in 2021-22, only 52.9 Mt (27%) was from Queensland.

The most noticeable development in relation to global coal trade in the past decade has been the rise of China as a major coal importer.

However, China's coal procurement has been uneven, with the country's total imports of coal and lignite rising to a peak of 327.2 Mt in 2013, falling sharply to 204.1 Mt in 2015, and then rebounding to 317 Mt in 2019.

In October 2020, China implemented an 'unofficial' ban on numerous exports from Australia, including coal. This saw coal exports from Australia to China fall to zero. However, a large portion of this decline in exports was largely offset by increased exports from Australia to other markets such as India, Japan and Korea.

Queensland's exporters were very successful in finding alternative destinations for Queensland's coal, with over 90% of tonnages lost to China offset by increased exports to other countries including India, Japan, and Korea by November 2021 (**Table 5.3**).

Table 5.3 Queensland coal exports[1] by country (Mt)

	Year-ending Oct-20	Year-ending Nov-21	Difference
China	55.5	0.4	-55.1
India	41.2	58.1	17.0
Japan	36.9	47.8	10.9
Korea	24.5	32.7	8.2
Vietnam	15.0	13.0	-2.1
Taiwan	9.8	11.9	2.2
Netherlands	4.9	6.9	2.0
Indonesia	3.0	6.0	3.0
Brazil	3.3	5.6	2.3
Other	12.7	19.5	6.8
Total	**206.9**	**202.1**	**-4.8**

1. Includes Queensland Treasury estimates of semi-soft/PCI exports by country prior to September 2021.
Source: ABS *International Trade in Goods and Services* (unpublished) and Queensland Treasury.

Another major development in global coal trade over the last decade is the sharp increase of thermal coal imports to India, up from 40 Mt in 2008 to 184 Mt in 2019. [59,60]

India's metallurgical coal imports have also grown substantially, rising from 25 Mt in 2008 to 60 Mt by 2018. More recently, India's metallurgical coal imports have plateaued, importing 58 Mt in 2019, 60 Mt in 2020 and 61 Mt in 2021.[61]

[58] IEA *Coal 2021*.

[59] 2019 Includes lignite.

[60] IEA *Coal 2021* and IEA *Coal Statistics 2019*. 2021 data are IEA estimates.

[61] IEA *Coal 2020*, IEA *Coal 2021* and IEA *Coal Statistics 2019*. 2021 data are IEA estimates.

6.0 IEA's long-term global coal demand outlook

6.1 Introduction

In September 2020, Queensland Treasury published the report *A Study of Long-Term Global Coal Demand* which drew on the findings from the IEA's 2019 WEO.

The IEA has recently released its 2022 WEO, with key findings from the latest report discussed in detail in this chapter.

In the context of recent developments in global coal and broader energy sectors, the 2022 WEO has highlighted that '*the world is in the midst of its first global energy crisis*'[62] which has '*stoked inflationary pressures and created a looming risk of recession, as well as a huge US$2 trillion windfall for fossil fuel producers above their 2021 net income*'.[63]

Importantly, the WEO also includes detailed discussion around the long-term outlook and implications for the global coal and other major energy-related industries in the context of the pathway for the global energy sector to reach zero net emissions by 2050.

6.2 Key changes compared with 2019 WEO projections

The three scenarios outlined in the 2022 WEO are slightly different to those outlined in the 2019 report.

In the 2019 WEO, the IEA considered a Stated Policies Scenario (STEPS, which incorporated policies and measures that governments have already put in place and anticipated effects of announced policies), a Current Policies Scenario (which served as a baseline '*business-as-usual*'[64] scenario) and a Sustainable Development Scenario (which was consistent with reaching global net zero CO_2 emissions in 2070).[65] As outlined in section 6.3, the three scenarios in the 2022 WEO are aligned with the 2019 scenarios but have a slightly different definition and scope.

However, for consistency, the 2019 WEO STEPS projections can be broadly compared with the 2022 WEO STEPS projections to provide a meaningful understanding of key changes in the IEA's outlook since 2019.

Further, the updated WEO analysis provides projections over a longer time horizon, out to 2050, compared with the 2019 WEO, which provided projections out to 2040. However, both reports also include interim projections as of 2030, which allows for a more direct comparison over that medium term horizon.

While drawing meaningful comparisons between the two reports at the end of the projection period is difficult given the different time periods involved, there are some material changes in the projections as of 2030.

In particular, it is noted that, compared to the IEA's 2019 WEO, projected overall global coal demand in 2030 is now expected to be 6.3% lower under the STEPS, downwardly revised from 5,498 Mtce[66,67] to 5,149 Mtce.

In contrast, the 2019 WEO, indicated that global coal demand would only decline to 5,398 Mtce by 2040[68], implying that the IEA now expect total global coal demand in 2030 to be less than it previously projected in 2040.

However, significantly, compared with the 2019 STEPS projections, thermal coal[69] demand in 2030 has been downwardly revised by 8.4% in the 2022 WEO[70], while metallurgical coal[71] demand is 9.2% higher than previously projected[72].

Given the WEO is an annual report, analysis of the 2022 WEO also highlights some key revisions to the IEA's projections outlined in the previous year's 2021 WEO, as discussed further below.

6.3 IEA's long-term scenarios

The 2022 edition of the IEA's WEO outlines projections of long-term global coal demand out to 2050 under three scenarios:

1. The **Stated Policies Scenario (STEPS)**, *'looks not at what governments say they will achieve, but at what they are actually doing to reach the targets and objectives that they have set out.'* According to the IEA '*it is based on a detailed sector‐by‐sector review of the policies and measures that are actually in place or under development in a variety of areas.*'[73]

[62] IEA *World Energy Outlook 2022*, p 19.

[63] IEA *World Energy Outlook 2022*, p 19.

[64] IEA *World Energy Outlook 2022*, p 30.

[65] IEA *World Energy Outlook 2022*, p 30.

[66] 1 tonne of coal equivalent is defined as 7 million kilocalories (kcal). One tonne of coal equivalent equals to 0.7 tonnes of oil equivalent.

[67] IEA *World Energy Outlook 2019*, p 674.

[68] IEA *World Energy Outlook 2019*, p 674.

[69] The IEA WEO refers to thermal coal as steam coal.

[70] IEA *World Energy Outlook 2019*, p 673 and IEA *World Energy Outlook 2022*, p 412.

[71] The IEA WEO refers to metallurgical coal as coking coal.

[72] IEA *World Energy Outlook 2019*, p 673 and IEA *World Energy Outlook 2022*, p 412.

[73] IEA *World Energy Outlook 2022*, p 107.

2. The **Announced Pledges Scenario (APS),** which '*assumes that governments will meet, in full and on time, all of the climate-related commitments that they have announced, including longer term net zero emissions targets and pledges in NDCs*[74]*, as well as commitments in related areas such as energy access.*'[75]
3. The **Net Zero Emissions by 2050 Scenario (NZE)** is a normative scenario, which works backwards from a defined outcome of global net zero CO_2 emissions by 2050 and the stabilisation of global average temperatures at 1.5°C above pre-industrial levels. The NZE '*also meets the key energy-related UN Sustainable Development Goals, achieving universal access to energy by 2030 and securing major improvements in air quality.*'[76]

According to the IEA, under STEPS, global temperatures rise by around 2.5°C in 2100 (with 50% probability), while APS would result in a global temperature rise of 1.7 °C in 2100 (with a 50% probability).[77]

The IEA refer to the gap in outcomes between STEPS and APS as the 'implementation gap', i.e. the gap that needs to be filled to realise commitments in full, while the gap between APS and NZE is referred to as the 'ambition gap', as the current announced pledges are not ambitious enough to reach net zero CO_2 emissions by 2050.[78]

It should be noted that the WEO scenarios are not IEA forecasts, and the IEA does not have a single view on the future of the energy system. The scenarios are intended to '*provide a framework for thinking about the future of energy and exploring the implications of various policy choices, investment trends and technology dynamics.*'[79]

As would be expected, under the three scenarios, the IEA projects vastly different outlooks for global coal demand. However, in all scenarios global demand for coal declines significantly, with a faster phase-down in advanced economies.

The IEA noted '*the outlook for coal is heavily dependent on the strength of the world's resolve to address climate change*'.[80]

6.4 Types of use and prices

The WEO also projects long-term coal demand on the basis of three main types of coal usage:

- *'Power Generation'* - includes electricity plants, heat plants and combined heat and power (CHP) plants.
- *'Industrial Use'* - includes manufacturing and construction industries. Key industry branches include iron and steel, chemical and petrochemical, cement, and pulp and paper.
- *'Other Sectors'* - covers the use of energy by transformation industries and the energy losses in converting primary energy into a form that can be used in the final consuming sectors. It includes losses in low-emissions hydrogen and hydrogen-based fuels production, bioenergy processing, gas works, petroleum refineries, coal and gas transformation and liquefaction. It also includes energy used in coal mines, in oil and gas extraction and in electricity and heat production.

In terms of coal prices, IEA assume coal markets balance at lower prices, but these prices vary considerably depending on overall levels of demand.

Relatively robust coal consumption trends in the STEPS offer some support to price levels, particularly given constrained access to finance for new coal supply projects and infrastructure outside China and India.

However, prices decline towards the operating costs of existing mines in the APS, and they do the same in the NZE scenario, but decline faster.

6.5 IEA's key findings

Global coal demand

World coal demand was 5,644 Mtce in 2021, with 3,642 Mtce used to generate power and 1,629 Mtce used in industry.[81] By region, China accounted for 56% of coal use, India 11% and the US 6%. China was also the largest coal producer in 2021 at 3,004 Mtce, followed by India (447 Mtce), Indonesia (438 Mtce), US (433 Mtce) and Australia (421 Mtce).[82]

The IEA expects the current energy crisis sparked by Russia's invasion of Ukraine to temporarily increase utilisation rates for existing coal-fired assets due to some substituting away from high priced gas.[83] As a result, coal demand (based on the primary energy demand sourced from coal) under the STEPS is higher in 2030 than in the

[74] Nationally Determined Contributions in the Paris Agreement.
[75] IEA *World Energy Outlook 2022*, p 106.
[76] IEA *World Energy Outlook 2022*, p 106.
[77] IEA *World Energy Outlook 2022*, p 107.
[78] IEA *World Energy Outlook 2022*, p 107.
[79] IEA *World Energy Outlook 2022*, p 84.
[80] IEA *World Energy Outlook 2022*, p 409.
[81] IEA *World Energy Outlook 2022*, p 412.
[82] IEA *World Energy Outlook 2022*, p 414.
[83] IEA *World Energy Outlook 2022*, p 53.

same scenario in the 2021 WEO (in which 2030 estimates were revised down compared with the 2019 WEO), with peak coal-fired capacity now expected to occur in 2025.[84]

According to the IEA, while the crisis increases utilisation of existing coal-fired assets, it does not result in higher investment in new ones,[85] and the lasting gains from the crisis accrue to low-emissions sources, mainly renewables.

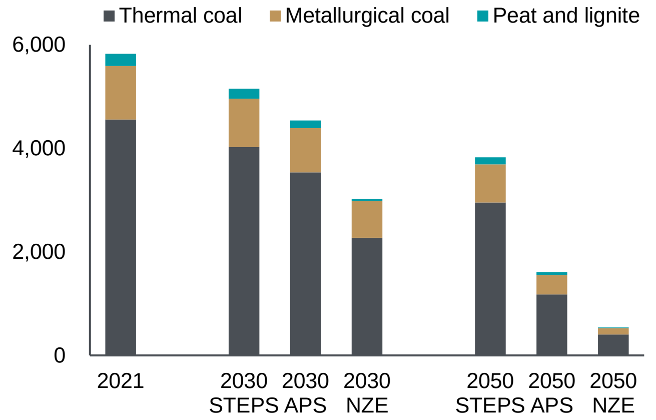
Longer term, the outlook for coal demand largely depends on '*the stringency with which countries pursue climate and environmental targets*'[86], with China still the most influential market in this regard.

Coal consumption is projected to fall in all IEA scenarios,[87] but more quickly in advanced economies (which account for around 18% of global demand) than elsewhere.[88] Similarly, investment in coal falls in all IEA scenarios in the current decade and thereafter.

Results range from a 10% decline in coal demand by 2030 under STEPS, to a 20% decline under APS and a 45% decline in the NZE scenario. Between 2030 and 2050, coal demand falls an additional 25% under STEPS, 64% under APS and 82% under the NZE scenario.[89]

Importantly for Australia and Queensland, the decline in metallurgical coal production in these scenarios is less severe than thermal coal[90] due to fewer readily available alternatives for the steel industry[91] (**Chart 6.1**).

Chart 6.1 Global Coal Production Projections (Mtce)



Source: IEA *World Energy Outlook 2022*.

STEPS scenario – overall demand

Under the **STEPS**, global coal demand remains near its historic peak for the first half of the 2020s[92] but returns to structural decline in the second half of this decade, to be around 10% lower by 2030.[93] A decline in demand by almost half in advanced economies is marginally offset by a slight increase in emerging market and developing economies.[94]

Following the decline in global coal use from 5,644 Mtce in 2021 to 5,149 Mtce by 2030, demand falls a further 25% to 3,828 Mtce by 2050, a cumulative decline of 32.2% from 2021 levels.[95]

Thermal coal production falls by 11.7% by 2030, with increases in Indian steel production resulting in a smaller 9.1% decline in metallurgical coal.[96] The IEA projects that demand for thermal and metallurgical coal will decline by 35% and 29% respectively by 2050.[97]

By use, there is a 42.7% decrease in power use by 2050, a 6.7% decrease in industrial use and a 40.5% decrease in use by other sectors. Around 65% of the coal used globally in 2021 was for power generation, falling to 62% by 2030 and 54% in 2050.[98]

Under the **STEPS**, bans by some countries on financing new coal-fired power plants and supply projects abroad, together with policies to phase out coal, result in a 30% decline in average annual investment to 2030 with continued declines thereafter.[99]

APS scenario – overall demand

Under the **APS**, global coal demand falls at a faster pace due to more stringent commitments on limiting use of fossil fuels. In particular, demand in advanced economies declines by 65% to 2030 as coal use in the power and industry sectors falls rapidly.[100]

Global demand for coal declines by 175 Mtce each year from 2025 to 2030[101] and is projected to be around 20% below current levels by 2030 (4,540 Mtce) and down 71.4% (to only 1,613 Mtce) by 2050.[102]

Thermal coal production falls more substantially, down 22% to 2030 and 74% by 2050, compared with the 17% and 63% respective declines in metallurgical coal production.[103]

[84] IEA *World Energy Outlook 2022*, p 53.
[85] IEA *World Energy Outlook 2022*, p 53.
[86] IEA *World Energy Outlook 2022*, p 412.
[87] IEA *World Energy Outlook 2022*, p 411.
[88] IEA *World Energy Outlook 2022*, p 412.
[89] IEA *World Energy Outlook 2022*, p 412.
[90] IEA *World Energy Outlook 2022*, p 412.
[91] IEA *World Energy Outlook 2022*, p 420.
[92] IEA *World Energy Outlook 2022*, p 53.
[93] IEA *World Energy Outlook 2022*, p 53.
[94] IEA *World Energy Outlook 2022*, p 412.
[95] IEA *World Energy Outlook 2022*, p 414.
[96] IEA *World Energy Outlook 2022*, p 412.
[97] IEA *World Energy Outlook 2022*, p 412.
[98] IEA *World Energy Outlook 2022*, p 412.
[99] IEA *World Energy Outlook 2022*, p 423.
[100] IEA *World Energy Outlook 2022*, p 413.
[101] IEA *World Energy Outlook 2022*, p 238.
[102] IEA *World Energy Outlook 2022*, p 414.
[103] IEA *World Energy Outlook 2022*, p 412.

This outcome reflects a greater reduction in coal for power generation (down 74.2% by 2050 and 65% after 2030), while industrial use is projected to fall 60.7% (55% from 2030).[104] The IEA notes that by 2030, coal plants are mainly used to provide flexibility, with their average utilisation dropping from 50% to 30%.[105]

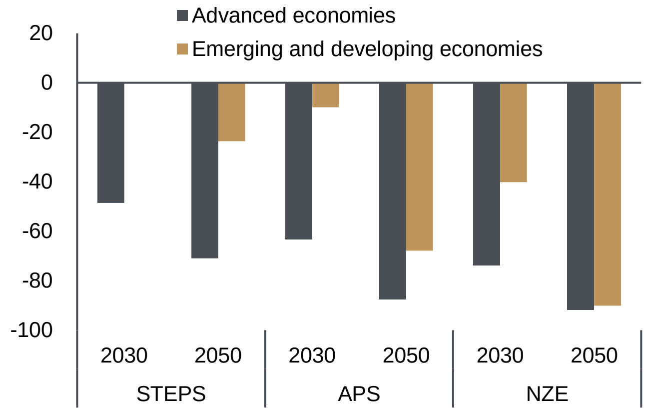
Where countries meet their climate targets, unabated coal generation[106] falls by around 80% in advanced economies by 2030 and is phased out completely by 2050.[107]

NZE scenario – overall demand

Under the **NZE Scenario**, coal demand is 45% lower by 2030, with a 75% decline in advanced economies and a 40% reduction elsewhere.[108] This scenario also results in some coal-fired power plants being retrofitted with carbon capture technologies or firing coal with low emissions fuels to avoid early shutdowns.[109]

Coal use declines from 5,644 Mtce in 2021 to 3,024 Mtce in 2030[110] (when all subcritical coal plants are phased out)[111]. Total demand falls to less than 600 Mtce in 2050 (or by 8% per year between 2030 and 2050 to be some 90% lower than current levels across both advanced and emerging and developing economies, **Chart 6.2**).[112]

Chart 6.2 Global coal demand relative to 2021 (%)



Source: IEA *World Energy Outlook 2022*.

By 2030, thermal coal production is 50% below 2021 levels, while metallurgical coal is 30% lower. By 2050, these declines extend to 91% for thermal coal and 88% for metallurgical coal.[113]

The IEA note this decline in demand can be met without approving new coal mines or extending mine lifetimes.[114] Further, more stringent policies mean unabated coal use is 99% lower by 2050, with almost 90% of coal power generation equipped with carbon capture technologies.[115]

Regional demand

The IEA expect there will be significant regional disparity in terms of long-term coal demand, with a faster decline in advanced economies and more variation in scenario outcomes for emerging market and developing economies.

Advanced economies account for just under 20% of global coal demand in 2021, mostly used in the power sector.[116] Under STEPS, coal demand is 49% lower by 2030 and 71% lower by 2050.[117] The decline to 2030 reflects a 60% fall in coal-fired power generation, with the share of solar PV and wind rising, while industrial coal use remains broadly unchanged.[118]

Coal demand in **emerging market and developing economies** rises slightly by 2030 under STEPS, reflecting both increased demand in the power sector and use by industry where coal already accounts for 35% of energy used.[119] However, the IEA expect structural decline to set in thereafter, as coal demand declines 24% by 2050.[120]

IEA expect overall coal consumption to show a sustained rise in a few fast-growing regions, notably India and Southeast Asia. Notably, coal's share of Southeast Asia's electricity sector falls only marginally by 2030, to 38% from 42% in 2021[121], as more coal is required to meet a rapid rise in energy demand.

Significantly, the IEA projects that the **Asia Pacific** region will remain the major consumer of coal under each scenario, dominated by China and India, with its share of demand rising from 79% in 2021 to 85% by 2050 under STEPS (**Chart 6.3**).[122]

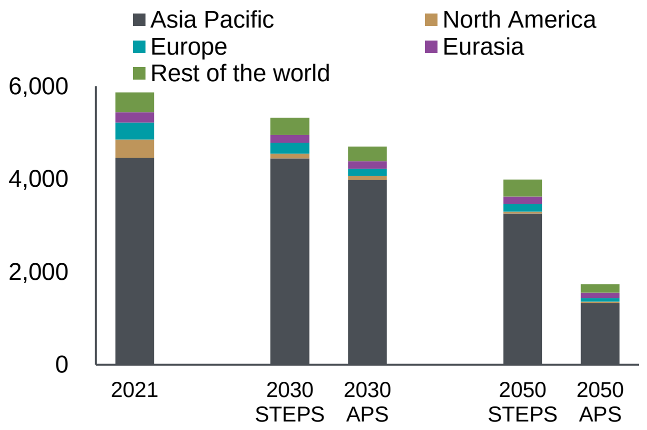
China accounts for more than half of both the world's production and consumption of coal.[123] Coal remains China's largest energy source, with 60% of coal consumed in the power sector and 30% in industry. New targets

[104] IEA *World Energy Outlook 2022*, p 412.
[105] IEA *World Energy Outlook 2022*, p 415.
[106] Coal fired power generation without the use of carbon capture and storage technology.
[107] IEA *World Energy Outlook 2022*, p 296.
[108] IEA *World Energy Outlook 2022*, p 413.
[109] IEA *World Energy Outlook 2022*, pp 413-414.
[110] IEA *World Energy Outlook 2022*, p 412.
[111] IEA *World Energy Outlook 2022*, p 238.
[112] IEA *World Energy Outlook 2022*, p 412.
[113] IEA *World Energy Outlook 2022*, p 412.
[114] IEA *World Energy Outlook 2022*, p 423.
[115] IEA *World Energy Outlook 2022*, p 414.
[116] IEA *World Energy Outlook 2022*, p 415.
[117] IEA *World Energy Outlook 2022*, p 412.
[118] IEA *World Energy Outlook 2022*, p 415.
[119] IEA *World Energy Outlook 2022*, p 53.
[120] IEA *World Energy Outlook 2022*, p 412.
[121] IEA *World Energy Outlook 2022*, pp 455 & 458.
[122] IEA *World Energy Outlook 2022*, p 414.
[123] IEA *World Energy Outlook 2022*, p 414.

incentivise substantial investment in clean energy, with coal use peaking during the 2020s.[124]

Under the **STEPS**, IEA expect China to have a small increase in coal demand to the late 2020s, with use in power generation and in the iron and steel sub-sectors peaking in the late 2020s as electricity generation from renewables increases and as more electric arc furnaces are deployed.[125] However, China's coal demand is lower than today by 2030 and falls 40% by 2050.[126]

Chart 6.3 Regional Coal Demand (Mtce)



Source: IEA *World Energy Outlook 2022*.

Under the **APS**, the peak occurs earlier in China (early 2020s), reflecting increased use of renewables, improvements in energy efficiency, and the installation of gas and electricity-based equipment in industry.[127]

The subsequent decline in coal demand is also considerably steeper in this scenario, falling by more than 1,000 Mtce in the 2030s.[128] Production in China falls by 70% from 2030 to 2050,[129] accounting for two-thirds of the global supply reduction.

India, the world's second largest coal consumer (10% of total), uses 25% more coal by 2030 under **STEPS** as economic growth requires more coal-fired power generation, as well as iron and steel and cement production.[130] Coal demand peaks somewhat later than in China (in the early 2030s) and then declines gradually as the deployment of renewables in the power sector speeds up. However, Indian coal demand in 2050 remains 10% higher than 2021 levels.[131]

As with China, India's peak in coal demand occurs earlier under the **APS**. After peaking in the late 2020s, demand in India falls by 65% between 2030 and 2050[132], along with an 80% decline in production.[133]

In contrast to many other regions, coal demand in **Southeast Asia** increases by nearly 30% to 2030 and 60% by 2050 in the STEPS to fuel the power, and iron and steel sectors.[134]

Coal demand in the **European Union** falls by nearly 50% to 2030 and 76% to 2050 in the STEPS.[135] The decline is spurred by faster deployment of renewables and efficiency improvements which is boosted by the need to diversify away from Russian gas.

Australian coal production

The IEA's WEO includes commentary on the Australian coal industry. The IEA report indicates that Australia and India are the only major coal suppliers to largely maintain production at 2021 levels out to 2050 under **STEPS**.

Under the **STEPS**, Australian coal production plateaus between 2021 and 2030, with a slight fall in domestic demand being partially offset by an increase in exports.[136] Production also remains at a similar level in 2050.[137] The IEA state '*Australian exports, which are mainly coking coal, increase by 10% to 2050*'.[138]

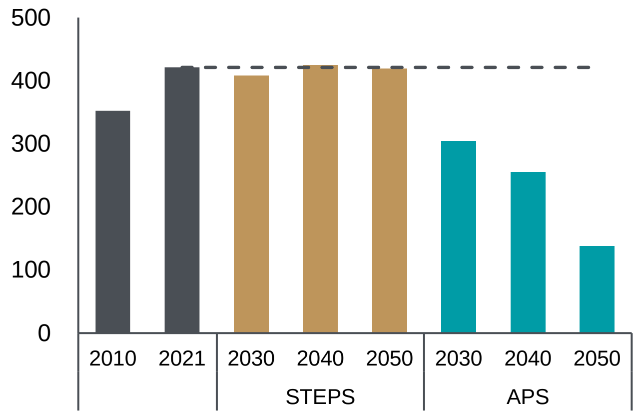
In **APS**, overall coal production falls by about 25% between 2021 and 2030. Metallurgical coal production remains steady over this period, with annual exports of around 190 Mtce through to 2030. However, thermal coal production falls by about 40% over the same period as demand declines quickly in key importing countries such as Japan and Korea.[139]

Under **APS**, Australian coal production declines by another 55% between 2030 and 2050,[140] so that production is about one-third of 2021 levels by mid-century.[141]

The IEA do not provide country specific projections for the **NZE**, but the IEA did state '*there is no need for any new coal mines or mine lifetime extensions*.'[142]

[124] IEA *World Energy Outlook 2022*, p 416.
[125] IEA *World Energy Outlook 2022*, p 416.
[126] IEA *World Energy Outlook 2022*, p 414.
[127] IEA *World Energy Outlook 2022*, pp 416 & 419.
[128] IEA *World Energy Outlook 2022*, p 414.
[129] IEA *World Energy Outlook 2022*, p 418.
[130] IEA *World Energy Outlook 2022*, p 416.
[131] IEA *World Energy Outlook 2022*, p 417.
[132] IEA *World Energy Outlook 2022*, p 417.
[133] IEA *World Energy Outlook 2022*, p 421.
[134] IEA *World Energy Outlook 2022*, pp 416-417.
[135] IEA *World Energy Outlook 2022*, p 414.
[136] IEA *World Energy Outlook 2022*, p 419.
[137] IEA *World Energy Outlook 2022*, p 418.
[138] IEA *World Energy Outlook 2022*, p 422.
[139] IEA *World Energy Outlook 2022*, pp 419-420.
[140] IEA *World Energy Outlook 2022*, p 421.
[141] IEA *World Energy Outlook 2022*, p 418.
[142] IEA *World Energy Outlook 2022*, p 420.

Chart 6.4 Australian Coal Production Projections (Mtce)



Source: IEA *World Energy Outlook 2022*.

Trade impacts

Global coal trade, and demand for Australia's exports, are driven by demand in the Asia Pacific region, which accounted for more than three-quarters of global coal imports in 2021.

Under the **STEPS**, the IEA project global trade to decline by 12% to 2030 and 16% to 2050.[143] By 2030, the Pacific Basin accounts for more than 80% of global coal trade (up from about 75% in 2021).[144]

India becomes the world's largest coal importer in the mid-2020s. India's coal imports rise by 35% to 2030 and by 40% by 2050, with most of the rise in metallurgical coal. While China remains the largest producer and consumer, its import requirements decrease by 35% to 2030.[145]

Australia and Indonesia are the two main coal exporters and accounted for 60% of coal exports in 2021. However, Australia's exports are mainly metallurgical coal, providing more than half of all metallurgical coal exports in 2021, while Indonesia's exports are mostly thermal coal.

The IEA note that projected changes in coal demand alter the dynamics of these exporting economies. As a result of the stronger demand for metallurgical coal trade relative to thermal coal, Australian exports increase by 10% to 2050, while Indonesia sees exports fall by 30%.[146]

Under the **APS**, coal trade falls by 25% to 2030 and 60% to 2050. Australian exports fall by less than 20% to 2030 but by another 50% between 2030 and 2050 as the use of clean energy technologies increases.[147]

In the **NZE Scenario**, global coal trade declines by 90% between 2021 and 2050 as clean energy technologies displace coal across the energy system.[148]

Risks and limitations to the long-term outlook

The IEA highlight that, apart from the ongoing shift towards renewable energy, technological advances in coal and gas fired power generation will also likely cause further disruption to coal demand for power generation.

Most notably, recent technologies have sought to utilise lower quality coal, while new technologies are projected to improve energy generation efficiency.

Therefore, while Queensland's coal industry enjoys key advantages compared with most of its global competitors, including its geographic location and quality of its coal, any eventuation of a global coal market closer to the IEA's APS outcome could clearly have a material impact on the state's coal industry in the medium-to-longer term.

IEA's long-term coal outlook depends on government policies and different assumptions about how these will develop. This means there is a wide variety of potential outcomes.

[143] IEA *World Energy Outlook 2022*, p 412.
[144] IEA *World Energy Outlook 2022*, p 57.
[145] IEA *World Energy Outlook 2022*, p 422.
[146] IEA *World Energy Outlook 2022*, p 422.
[147] IEA *World Energy Outlook 2022*, p 422.
[148] IEA *World Energy Outlook 2022*, p 422.

Summary of IEA projections

The key findings of the 2022 WEO, in terms of global coal demand, production and trade, (by scenario and types of use) are outlined in the table below.

Table 6.1: Global Coal Demand, Production and Trade, by Scenario (Mtce)

	2021	2050			% change (2021-2050)		
		STEPS	APS	NZE	STEPS	APS	NZE
Demand							
Power	3,642	2,086	938	306	-42.7	-74.2	-91.6
Industrial use	1,629	1,520	640	206	-6.7	-60.7	-87.4
Other	373	222	36	28	-40.5	-90.3	-92.5
Total	**5,644**	**3,828**	**1,613**	**539**	**-32.2**	**-71.4**	**-90.5**
Production							
Thermal coal	4,560	2,954	1,177	407	-35.2	-74.2	-91.1
Metallurgical coal	1,030	736	381	120	-28.5	-63.0	-88.3
Total	**5,825**	**3,829**	**1,613**	**539**	**-34.3**	**-72.3**	**-90.7**
Trade	**1,135**	**958**	**470**	**137**	**-15.6**	**-58.6**	**-87.9**

The WEO projections in terms of coal demand by region are outlined in the table below.

Table 6.2: Global Coal Demand by Region (Mtce)

	2021	2050		% change (2021-2050)	
		STEPS	APS	STEPS	APS
Asia Pacific	**4,460**	**3,258**	**1,332**	**-27.0**	**-70.1**
China	3,157	1,866	789	-40.9	-75.0
India	614	671	243	9.3	-60.4
North America	389	42	30	-89.2	-92.3
Europe	369	167	72	-54.7	-80.5
World	**5,644**	**3,828**	**1,613**	**-32.2**	**-71.4**

7.0 Key factors relevant to long-term demand for Queensland coal

7.1 Overview

In considering the potential implications for Queensland of the IEA's global and regional projections, it is important to understand the key factors likely to drive metallurgical and thermal coal demand in the State's key Asian export markets.

The state's traditional coal markets of Japan and Korea, along with strong growth in demand from China and India over the past decade, have been pivotal in the State achieving its current position in the global coal market.

As such, ongoing changes in demand and technological developments in terms of steel production and electricity generation in these key trading partners are critical to determining the outlook for the Queensland coal sector.

Therefore, to better understand the potential implications for Queensland's coal industry of recent and ongoing changes in global coal demand and trade, the following analysis focusses on factors likely to impact on the long-term outlook for steel production and energy/electricity production in those countries.

7.2 Metallurgical coal

Trends in global steel production

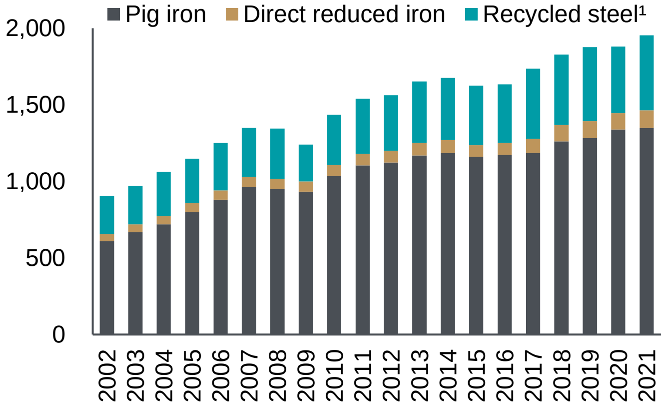
The majority of crude steel is produced through the Blast Furnace-Basic Oxygen Furnace (BF-BOF) route, where pig iron (iron ore is reduced by coke which, in turn, is produced from metallurgical coal) is the intermediate product.

There is a small portion of crude steel produced from direct reduced iron (DRI), an iron making process that does not require the use of metallurgical coal, while the recycling of steel scrap also makes a sizeable contribution to global steel production.

Since 2000, global steel production from both recycled steel and direct reduced iron have almost doubled but neither have increased materially as a proportion of total crude steel production, with global recycling of steel scrap comprising around 25% of total crude steel production globally[149] (**Chart 7.1**).

Over the 10 years to 2021, China's and India's crude steel production increased at a remarkable rate of 47% and 61% respectively. In contrast, crude steel production in the rest of the world was up only 5% over the period. As a result, China's and India's share of global crude steel production rose to 53% and 6% respectively by 2021.[150]

Chart 7.1 Global Crude Steel Production (Mt)



1. Recycled steel is approximated by Queensland Treasury by subtracting pig iron and direct reduced iron production from total crude steel production.
Sources: World Steel Association and Queensland Treasury.

This means that future demand for metallurgical coal hinges primarily on the outlook for steel production in China and India. This is particularly the case for Queensland as the world's largest exporter of metallurgical coal and the main exports markets are in the Asian region.

Therefore, the likely outlook for demand from China and India is an important factor in terms of the potential outlook for Queensland's metallurgical coal production. In particular, as India's steel-making capacity expands, it may increasingly become a growth market for Queensland's metallurgical coal exports.

China - outlook for steel production

China's crude steel production was 128.5 Mt in 2000 but increased almost eight-fold to 1,065 Mt by 2020, before falling slightly to 1,033 Mt in 2021.[151] The substantial rise of China's steel production capacity underpinned growth in global steel production over much of that period.

In late 2016, the Chinese government released its 13th Five-Year (2016-2020) development plans[152]. The Plans outlined how China aimed to consolidate and upgrade its existing steel making industry through a range of efficiency measures. The Plans also encourage the development of advanced steel products.

[149] Queensland Treasury approximation based on data from the World Steel Association.

[150] World Steel Association.

[151] World Steel Association.

[152] Most prominently was its Energy Development Plan and the associated Electricity Development Plan.

The new 14th Five-Year (2021-25) plans[153] were approved by the Chinese government in early 2021. The overarching themes are focussed on high quality green development. Specifically, China aims to reduce the carbon intensity of the economy and to reach a peak in carbon dioxide emissions before 2030, to reach carbon neutrality by 2060, and emphasises innovation as the core of modern development.

In late 2021, the Chinese government released the *14th Five-Year (2021-25) Raw Material Industry Development Plan*[154]*.* Soon after, *A Guideline on Promoting the High-Quality Development of the Iron and Steel Industry*[155] was released.

Under the previous plan, China's steel industry aimed to reduce excess crude steel production capacity by 100-150 Mt while the country's annual crude steel consumption was forecast to decline to 650-700 Mt by 2020.[156] Although apparent steel use in China fell to around 700 Mt in 2015 and 2016, it had rebounded strongly to more than one billion tonnes of crude steel equivalent by 2020.[157]

Strong domestic steel use means that China's exports of steel products (including semi-finished products) fell to 53.1 Mt in 2020, compared with the recent peak of more than 110 Mt in the middle of last decade.[158]

Under the new plan, further consolidation of the steel industry is enforced, with strict prohibition of any increase in crude steel production capacity. Meanwhile, energy efficiency of steel production is expected to improve further, while the share of steel production from electric arc furnaces is anticipated to increase to above 15%. Greater use of electric arc furnaces means that China aims to boost steel scrap recycling as a share of total steel production, from around 20% in 2019 to around 30% by 2025.[159]

The potential for China to increasingly recycle steel scrap may lower the demand for blast furnace iron, and therefore iron ore and metallurgical coal imports, in the medium term.

India - outlook for steel production

Although on a much smaller scale than China, India's crude steel production also increased significantly over the 21-year period, from 27 Mt in 2000 to 118 Mt by 2021.[160]

The Indian Government released its *National Steel Policy 2017*[161] in May 2017, which highlighted the rapid expansion of infrastructure and construction activity that is expected to be met by rising domestic steel production. In turn, this is expected to lead to a substantial increase in demand for imported metallurgical coal.

One characteristic of India's steel industry is the important role of direct reduced iron production and increasing recycling of steel scrap. The *National Steel Policy 2017* stated several important objectives:

- *Increase per capita steel consumption to 160kg by 2030-31 (from the current 61kg);*
- *Increase domestic availability of washed coking coal, so as to reduce import dependence on coking coal from approximately 85% to around 65% by 2030-31;*
- *To domestically meet total demand of high-grade automotive steel, electrical steel, special steels and alloys for strategic applications by 2030-31; and*
- *The steel industry will be encouraged to be competitive and to develop a global presence, not just in base grades of steel, but also in high quality steel.*[162]

Despite these ambitious goals, the *National Steel Policy* has yet to be translated into significantly higher crude steel production in India or larger metallurgical coal imports into the country.

Crude steel production in India was 101.5 Mt in 2017 and is on pace to surpass 120 Mt in 2022, achieving an average annual growth rate of around 4% between 2017 and 2022.[163]

Meanwhile, India's metallurgical coal imports increased from 44.8 Mt in 2017 to 59.4 Mt in 2021 but imports are likely to be slightly lower in 2022, resulting in an average annual growth rate of around 5% over the past five years.[164]

Given that Queensland is a major metallurgical coal exporter to India, Queensland should benefit greatly from India's planned steel industry expansion. Nevertheless,

[153] The 14th Five-Year Plan of the People's Republic of China - Promoting high-quality development https://www.adb.org/zh/publications/14th-five-year-plan-high-quality-development-prc.

[154] Five-Year Plan for the Development of Raw Materials Industry http://www.gov.cn/zhengce/zhengceku/2021-12/29/5665166/files/90c1c79a00b44c67b59c29392476c862.pdf.

[155] Guiding Opinions on Promoting the High-quality Development of the Iron and Steel http://www.gov.cn/zhengce/zhengceku/2022-02/08/content_5672513.htm.

[156] Published in Adjustment and Upgrading Plan for Iron and Steel Industry (2016-2020) in mid-November 2016.

[157] World Steel Association.

[158] World Steel Association.

[159] Guiding Opinions on Promoting the High-quality Development of the Iron and Steel http://www.gov.cn/zhengce/zhengceku/2022-02/08/content_5672513.htm.

[160] World Steel Association.

[161] National Steel Policy 2017 https://steel.gov.in/national-steel-policy-nsp-2017.

[162] National Steel Policy 2017 https://steel.gov.in/national-steel-policy-nsp-2017.

[163] World Steel Association.

[164] Government of India, Ministry of Commerce and Industry, Department of Commerce, Monitoring Dashboard.

Queensland metallurgical exports to India have only been growing moderately, from around 38 Mt in 2017, to around 50 Mt in 2021, before falling by around 6 Mt in the first 9 months of 2022 (compared with the same period in 2021), achieving an average annual growth of around 3%.[165]

Changes in steelmaking technologies

While the BF-BOF route is still expected to be the main form of crude steel production in the long term, there are several alternative steelmaking processes which do not require metallurgical coal.

It is expected that non-blast furnace routes of steelmaking are destined to become more prominent in the long term. The two most mature technologies are COREX and MIDREX. COREX is a process in which iron ore is reduced by gasified non-coking coal[166], while MIDREX is a gas-based process where natural gas is used as the reducing agent.[167]

Several COREX projects in China and India have proved that the COREX process is a commercially viable option for steelmaking.[168] Meanwhile, almost 60% of the world's production of direct reduced iron in 2021 was based on the MIDREX process.[169]

While COREX and MIDREX are the two most developed non-blast furnace technologies, there are several other technologies in various phases of development, including FINEX, HIsmelt, Romelt and Tecnored.

More recently, European steel companies have started to develop hydrogen-based steel making processes in an attempt to attain carbon-neutrality by 2050.

Sweden's HYBRIT (Hydrogen Breakthrough Ironmaking Technology) project[170] is a joint-venture between SSAB, LKAB and Vattenfall to develop a fossil-free value chain for iron and steel production. The Luleå pilot plant produced its first direct reduced sponge iron in June 2021, and HYBRIT is expected to move from the pilot phase to demonstration phase by 2026, with the demonstration plant producing fossil-free steel at industrial scale. [171]

Latest test results from HYBRIT indicate that hydrogen-reduced carbon-free direct reduction iron is highly metallised and has superior mechanical and aging properties compared with direct reduced iron using fossil-based reducing gas such as natural gas.[172]

In November 2020, Tenova signed a contract with the HBIS Group for the implementation of the Paradigm Project, a High-Tech Hydrogen Energy Development and Utilization Plant. The project includes a 600,000 kilotonnes per year direct reduction iron plant. The core direct reduction technology for the project is Tenova's ENERGIRON ZR (Zero Reformer) process. The project will use hydrogen enriched gas, not pure hydrogen, as the reducing agent. [173]

In China, Jianlong reported on 13 April 2021 that their demonstration hydrogen based direct reduction plant at Wuhai in inner-Mongolia successfully produced its first pig iron of 156 tonnes[174]. The plant has an annual capacity of 300,000 tonnes and the reduction technology appears to be largely based on Shandong Molong Petroleum Machinery's improved HIsmelt technology which is in turn sourced from Rio Tinto.

In February 2022, China Baowu Steel Group Corporation, the world's largest steel manufacturer, began construction of a million-ton hydrogen-based shaft furnace. The project is China's first million-ton hydrogen-based shaft furnace, it is also the first direct reduction production line integrating hydrogen and coke oven gas for industrialized production.[175]

Therefore, the ongoing development and utilisation of alternative steelmaking processes that are not as dependent on metallurgical coal is likely to continue to impact on global demand for metallurgical coal.

7.3 Thermal coal

Trends in electricity generation

In addition to the expectation that coal used for power generation will inevitably decline over time due to environmental impacts, technological advancements in coal and gas fired power generation will also impact on future thermal coal demand.

Advances in conventional coal fired power generation technology can substantially increase the efficiency of power plants and any large-scale adoption of these technologies would potentially lead to a sizeable reduction in thermal coal demand in coming decades.

[165] ABS *International Trade in Goods and Services (unpublished)*, Queensland Treasury estimates and Queensland Treasury calculations.

[166] Siemens VAI Metals Technologies *SIMETAL Corex Techonoloy*.

[167] MIDREX https://www.midrex.com/technology/midrex-process/

[168] Siemens VAI Metals Technologies *SIMETAL Corex Techonoloy*.

[169] MIDREX 2021 World Direct Reduction Statistics

[170] https://www.hybritdevelopment.se/en/.

[171] https://www.hybritdevelopment.se/en/hybrit-new-research-shows-hydrogen-reduced-iron-has-superior-properties/

[172] https://www.hybritdevelopment.se/en/hybrit-new-research-shows-hydrogen-reduced-iron-has-superior-properties/

[173] https://www.tenova.com/news/detail/first-hydrogen-based-dri-plant-in-china/
https://www.hbisco.com/site/group/groupnewssub/info/2021/16052.html.

[174] https://www.nasdaq.com/articles/china-steelmaker-jianlong-produces-first-iron-using-hydrogen-2021-04-14

[175] http://www.baowugroup.com/en/media_center/news_detail/233217

Specifically, advances in conventional coal fired power generation technology following the Ultra-Supercritical route can bring a power plant's thermal efficiency to over 45%, well above the global average of 34%.[176] The alternative Integrated Gasification Combined Cycle route can bring another 5% improvement in efficiency.[177]

A key issue related to these technological advancements is the quality of thermal coal required for new generation coal fired power plants. Indeed, several newly-built coal-fired power plants in various countries are designed to use lower quality thermal coal.

Any further developments or adoption of technology to use lower quality coal will continue to be reflected in the global demand and trade for this type of coal.

Therefore, consideration of the potential implications of the IEA's projections for the State's thermal coal industry needs to be informed by consideration of electricity generation trends, including the adoption of new technology in the State's key current and potential export markets, including China, Japan, Korea and India.

China

As part of its previous Five-Year Plan, the Chinese government intended in the period from 2016 to 2020 to:

- reduce growth in energy consumption;
- accelerate the substitution from coal towards non-fossil and natural energy;
- move away from the traditional energy intensive industries towards innovative and green industries;
- introduce distributed and localised energy supply systems; and
- encourage and strengthen international energy cooperation.[178]

Importantly, some targets set out in the Plan had already been largely achieved by the end of 2017. For example, coal fired power generation capacity has already fallen to 55.2% of total installed capacity in 2017 (compared with the target of 55% by 2020). This proportion had fallen further to 54.6% in 2021 (1,297GW vs. 2,378GW).[179]

Coal fired power generation efficiency in China has also improved from 318g of standard coal[180] per kilowatt hour of electricity produced in 2015 to 309g in 2017 (303g in 2021), achieving the target of less than 310g.

The *14th Five-Year (2021-25) Plan for a Modernised Energy System*[181] was released in late March 2022. The three guiding principles are: enhancing the security and stability of energy supply chain; developing green and low-carbon energy production and consumption; and modernising all aspects of the energy industry.

Specifically, the plan set the target for electricity generation capacity to 3,000GW by 2025, a 26% increase from the 2021 level, with overall energy production capacity reaching 4.6 billion tonnes standard coal equivalent by that time. By 2025, non-fossil fuels would constitute around 39% of electricity generation, more than 4 percentage points higher than that in 2021, while non-fossil fuel should constitute around 20% of total energy consumption.

Over the 14th Five-Year Plan period, CO_2 emissions and energy intensity per unit of GDP are expected to fall by 18% and 13.5% respectively.

These developments highlight the likelihood that, consistent with the IEA's outlook, China's demand for thermal coal for power generation is likely to decline over coming decades, as China approaches carbon neutrality.

Japan

The Japanese government approved the *Sixth Strategic Energy Plan* in October 2021. The key themes of this plan are to demonstrate the policy pathway to realise carbon neutrality by 2050; to reduce greenhouse gas emissions by 46% in 2030 Japanese Financial Year (JFY) from its JFY2013 levels; and to contemplate meeting the higher goal of cutting emissions by 50%.[182]

Under this new plan, renewables would constitute 36-38% of the country's power generation by JFY2030, significantly lifted from the 22-24% envisioned in the previous plan in 2018.[183]

The share of nuclear power is expected to remain at 20-22%, unchanged from the previous plan but the shares of both coal and gas fired power would fall to 19% and 20% by JFY2030, compared with 26% and 27% respectively predicted in the previous plan, and 32% and 37% respectively in JFY2019. It should be noted that electricity

[176] https://www.ge.com/steam-power/coal-power-plant/usc-ausc

[177] http://www.joban-power.co.jp/igcc-en/unit10-en/features-en/

[178] 13th Five-Year Plan For Economic and Social Development of the People's Republic of China (2016-2020) https://policy.asiapacificenergy.org/node/2509

[179] China Electricity Council China Power Industry Annual Development Report 2022

[180] 1kg of standard coal is defined as 7,000 kilocalories.

[181] 14th Five-Year Plan Modern Energy System Plan https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/202203/t20220322_1320016.html.

[182] Outline of Strategic Energy Plan https://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/6th_outline.pdf.

[183] Ministry of Economy, Trade and Industry *Fifth Strategic Energy Plan* https://policy.asiapacificenergy.org/node/1291

generation in Japan is expected to fall by more than 12% between JFY2019 and JFY2030.

The new energy plan clearly demonstrates that, in an attempt to achieve carbon neutrality in Japan by 2050, the country has to substantially reduce its reliance on coal, and even gas-fired power.

Korea

Korea released its 9*th Basic Plan for Long-term Electricity Supply and Demand* in late December 2020. To achieve carbon neutrality by 2050, installed renewable power generation capacity is predicted to increase from 15.8% of total installed capacity in 2020 to 40.3% by 2034. Conversely, coal and nuclear capacities will moderate from 28.1% and 18.2% respectively to 15.0% and 10.1%. The share of power generation from coal will fall from 40.4% in 2019 to 29.9% by 2030, while the share of renewable power will rise from 6.5% to 20.8%[184]

The new plan indicates that coal fired power capacity will still expand in the short term, from 35.8GW in 2020 to 40.6GW by 2024 but will decline to 29.0GW by 2034 as all coal fired power plants that reach a 30-year life will be retired.[185]

A significant increase in the share of renewable power means that renewable capacity will expand tremendously from 20.1GW in 2020, to 77.8GW in 2034, with solar (45.6GW) and wind (24.9GW) power dominating this increase.[186]

Similar to Japan, Korea is expected to reduce its reliance on coal-fired power in its pursuit of carbon neutrality by 2050.

India

In September 2022, the Central Electricity Authority (CEA) issued a draft *National Electricity Plan for Generation*. [187]

Table 7.1 India installed capacity of power stations (GW)

Year[1]	Coal	Gas	Nuclear	Hydro	RES[2]	Total
2017	192.2	25.3	6.8	44.5	57.2	**326.8**
2018	197.2	24.9	6.8	45.3	69.0	**344.0**
2019	200.7	24.9	6.8	45.4	77.6	**356.1**
2020	205.1	25.0	6.8	45.7	87.0	**370.1**
2021	209.3	24.9	6.8	46.2	94.4	**382.2**
2022	204.1	24.9	6.8	46.7	109.9	**399.5**

1. as at the end of March
2. Renewable Energy Sources.
Sources: Indian Central Electricity Authority *Growth of Electricity Sector In India From 1947-2020* and CEA Dashboard.

As seen from the actual additions during the previous planning period, total installed power generation capacity increased 72.7GW between March 2017 to March 2022. This increase was driven by a 52.6GW increase in renewable energy sources (RES) and a 11.9GW increase in coal fired power. The total installed renewable power (including large hydro) as at the end of March 2022 was 156.6GW, somewhat short of the 175GW target set in the previous plan.

Under the new (draft) plan, extra capacity required during 2022 to 2027 is 228.5GW, comprising of 41GW of additional conventional capacity (coal and lignite 33GW, gas 370MW and nuclear 7GW) and 188GW of additional renewable capacity (large hydro 11GW, solar 132GW, wind 41GW, biomass 2.3GW and pumped storage plants 2.1GW), excluding 5.9GW of likely hydro based imports.

Looking further ahead, the new plan anticipates that additional capacity required during 2027-2032 would be 243GW. Additional renewable capacity will be the key to this increase, with solar contributing an additional 147GW, wind 53GW, pumped storage plants 12GW and large hydro 11GW.

Nevertheless, coal capacity is still expected to increase by another 9.4GW during this period. This means that, in addition to coal-based capacity of 26GW already under construction, the additional coal-based capacity required by 2031-32 Indian Fiscal Year is expected to be around 17GW.

While this new plan has put coal fired power in a more prominent role than the previous plan and CEA's previous internal study, the planned additional coal fired capacity is expected mainly to be brownfield expansion, preferably closer to domestic mines. The plan estimates that domestic coal requirement would be 831.5 Mt in 2026-27, rising to 1,018.2 Mt in 2031-32. Coal imported by power plants designed on imported coal would only be around 40 Mt.

Intergovernmental panel on climate change

The IEA's Report clearly highlights the potential ongoing impact on thermal coal demand of global policy changes related to climate change and increasing environmental impacts.

In particular, as discussed previously in this paper, the IEA's APS and NZE scenarios highlight the significant impacts that substantial global policy changes would make to the global demand and trade for coal, particularly in relation to thermal coal.

It is also important to note that, further to the IEA analysis, the Intergovernmental Panel on Climate Change (IPCC) is

[184] Ministry of Trade, Industry and Energy The 9th Basic Plan for Electricity Supply and Demand (2020-2034).

[185] Ministry of Trade, Industry and Energy The 9th Basic Plan for Electricity Supply and Demand (2020-2034).

[186] Ministry of Trade, Industry and Energy The 9th Basic Plan for Electricity Supply and Demand (2020-2034).

[187] Government of India, Ministry of Power, Central Electricity Authority *National Electricity Plan (Draft) Generation Vol*- I

currently in its Sixth Assessment cycle and is in the process of finalising the Synthesis Report (SYR), which synthesises and integrates materials contained within the Assessment Reports and Special Reports. The SYR will be released in late 2022 or early 2023.

Nevertheless, the third Working Group assessment report named *Climate Change 2022: Mitigation of Climate Change*[188] was released in April 2022. The report assesses a wide range of modelled global emission pathways and scenarios from literature. The report notes:

'*All global modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot, and those that limit warming to 2°C (>67%), involve rapid and deep and in most cases immediate GHG emission reductions in all sectors. Modelled mitigation strategies to achieve these reductions include transitioning from fossil fuels without CCS to very low- or zero-carbon energy sources, such as renewables or fossil fuels with CCS, demand side measures and improving efficiency, reducing non-CO_2 emissions, and deploying carbon dioxide removal (CDR) methods to counterbalance residual GHG emissions*'[189].

Specifically, in modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot, the global use of coal, oil and gas in 2050 is projected to decline with median values of about 95%, 60% and 45% respectively, compared with 2019. With pathways that limit warming to 2°C (>67%), median values of these projected declines are 85%, 30% and 15% respectively by the middle of this century.

Clearly, if global coal demand trends closer to those described under alternative scenarios such as the APS, NZE or IPCC's projections were to eventuate, there would likely be more significant implications for the state's coal industry, particularly in relation to the long-term outlook for thermal coal.

7.4 Australia's Safeguard Mechanism

The Safeguard Mechanism, administered by the Clean Energy Regulator, commenced on 1 July 2016, and applies to facilities with direct (scope 1) greenhouse gas (GHG) emissions of over 100,000 tonnes carbon dioxide equivalent (tCO2-e) per year.

It was established as part of the Emissions Reduction Fund (ERF) to ensure emissions reductions as part of the ERF weren't displaced by significant increases in emissions occurring elsewhere in the economy.

The Safeguard Mechanism requires covered entities to keep their net emissions (Scope 1 only) at or below a baseline, with facility operators given flexibility to manage any excess emissions through the use of domestic Australian Carbon Credit Unit (ACCU) offsets, and other baseline adjustment measures.

The Australian Government is considering options to reform the Safeguard Mechanism to help industry reduce emissions in line with Australia's climate targets. The Australian Government proposes:

- gradually reducing baselines to help Australia reach net zero emissions by 2050;
- introducing credits for facilities that emit less than their baseline; and
- providing tailored treatment to emissions-intensive, trade-exposed facilities so businesses are not disadvantaged compared to international competitors and emissions do not increase overseas.

The Australian Government has announced a 1 July 2023 start date for the Safeguard Mechanism reforms.

In 2020-21, there were 34 facilities related to coal mining under the Safeguard Mechanism.

Coal facilities contributed 19.4 million tonnes (Mt CO2-e) of Queensland's total safeguard mechanism emissions. The coal mines covered under the Safeguard Mechanism in 2021-22 had a cumulative production volume of almost 188 Mt of saleable metallurgical and thermal coal, which made up 86% of the total coal production in Queensland (around 218 Mt).

The reform to the Safeguard Mechanism may require coal mining facilities to further consider a range of options to reduce their scope 1 emissions, including through the use of credible offsets.

[188] The Intergovernmental Panel on Climate Change *Climate Change 2022: Mitigation of Climate Change* https://www.ipcc.ch/report/ar6/wg3/.

[189] The Intergovernmental Panel on Climate *Change Climate Change 2022: Mitigation of Climate Change: Summary for Policymakers*, p 28.

8.0 Conclusion

The global coal industry has seen substantial volatility in coal prices over recent years, with unprecedented high prices seen over the period since mid-2021.

The Russian invasion of Ukraine and subsequent sanctions on Russia have disrupted global energy markets and driven coal prices to record levels. The premium hard coking coal spot price peaked at US$670.50/t (A$924/t) in March 2022, while the premium thermal coal spot price peaked at US$457.80/t (A$675/t) in September 2022.

These unprecedented high prices have resulted in significant increases in revenues and profits for many Australian and Queensland coal producers.

The continued high prices drove the value of Queensland's 12-monthly coal exports to a new record high of A$79.7 billion in the year ended September 2022

However, these exceptionally high prices are only expected to be temporary, with prices expected to return to medium-term levels over time.

Over the longer term, Queensland Treasury's analysis of the IEA's 2022 WEO projections and other information relevant to long-term global coal demand highlights a range of factors that could have significant implications for the Queensland coal industry.

The IEA's report highlights that the outlook for global coal demand is dependent on the world's determination to combat climate change. However, under all three scenarios considered by the IEA, global coal demand falls by both 2030 and 2050.

Importantly for Queensland's coal industry, the outlook for metallurgical coal is more resilient than for thermal coal, as there are currently less readily available alternatives to coal for the steelmaking process than power generation.

There is a substantial degree of uncertainty inherent in the IEA projections and other key assumptions underpinning the analysis, given the long-term nature of the outlook in a global energy market that is facing ongoing change.

However, given Queensland accounted for around 90% of Australia's metallurgical coal production in 2021-22 and around 70% of the state's coal production in 2021-22 was metallurgical coal, Queensland's coal industry remains relatively well placed over the longer term compared with other jurisdictions that are much more reliant on thermal coal production and exports.

Queensland's coal industry also continues to enjoy key advantages, including its geographic location and quality of its coal, compared with many of its global competitors.[190]

Therefore, under the long-term scenarios outlined in the IEA's 2022 WEO, it is still expected that international demand should continue to support Queensland's coal exports over coming decades, in particular for the State's metallurgical coal producers.

8.1 Metallurgical coal

Queensland Treasury's analysis of the WEO continues to highlight that, due to Queensland's geographical location, its major coal export markets are most likely to remain primarily within North-East and South-East Asia.

China and India have been the main drivers of global steel production in the past two decades. Therefore, the outlook for the steel industries of these two countries remains critical to the long-term demand for Queensland metallurgical coal.

China's indefinite ban on Australian coal imports currently restricts Queensland's access to the world's second largest metallurgical coal importer. However, Queensland's coal exporters have been relatively successful in finding alternative markets, with over 90% of Queensland coal exports lost to China offset by increased exports to other countries by November 2021.

As outlined in Queensland Treasury's 2020 paper on long-term global coal demand, as India's steel-making capacity expands, it has increasingly become a growth market for Queensland's metallurgical coal exports. Queensland continues to be in prime position to benefit from any ongoing expansion in India's steel production.

This outlook is consistent with observations from the IEA when, in relation to its STEPS, it expects India to become the largest importer of coal by the mid-2020s, with coal imports in 2050 to be 40% above 2021 levels, most of which is expected to be metallurgical coal. Further, under the STEPS the IEA expect Australian coal exports to increase 10% by 2050, mostly due to metallurgical coal.

Finally, the ongoing development and utilisation of alternative steelmaking processes, which are not as dependent on metallurgical coal, is likely to continue to impact on global demand for metallurgical coal going forward.

[190] Minerals Council of Australia *Best in Class: Australia's Bulk Commodity Giants - Australian Export Thermal Coal: The Comparative Quality Advantages*, p 2 and Minerals Council of *Australia Best in Class: Australia's Bulk Commodity Giants - Australian Metallurgical Coal: Quality Sought Around the World*, pp 18-19.

8.2 Thermal coal

As outlined by the IEA, particularly under the NZE scenario, it is expected that the extent to which thermal coal is used for power generation will decline over time, reflecting the ongoing transition to a low emissions global economy and the adoption of more advanced power generation technologies likely to increase generation efficiency.

Therefore, in line with the IEA's projections, the potential long-term demand for Queensland's thermal coal will be largely driven by electricity generation trends in the State's key export markets and potential markets.

The IEA noted that most advanced economies are pursuing coal phase-out policies and thermal coal demand is also expected to enter a long-term decline in emerging market and developing economies after 2030.

Further, Queensland Treasury analysis of the announced policies of Queensland's key thermal coal export markets (including Japan and Korea) indicates those countries are expected to reduce coal-fired power generation in order to meet carbon reduction and neutrality goals.

While India has announced plans to increase coal fired power generation, this is mostly expected to be met through domestic supply.

The IEA also note the impact on thermal coal in the APS scenario, with the share of electricity generation from unabated coal falling from 36% in 2021 to 3% in 2050. Under the NZE scenario, unabated coal electricity generation falls to 0% by 2050.

Given these range of factors, the IEA's projections and the further analysis undertaken by Treasury both highlight that the long-term global demand for thermal coal remains challenging and is likely to decline more substantially over coming decades than the demand for metallurgical coal.

Queensland
Government