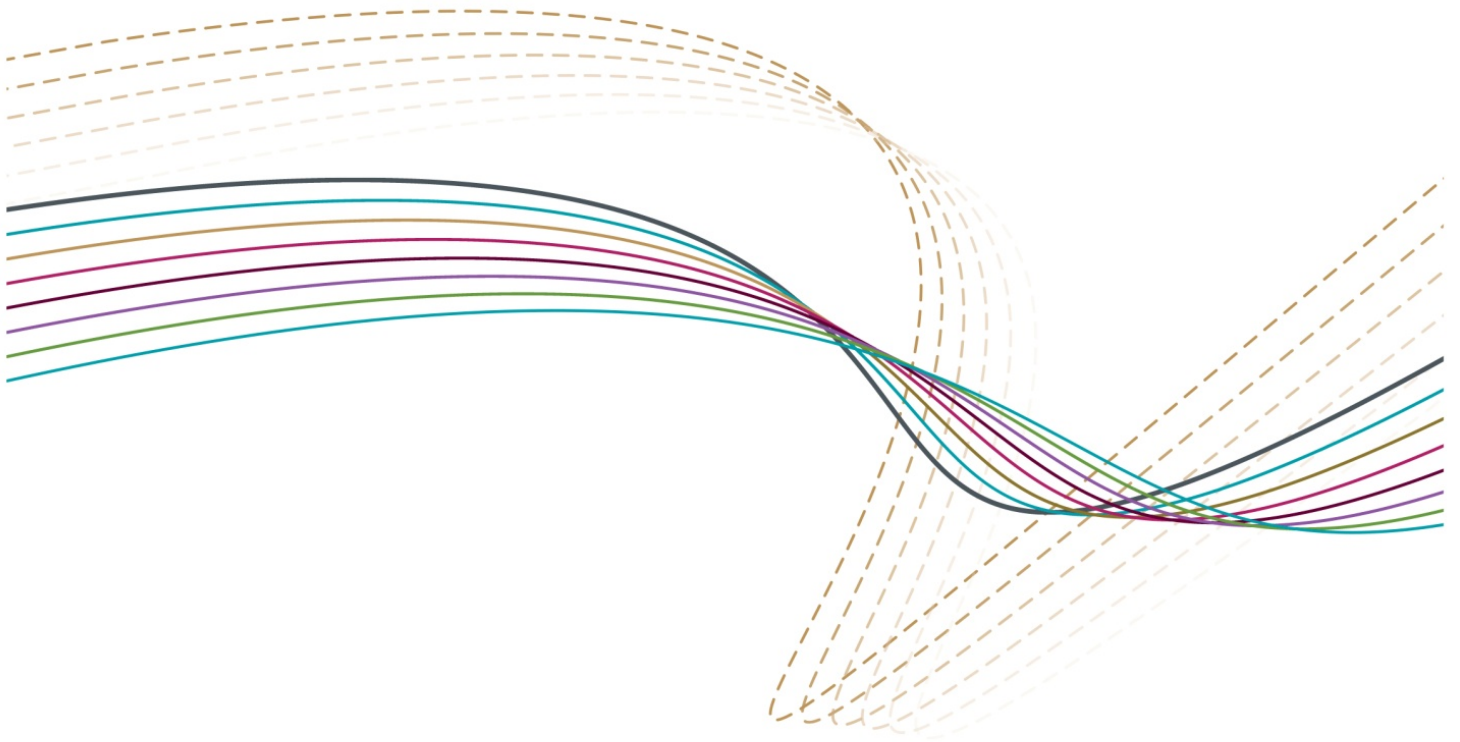


QUEENSLAND TREASURY

A Study of Long-Term Global Coal Demand

September 2020





1.0 Introduction

Over recent decades, Queensland has been well positioned to capitalise on developments in the global coal industry, possessing reserves of high-quality coal and capitalising on its geographical advantage to establish itself as a major exporter to some of the world's major coal importers.

In particular, Queensland has benefitted from the development of newly industrialised economies in Asia, many of which do not have their own or sufficient coal reserves. The substantial growth in demand from China has been the other primary driver of growth in the State's coal production and exports.

Coal has historically formed a major component of the State's mining industry (which in total contributed \$47.9 billion to the State's economy in 2018-19).

One of the Queensland Government's 2017 election commitments was to commission a Queensland Treasury study of long-term global demand for thermal and coking coal, based on International Energy Agency (IEA) projections.¹ The findings will inform policy development and engagement with the industry and community that it supports.

The IEA produces an annual World Energy Outlook (WEO) Report, in which it provides a detailed overview and analysis of key elements of the current and likely future global demand for energy, including the long-term global demand for both coking (i.e. metallurgical) coal and steaming (i.e. thermal) coal.

By its nature, the WEO focuses on the global outlook for coal demand and, therefore, references Australia's coal industry where appropriate but does not explore the likely impacts on coal demand or production at a state or regional level. As such, the WEO does not in itself provide any clear indication of the likely specific impacts and outlook for Queensland's coal industry or the potential long-term future demand for the State's metallurgical or thermal coal.

Queensland Treasury's analysis, as outlined in this paper, examines key characteristics of the Queensland and global coal industry and discusses the key findings of the WEO in the context of the State's coal production and major export markets.

Based on Queensland Treasury's analysis of the IEA's projections and other sources of information pertinent to potential long-term global coal demand, this paper discusses potential implications of the long-term outlook for global coal demand for the State's metallurgical and thermal coal industries.

This study was prepared on the basis of information available at the time of the release of the most recent IEA WEO in November 2019, which does not include the impacts of the COVID-19 outbreak and developments in the trade relationship between China and Australia.

The report includes 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. However, the impacts of these factors are expected to be relatively short-lived compared with the underlying drivers of the long-term outlook (up to 2040) outlined in the WEO and underpinning the longer-term analysis in this report.

¹ In the 2019 WEO, the IEA refers to thermal coal as steam coal, and defines steam coal as the type of coal that is mainly used for heat production or steam-raising in power plants and, to a lesser extent, in industry. Furthermore, the IEA defines coking coal as the type of coal that can be used for steel making, where it produces coke capable of supporting a blast furnace charge, and states that this type of coal is also commonly known as metallurgical coal. As such, the terms thermal/steam and coking/metallurgical are treated as if interchangeable in the context of compiling this report.



2.0 Executive Summary

Queensland's mining industry

- Mining accounted for \$47.9 billion of economic output in Queensland in 2018-19, with the majority of this activity attributed to coal mining. Coal mining also supports activity in other sectors of the economy through the flow on demand for inputs and other goods and services, particularly in regions in which coal mining is based.
- Queensland produced 251.2 million tonnes (Mt) of saleable coal in 2018-19, comprising around 62% metallurgical coal and 38% thermal coal. Close to 90% of Queensland coal is exported overseas, with the State's key export markets for both metallurgical coal and thermal coal including China, India, Japan and Korea.

WEO Report and IEA findings

- The 2019 WEO Report outlines projections of long-term global coal demand to 2040 under three scenarios. The Current Policies Scenario (CPS) reflects legislated policies. The sole purpose of this scenario is to be a benchmark against the main Stated Policies Scenario (STEPS). The STEPS includes the anticipated effects of announced policies expressed in official targets and plans. The Sustainable Development Scenario (SDS) reflects the potential outcomes if global policies and actions were to align closely with the key Sustainable Development Goals of the United Nations.
- Under the STEPS, the WEO projects total world demand for energy sourced from coal to be marginally lower (down 1.1%) in 2040 compared with 2018, with demand for power generation down 3.0% and demand for industrial use to be 13.3% higher. In comparison, under the SDS, global demand for coal is projected to fall substantially (down 61.5%) by 2040, with demand for power generation falling 75.5% and demand for industrial use falling 28.2%.
- Significantly, the IEA projects that the Asia Pacific region will remain the major consumer of coal under all scenarios. Coal demand in the Asia Pacific region is projected to increase by 10.0% over the period to 2040 under the STEPS, driven primarily by a near-doubling of India's demand for coal.
- Under the STEPS, the IEA projects global production of steam coal will increase by 1.2%, while production of coking coal will fall by 17.3%. However, while global trade in steam coal is expected to fall 15.5%, trade in coking coal is projected to increase by 16.3%. Under the SDS, production of steam and coking coal are both projected to fall significantly, by 65.1% and 48.0% respectively. As a result, global trade in steam coal is projected to also fall substantially (down 77.1%), however trade in coking coal is projected to fall more moderately (down 22.6%).
- The WEO highlights that the long-term outlook for global coal demand remains uncertain. As such, long-term outcomes at almost any point along the continuum between the STEPS and the SDS could be possible, depending on the extent to which relevant policy outcomes are pursued globally and the level of ongoing development and adoption of technology across major economies.

Potential implications for Queensland's coal industry

- Queensland Treasury's analysis of the IEA's projections highlights that Queensland's future coal demand will continue to be primarily linked to key economies in North-East and South-East Asia. In particular, the future demand for Queensland's metallurgical coal likely hinges on demand from the world's two largest coal consumers, China and India.
- Queensland's coal industry continues to enjoy key advantages, including its geographic location and the quality of its coal, compared with most of its global competitors. Therefore, under the main scenario (STEPS) outlined in the IEA's projections, it is likely that international demand will 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.
- However, 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. This includes long-term prices of high-quality coking coal, which is a critical component of Queensland's total coal production and exports.
- **Note:** *This study was prepared on the basis of information available at the time of release of the 2019 WEO. While the analysis does not include more recent developments, particularly the COVID-19 outbreak and developments in the trade relationship between China and Australia, their impacts are expected to be relatively short-lived compared with the underlying drivers of the long-term outlook (up to 2040) described in this report.*

3.0 Queensland's Coal Industry

3.1 Overview

Mining accounted for \$47.9 billion of Queensland's economic output in 2018-19, representing 13.8% of total economic output in nominal terms.

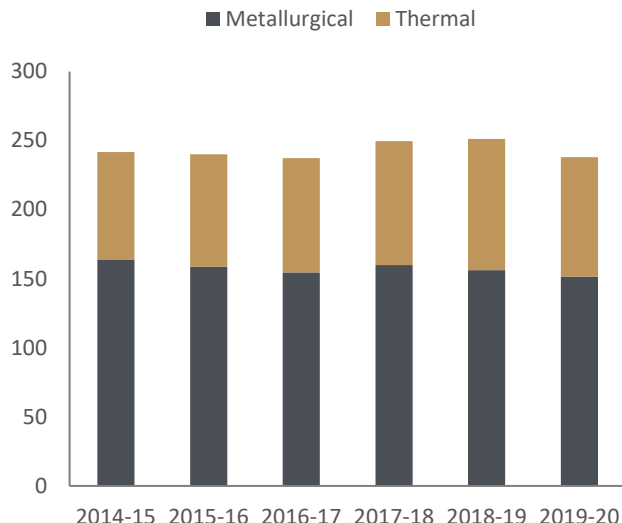
Coal accounts for the majority of mining output and accounted for 64% of the value of Queensland's mining exports in 2018-19. The coal mining industry also supports activity in other sectors, including coal processing and the construction or expansion of mines.

3.2 Production

There were 51 operating coal mines in Queensland in 2018-19, with coal mining and related activity primarily based in the Mackay and Fitzroy regions.

Queensland produced 317.4 million tonnes (Mt) of raw coal in 2018-19, resulting in 251.2 Mt of saleable coal (156.2 Mt of metallurgical coal and 95.0 Mt of thermal coal).² More recent data indicate that Queensland's saleable coal production in 2019-20 was around 240 Mt.

Chart 3.1 Queensland Saleable Coal Production (Mt)



Source: Department of Natural Resources, Mines and Energy

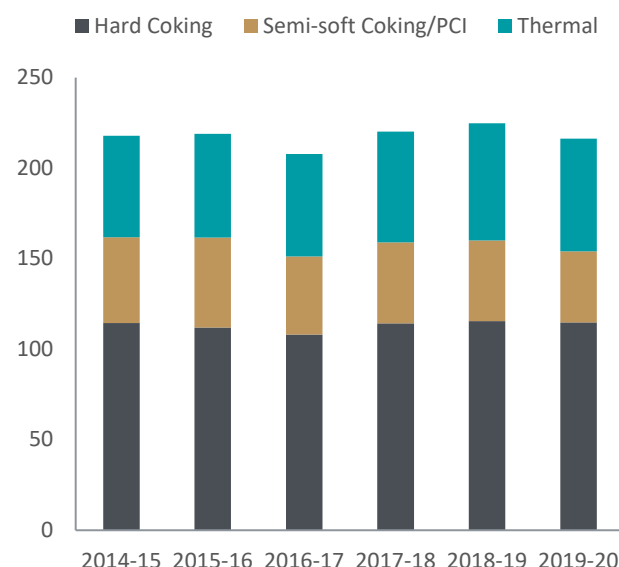
3.3 Exports

Around 90% of coal produced in the State in 2019-20 was exported overseas, included 114.8 Mt of hard coking, 39.3 Mt of semi-soft coking/PCI and 62.3 Mt of thermal coal.

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 were China, India, Japan, Korea, The Netherlands and Taiwan, which combined accounted for 86% of the total volume of the State's hard coking coal exports in 2019-20.

Japan, India, China, Korea, Brazil and Taiwan are the main export destinations for semi-soft coking/PCI coal.³

Chart 3.2 Queensland Coal Exports (Mt)



Sources: ABS and Queensland Treasury

China, Japan, Korea, Vietnam, Taiwan and India were the State's top six export destinations for thermal coal, accounting for 95% of total thermal coal exports in 2019-20.

Table 3.1 Queensland's Major Coal Export Markets, 2019-20 (Mt)

Hard Coking	Thermal
China (41.4)	China (16.1)
India (26.4)	Japan (13.7)
Japan (14.1)	Korea (12.9)
Korea (7.0)	Vietnam (9.5)
Netherlands (4.9)	Taiwan (4.3)
Taiwan (4.9)	India (2.6)
Vietnam (2.8)	Malaysia (1.3)
France (1.9)	Indonesia (0.9)

Source: ABS

² Department of Natural Resources, Mine and Energy, data subject to revision.

³ 2018 calendar year, Department of Natural Resources, Energy and Mines.

4.0 Global Coal Industry

4.1 Supply

In the 2017 WEO, the IEA noted that “*proven reserves are more than sufficient to meet any plausible level of coal demand over the outlook period.*”⁴

It is estimated that economically recoverable global coal reserves totalled 1,070 billion tonnes in 2018 (Table 4.1), 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 – are estimated at 19,861 billion tonnes.

Table 4.1 Economically Recoverable Coal Reserves

	Hard coal		Lignite		Total	
	Mt	%	Mt	%	Mt	%
US	219,534	29.3	30,003	9.4	249,537	23.3
Russia	71,719	9.6	90,447	28.2	162,166	15.2
Australia	72,571	9.7	76,508	23.9	149,079	13.9
China	133,467	17.8	8,128	2.5	141,595	13.2
India	100,858	13.5	5,073	1.6	105,931	9.9
Indonesia	28,163	3.8	11,728	3.7	39,891	3.7
Germany	-	0.0	35,900	11.2	35,900	3.4
Ukraine	32,039	4.3	2,336	0.7	34,375	3.2
Poland	21,067	2.8	5,865	1.8	26,932	2.5
Kazakhstan	25,605	3.4	-	-	25,605	2.4
World	749,166	100	320,468	100	1,069,634	100

Source: IEA and GFIGNR

4.2 Production

Global coal production was 7.92 billion tonnes in 2019, up 1.5% from 2018, near the 2013 peak of 7.97 billion tonnes.⁵

Table 4.2 Top 10 Coal Producing Countries (Mt)

	2013	2019	Difference
China	3,748.5	3,692.9	-55.6
US	903.7	639.8	-263.9
India	610.0	769.0	159.0
Indonesia	491.1	616.2	125.1
Australia	458.4	503.2	44.8
Russia	326.0	417.9	91.9
South Africa	256.3	254	-2.3
Germany	191.0	131	-60.0
Poland	142.9	112	-30.9
Kazakhstan	119.6	105	-14.6
Total	7,975.5	7,921.0	-54.5

Source: IEA

⁴ Based on research by Germany’s Federal Institute for Geosciences and Natural Resources (GFIGNR).

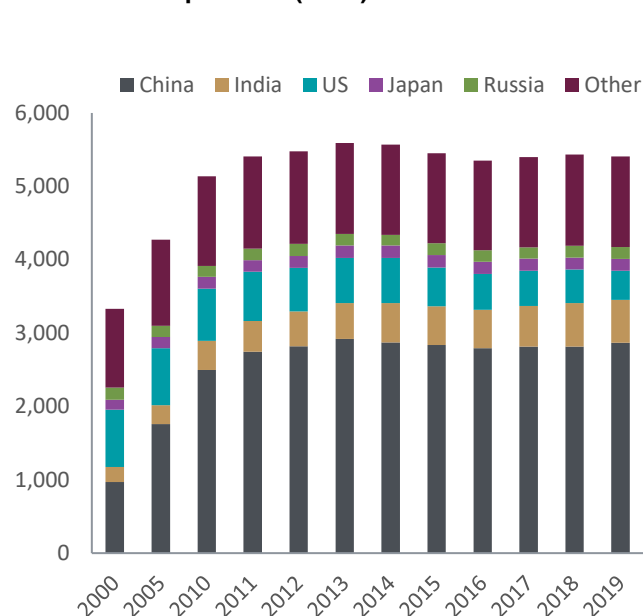
⁵ Sources: IEA Coal Information Overview: 2020, IEA Coal Information 2019 and IEA Coal Information 2016.

4.3 Consumption

In tonnes of coal equivalent (TCE) terms (i.e. measured by the energy content of coal used), global coal consumption has increased moderately in recent years.

However, global coal consumption has declined slightly since peaking in 2013, mainly due to a fall in consumption in China, reflecting China’s coal industry reforms and anti-pollution policies, as well as an ongoing decline in coal consumption in the US due to its rising natural gas production.

Chart 4.1 Global Coal Consumption (Mt of coal equivalent (Mtce)⁶)



Source: IEA

Global consumption of thermal and coking coal peaked in 2013 and 2014 respectively.

From its peak in 2014, global consumption of coking coal fell by 3.6% in 2015 and a further 5.1% in 2016. However, by 2017 the decline in global metallurgical coal consumption had largely stabilised, to increase by 1.1% in 2018 (latest data available). This trend has moved broadly in line with global pig iron production, which increased to around 1.24 billion tonnes in 2018.

⁶ 1 kilogram of coal equivalent is defined as 7,000 kilocalories. One tonne of coal equivalent equals to 0.7 tonnes of oil equivalent.

These trends have mainly been driven by consumption in China, which fell 4.7%, 7.0% and 3.1% in 2015, 2016 and 2017 respectively, but increased 0.8% in 2018.

For thermal coal, global consumption fell 6.4% from the peak in 2013 to 2016, driven by decreases in China (down 8.5%) and the US (down 23.3%). Meanwhile, strong demand for use in coal fired power generation in India, up 26.3% between 2013 and 2018, has partially offset this.

4.4 Global Trade

In general, most major coal consuming countries are also 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 trade of hard coal in 2019 rose by 0.9%, to 1,336 Mt, after rising 4.5% in the previous year.⁷

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

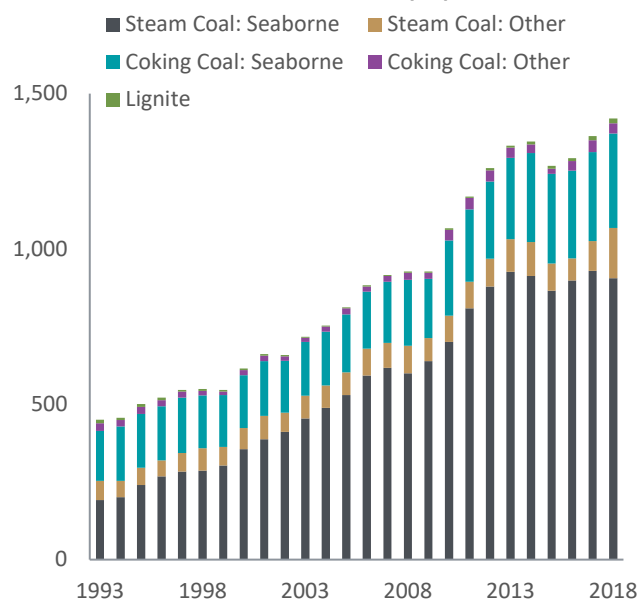
Since 1993, seaborne trade has increased at an average annual rate of 5.1%, whereas trade using other modes of transportation has increased at only 2.9% p.a.

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).⁸

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 coking coal, where global trade increased at an average annual rate of 8.8% over the period, compared with an average of 1.1% per annum between 1993 and 2007.

Although global coal trade fell 5.8% in 2015, from its peak in 2014, global coal trade has increased steadily over the past three years (detailed data available only up to 2018), largely reflecting movements in China’s and India’s coal imports.

Chart 4.2 Global Coal Trade (Mt)



Source: IEA

In 2019-20, Australia exported a total of 175.6 Mt of metallurgical coal, of which 120.6 Mt was hard coking coal. Significantly, almost 90% of Australia’s metallurgical coal exports originated from Queensland.

In contrast, of the 212.6 Mt of thermal coal exported from Australia in 2019-20, only 62.3 Mt (29%) 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 327.1 Mt in 2013, falling sharply to 204.1 Mt in 2015, and then rebounding to 299.7 Mt in 2019.

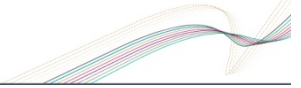
Another recent major development in global coal trade is the sharp increase of steam coal imports to India, up from 55.3 Mt in 2011-12⁹ to 157.3 Mt in 2019-20.

Meanwhile, India’s coking coal imports have also grown consistently since 2011-12, rising at an average annual rate of 7.2% over the seven years to 2018-19, to 51.8 Mt. However, the recent economic downturn saw India’s coking coal imports remain almost unchanged in the 2019-20 fiscal year.

⁷ German Coal Importers Association

⁸ German Coal Importers Association

⁹Indian Fiscal Year (April 2011 to March 2012).



5.0 IEA's long-term global coal demand outlook

5.1 IEA's Long-Term Scenarios

The 2019 edition of the IEA's *World Energy Outlook* (WEO) outlines projections of long-term global coal demand out to 2040 under three scenarios:

1. The **'Stated Policies' Scenario (STEPS)**, the IEA's main scenario, incorporates policies and measures that governments have already put in place and anticipated effects of announced policies, as expressed in official targets and plans. The IEA indicates that since "stated policies" are by definition not yet fully reflected in legislation or regulation, the prospects and timing for their full realisation are based upon its own assessment of the relevant political, regulatory, market, infrastructure and financial constraints.
2. The **'Current Policies' Scenario (CPS)** considers the impact of those policies and measures that are firmly enshrined in legislation. In addition, where existing policies target a range of outcomes, it is assumed that the lower end of the range is achieved. This means that the CPS is not a realistic portrayal of the future direction of energy markets. Rather, the CPS serves as a benchmark against which to consider the possible impacts under the STEPS.
3. The **'Sustainable Development' Scenario (SDS)** was introduced for the first time in the 2017 edition of the WEO. Unlike the other main scenarios, it starts from the objectives to be achieved and then assesses what combination of actions would deliver them. These objectives are key energy-related goals of the United Nations Sustainable Development Agenda, including:
 - (1) an early peak and rapid subsequent reduction in emissions, in line with the Paris Agreement;
 - (2) universal access to modern energy by 2030 including electricity and clean cooking; and
 - (3) a dramatic reduction in energy-related air pollution and associated impacts on public health.

The SDS reflects the impacts of global actions consistent with reaching global "net zero" CO₂ emission by 2070, which would mean a 66% chance of limiting the global average temperature rise to 1.8°C above the pre-industrial levels.

As would be expected, under the three scenarios, the IEA forecasts vastly different outlooks for global coal demand. However, the IEA highlights that the STEPS is its main scenario, with its detailed analysis of long-term coal demand outlined in the 2019 WEO based primarily on the STEPS.

However, it should be noted that the WEO "does not aim to forecast the future, but provides a way of exploring different possible futures, the levers that bring them about and the interactions that arise across a complex energy system," as pointed out in the previous issue of the WEO.

Further, in relation to the three scenarios provided in the publication, the IEA also emphasised that "none of these potential pathways is preordained; all are possible. The actions taken by governments will be decisive in determining which path we follow."

5.2 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 by gas works, petroleum refineries, blast furnaces, coke ovens, 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 that steam coal prices will increase slightly between 2025 and 2040 under the STEPS, reflecting upward cost pressure caused by worsening geological conditions, declining coal quality in mature mining regions and the need to tap more remote coal deposits.

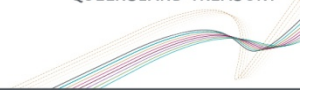
Meanwhile, the IEA assumes steam coal prices will continue to decrease under the SDS as lower demand forces the closures of high cost mines in a market where only the most productive, least-cost mines can survive.

5.3 IEA's Key Findings

Global Coal Demand

Under the STEPS, the IEA projects that global coal demand (based on the primary energy demand sourced from coal) would fall marginally from 5,458 Mtce in 2018 to 5,398 Mtce by 2040, a decrease of 1.1% over the 22-year period.

This decrease reflects decreases in Power and Other uses (down 3.0% and 64.2% respectively), offsetting a 13.3% increase in Industrial use.



The latest (2019) IEA projection for 2040 is 0.8% lower than that published under the STEPS in the 2018 WEO. While the IEA’s estimated demand from Power and Other uses in 2040 were both slightly upgraded, projections of demand for Industrial use were downgraded.

However, under the SDS, global demand for coal is projected to fall substantially (down 61.5% to only 2,101 Mtce) by 2040. This outcome primarily reflects reduced demand for coal for power generation (down 75.5%), while Industrial use is also projected to fall 28.2%.

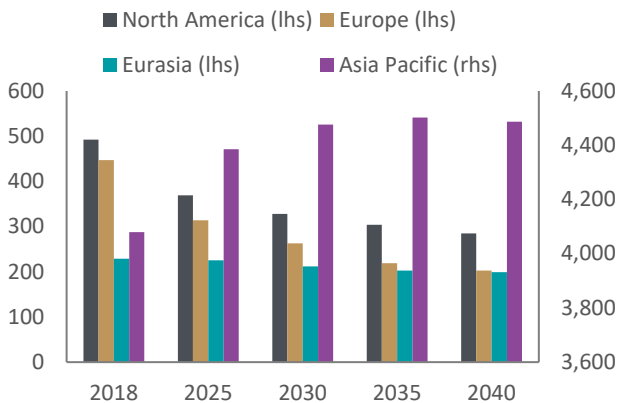
Under the STEPS, the IEA projects that the production of steam coal will increase by a mere 1.2%, while production of coking coal will fall by 17.3%.

However, significantly, under the SDS, steam coal production is projected to fall by 65.1%, while coking coal production is also projected to fall by 48.0%.

Regional Demand¹⁰

The IEA expect there will be significant regional disparity in terms of long-term coal demand.

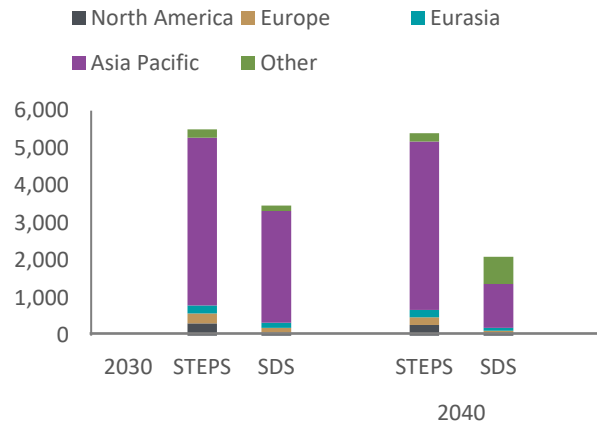
Chart 5.1 Regional Coal Demand under STEPS (Mtce)



Source: IEA

Significantly, the IEA projects that the Asia Pacific region will remain the major consumer of coal under all scenarios. Importantly, India, and to a lesser degree South-east Asia, continues to increase coal consumption under the STEPS, and only reduces consumption under the SDS.

Chart 5.2 Global Coal Demand Projections (Mtce)

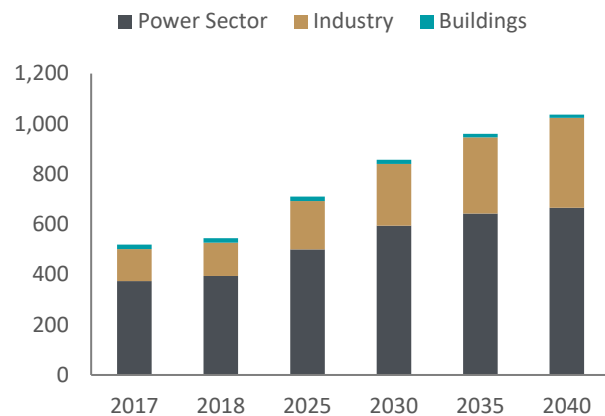


Source: IEA

Under the STEPS, the IEA expects a near-doubling in India’s coal demand, from 586 Mtce in 2018 to 1,157 Mtce by 2040.

Combined with expected increased demand from Southeast Asia (204 Mtce to 389 Mtce), this is projected to underpin continued strong growth in coal demand in the Asia Pacific region, offsetting declines in other regions.

Chart 5.3 India’s Major Components of Coal Demand under STEPS (Mtce)



Note: the sum of components does not equal total demand for coal
Source: IEA.

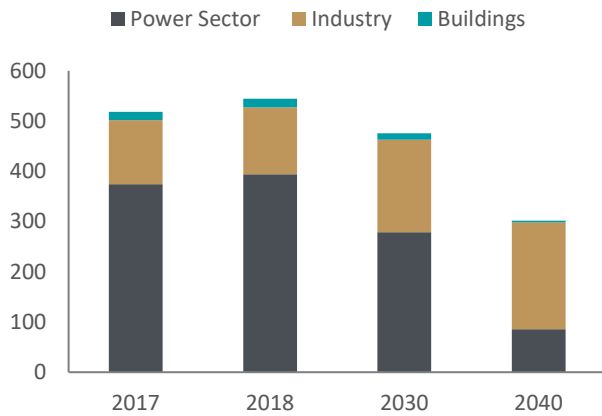
While the IEA predicts that coal demand from India’s power sector and industry will increase substantially to 2040 under the STEPS, the IEA projects that China’s total demand for coal will begin to fall from the middle of the 2030s onwards. Under the SDS, India’s coal demand is expected fall over

¹⁰ Detailed projections in Annex A in the 2019 WEO have been provided in million tonnes of oil equivalent and the ‘other’ use was disaggregated into use for ‘Buildings’ and ‘Other’. For the purposes of

this paper, projections are expressed as Mtce and classified into the three main uses as defined by the IEA in the body of the WEO.

30% by 2040, reflecting a 78.3% fall in demand from the power sector.

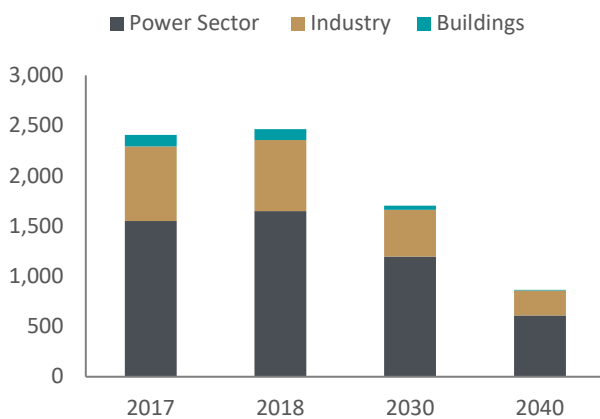
Chart 5.4 India’s Major Components of Coal Demand under SDS (Mtce)



Note: the sum of components does not equal total demand for coal. Source: IEA

The most significant adjustment under the SDS is China, whose demand for coal is projected to drop from 2,834 Mtce in 2018 to 1,154 Mtce by 2040, with coal demand from the power sector falling from 1,650 Mtce to only 611 Mtce.

Chart 5.5 China’s Major Components of Coal Demand under SDS (Mtce)



Note: the sum of components does not equal total demand for coal. Source: IEA

Reflecting this regional disparity in demand, the IEA note in the WEO that “there are uncertainties over how the supply-demand balance in Asia plays out. Among exporters, Australia and Russia could take advantage of any new export opportunities, as Indonesian exports decline.”

Trade Impacts

In terms of international coal trade, steam coal trade is expected to fall by 2040 under both the STEPS and SDS (down 15.5% and 77.1% respectively).

In contrast, the WEO suggests the rising scarcity of coking coal means that international trade is projected to increase (up 16.3%) under STEPS, despite a projected 17.3% fall in total global production for coking coal over the period.

However, under the SDS, an expected increase of steel scrap recycling and more efficient use of steel contributes to a 48.0% drop in global coking coal production. Under this scenario, coking coal trade is projected to fall by 22.6%.

While the IEA does not provide sub-national projections in the WEO, they note “Australia is one of the few major producers projected to increase coal production to 2040”.

Risks and Limitations to the Long-Term Outlook

The IEA Report highlights 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 SDS outcome could clearly have a material impact on the State’s coal industry in the medium to longer term.

The Report also notes a range of factors that may impact on coal producers’ ability to access, and/or cost of, finance for investment in the future. These include,

- general uncertainty surrounding future coal demand;
- changes in policy from large investors, such as pension funds and multilateral development banks;
- activism by groups such as *Climate Action 100+ Initiative* and opposition from local communities; and
- decisions by a range of banks and insurance companies to get out of the coal sector.

The IEA highlight that smaller operators and pure coal players will likely face much greater obstacles to finance than big global diversified mining groups. Conversely, the report also suggests that “the tougher environment for investment and difficult conditions for market entry may reduce the possibility of oversupply, one of the bigger risks in the commodity business.”

As such, the IEA’s projections of Australia’s coal production should be considered against the backdrop of these uncertainties, while the IEA’s projections do not include any discussion of what the outlook for national production may imply in terms of Queensland’s coal production over the coming two decades.



Summary of IEA projections

The key findings of the 2019 WEO, in terms of global coal demand, production and trade, (by scenario and types of use) are outlined in the table below.

Table 5.1: Global Coal Demand, Production and Trade, by Scenario (Mtce)

	2018	2040			% change (2018-2040)		
		CPS	STEPS	SDS	CPS	STEPS	SDS
Demand							
<i>Power</i>	3,500	4,156	3,395	858	18.7	-3.0	-75.5
<i>Industrial use</i>	1,680	2,075	1,903	1,206	23.5	13.3	-28.2
<i>Other</i>	279	168	100	36	-39.8	-64.2	-87.1
Total	5,458	6,399	5,398	2,101	17.2	-1.1	-61.5
Production							
<i>Steam coal</i>	4,342	5,266	4,394	1,515	21.3	1.2	-65.1
<i>Coking coal</i>	955	854	790	497	-10.6	-17.3	-48.0
Total	5,566	6,399	5,398	2,101	15.0	-3.0	-62.3
Trade							
<i>Steam coal</i>	859	964	726	197	12.2	-15.5	-77.1
<i>Coking coal</i>	319	404	371	247	26.6	16.3	-22.6
Total	1,169	1,355	1087	413	15.9	-7.0	-64.7

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

Table 5.2: Global Coal Demand by Region (Mtce)

	2018	2040			% change (2018-2040)		
		CPS	STEPS	SDS	CPS	STEPS	SDS
Asia Pacific	4,079	5,202	4,487	1,771	27.5	10.0	-56.6
China	2,834	2,838	2,568	1,154	0.1	-9.4	-59.3
India	586	1,417	1,157	395	141.8	97.4	-32.6
North America	492	341	285	50	-30.7	-42.1	-89.8
Europe	447	319	203	84	-28.6	-54.6	-81.2
World	5,458	6,399	5,398	2,101	17.2	-1.1	-61.5

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

6.1 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.

6.2 Metallurgical Coal

Trends in Global Steel Production

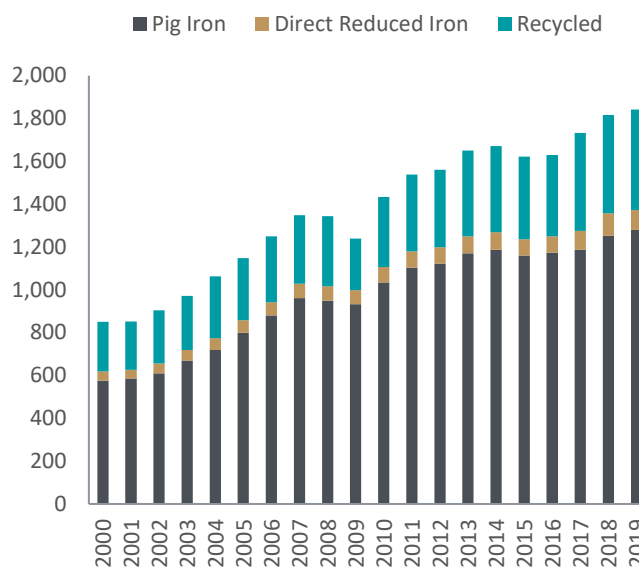
The majority of crude steel is produced through the Blast Furnace-Basic Oxygen Furnace (BF-BOF) route, where pig iron (a combination of iron ore and coking coal) is the intermediate product.

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 also makes a substantial contribution to global steel production.

Since the year 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.

Excluding China and India, crude steel production in the rest of the world rose only 6.0% over the 19 years to 2019, at an average of 0.3% per annum.

Chart 6.1 Global Crude Steel Production (Mt)



Note: Global direct reduced iron production in 2019 is yet to be made available. It is estimated from the 12 countries reported in the monthly production statistics.

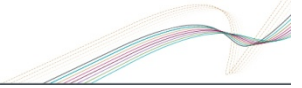
Source: World Steel Association

As outlined in the WEO, future demand for metallurgical coal hinges primarily on developments in China and India, in particular the outlook for steel production in those economies.

Queensland is the world's largest exporter of metallurgical coal. Therefore, it is vital to explore in further detail the likely outlook for demand from China and India. In particular, as India's steel-making capacity expands, it has 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 993.2 Mt by 2019. The substantial rise of China's steel production capacity underpinned growth in global steel production over much of that period.



The Chinese government released its most recent Five-Year (2016-2020) development plans in late 2016¹¹.

The Plans outlines how China aims to consolidate and upgrade its existing steel making industry through a range of efficiency measures which may limit the country's metallurgical coal demand. The Plans also encourage the development of advanced steel products.

According to the Chinese government, China's annual consumption of crude steel is forecast¹² to decline to 650-700 Mt by 2020, compared with the peak of 772 Mt recorded in 2013.

With China's crude steel production forecast to be 750-800 Mt by that time, China is still expected to export around 100 Mt of steel products per annum by the end of this decade. In fact, China's exports of iron and steel products (including semi-finished products) were only 64.3 Mt in 2019.

The extent of steel scrap recycling in China¹³ was around 169 Mt in 2019, or 17% of the country's crude steel production. This compares with an estimate of only 8.3% seven years earlier.

Previous fast growth in steel consumption suggests that China's domestic supply of steel scrap is expected to increase significantly in coming years, with the World Steel Association estimating that steel scrap availability in China will increase significantly to 300 Mt by 2030. This is particularly the case as technological progress will allow for more high-quality flat steel products to be produced from steel scrap.

Therefore, looking beyond 2020, 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 smaller scale than China, India's crude steel production also increased significantly over the 19-year period, from 26.9 Mt in 2000 to 111.4 Mt by 2019.

The Indian Government released its *National Steel Policy 2017* 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.*

It is expected that, at the current rate of GDP growth, annual steel demand in India will grow threefold to reach 230 Mt by 2030-31.

If these goals are achieved, India's coking coal demand may triple, from 47.0 Mt in 2017-18¹⁴ to above 160 Mt by 2030-31.

Given that Queensland is a major coking coal exporter to India, Queensland is likely to benefit from India's planned steel industry expansion. Most importantly, the scale of Indian's expansion, if it eventuates, is large enough to offset any potential reduction in demand for metallurgical coal due to the rising use of steel scrap in China.

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.

Increasing scarcity in high quality coking coal means 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, while MIDREX is a gas-based process where natural gas is used as the reducing agent.

Several COREX projects in China and India have proved that the COREX process is a commercially viable option for steelmaking. Meanwhile, almost 65% (56.45 Mt) of the world's production of direct reduced iron in 2017 was based on the MIDREX process.

While COREX and MIDREX are the two most developed non-blast furnace technologies, there are several other

¹¹ Most prominent was its Energy Development Plan and the associated Electricity Development Plan.

¹² Published in "Adjustment and Upgrading Plan for Iron and Steel Industry (2016-2020)" in mid-November 2016.

¹³ Implied by the ratio between blast furnace iron and crude steel production (as China does not report any direct reduced iron production).

¹⁴ Fiscal Year (April to March).

technologies in various phases of development, including FINEX, Hismelt, Romelt and Tecnoled.

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

Therefore, the ongoing development and utilisation of alternative steelmaking processes that are not as dependent on coking coal is likely to continue to impact on global demand for metallurgical coal. However, it is expected that the current expected uptake and application of these technologies have at least partly been reflected in IEA's global coal demand projections.

6.3 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.

Specifically, advances in conventional coal fired power generation technology following the Ultra-Supercritical (USC) route can bring a power plant's thermal efficiency up from around 40% to 45%. The alternative Integrated Gasification Combined Cycle (IGCC) route can bring another 5% improvement in efficiency, while, improvement in technology is expected to see the Gas Turbine Combined Cycle (GTCC) route gas fired power generation surpass 55% efficiency by the end of the next decade.

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 latest Five-Year Plan, the Chinese government intends 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.

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).

Coal fired power generation efficiency in China has also improved from 318g of standard coal¹⁵ per kilowatt hour of electricity produced in 2015 to 309g in 2017 (307g in 2019), achieving the target of less than 310g.

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.

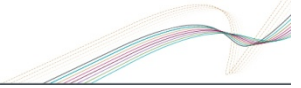
Japan

The Ministry of Economy, Trade and Industry (METI) released a draft of the *Fifth Basic Energy Plan* in mid-May 2018. The plan was approved by Cabinet in July 2018. The plan proposed to maintain the country's traditional energy policy principles, confirming that the new plan will be in many ways similar to the current one. Specifically, nuclear and coal-based thermal power stations are described as "*important base load power sources*".

As such, nuclear power is still expected to constitute 20% to 22% of Japan's electricity supply by 2030, while renewable energy will constitute 22% to 24% by that time.

The continuing reliance on coal fired power means that the construction of coal fired power plants is projected to increase in Japan, potentially increasing thermal coal consumption in Japan by 17-20 Mt per annum. Importantly, almost all coal fired power plants under construction in Japan utilise the latest technology, meaning a greater variety of coal grades can be used in these plants.

¹⁵ 1kg of standard coal is defined as 7,000 kilocalories.



Korea

Korea has committed to a gradual reduction in the reliance on coal and nuclear energy. In June 2017, eight aging coal-fired power plants were closed for a month, while five coal fired power plants were again shut between March and June 2018.

A draft of Korea's *8th Basic Plan for Long-term Electricity Supply and Demand* was released in mid-December 2017. The plan stated that by 2030, a further 4.3GW of capacity is required to be added to existing and already planned capacity of 118.3GW. These additional facilities will be either liquefied natural gas (LNG) power stations or pumped-storage hydroelectric facilities.

Between 2017 and 2030, the installed capacity of renewables is expected to increase five-fold to 58.5 GW, with the growth mainly coming from solar and wind power.

In line with the Korean Government's objective, total capacity of coal-fired power plants would only increase slightly from 36.8 GW to 39.9 GW, while nuclear power capacity would be reduced from 22.5GW to 20.4GW. There are currently six coal power generation units under construction in Korea, with total capacity of 5.259GW. All¹⁶ except one unit¹⁷ are based on USC technology.

India

In the latest *National Electricity Plan* (published January 2018), the Indian Central Electricity Agency (CEA) provides projections of required electricity generation capacity based on demand projections.

The Indian Government has placed emphasis on renewable energy sources, particularly from solar, but also from wind and biomass. The target is for installed capacity from renewable energy sources (RES) to increase from 57.2GW in 2017 to 175GW by 2021-22 and 275GW by 2026-27. It is expected that RES will contribute more than 24% of the country's total energy demand by 2026-27.

Nevertheless, coal fired power will remain as a prominent component of India's electricity generation energy mix. Installed coal fired power generation capacity by the end of 2026-27 is projected to be 238GW, constituting almost 39% of the country's total power generation capacity by that time and almost 25% higher than the 191GW capacity installed at the end of 2018.

Importantly, coal fired capacity already under construction would be largely sufficient to meet targets set in the Plan out to 2021-22. Additional coal-based capacity required is only 6.445GW between 2017 and 2022 as a total of 47.855GW

of coal-based capacity have already under different stages of construction. Meanwhile, CEA identifies that a total of 22.716GW of coal fired power capacity will be considered for retirement over the same period. An additional 46.420GW of coal-based capacity is required between 2022 and 2027 while 25.572GW of old capacity will be retired over the same period.

The CEA assesses that power plants designed to use domestic coal can meet their requirements from domestic sources. Therefore, imported coal may only be required for power plants which may find imported coal more economical than domestic coal due to logistical constraints or those power plants designed for imported coal specifications. As such, India's thermal coal imports may not surpass the record of 157.3 Mt (in 2019-20 India's Fiscal Year) over the coming decade.

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 SDS highlights 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's (IPCC) *Special Report on Global Warming of 1.5°C* was released shortly before the IEA's 2018 edition of the WEO.

The IPCC's report outlines the possibility of even more dramatic reductions in longer term coal demand than under IEA's SDS outlook.

Under the IPCC's four illustrative pathways to limit global warming to 1.5°C with no or limited overshoot, primary energy sourced globally from coal is projected to decline by between 59% to 78% by 2030 and 73% to 97% by 2050.

The IPCC's projections highlight the uncertainty around long-term global coal demand in the context of ongoing global policy debate and consideration.

Clearly, if global coal demand trends closer to those described under alternative scenarios such as the SDS 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.

¹⁶ (KEPCO's Anin Unit 1&2 (2×1,040MW), Goseong Green Power's Unit 1&2 (2×1,040MW) and KEPCO's Seocheon replacement unit (1,000MW))

¹⁷ (Hanwha Energy's Gunsan cogeneration plant (99MW))



Recent developments in global coal markets

Since release of the IEA's WEO in November 2019 and the detailed analysis underpinning preparation of this report, a number of key developments have been observed in global coal markets.

In particular, the COVID-19 outbreak has had far-reaching implications for global economic activity, which in turn has significantly weakened coal demand since early 2020 in some parts of the world. Further, as extensively discussed in this report, the environmental impacts arising from coal consumption continue to be increasingly considered and addressed by governments and financial institutions around the world, particularly in developing nations.

COVID-19

Metallurgical coal demand

Global demand for metallurgical coal has weakened materially since early 2020 due to the outbreak of COVID-19. Major steelmakers around the world, including in India, Japan and Europe, have announced production cuts in response to the slowdown in steel demand arising from COVID-19.

The government of India announced a nationwide lockdown on 24 March to 31 May (but extended to the end of June in containment zones), although some "zones" that have managed to contain the outbreak have had restrictions eased. The lockdowns across the country have subdued construction and manufacturing activity, which has softened the demand for steel. Several major Indian steel mills have announced large curbs to production. The Indian Steel Association estimated in mid-April that steel demand in the country would decline 7.7% in 2020 but the World Steel Association predicted a much steeper 18% fall in early June.

The number of COVID-19 cases in India has surged since June, from around 200,000 to more than 5.4 million by late September. Meanwhile, the country's crude steel production between March and July 2020 (latest data available) recorded an annual decline of 33.5%.

Since the beginning of April, several Japanese automakers had announced intentions to suspend operations at factories due to a coronavirus-related slump in demand. As a result, the country's two largest steelmakers have halted some blast furnace operations. A quarterly survey conducted by Japan's Ministry of Economy, Trade and Industry indicates crude steel demand in the September quarter will be 27.9% lower than a year earlier, after crude steel production in the country fell at an annual rate of 30.6% in the June quarter.

One of the world's largest steelmakers, ArcelorMittal, which is predominately based in Europe, also reduced production in response to demand conditions, and declared force majeure on raw materials supplied to its European steel mills.

In contrast, industrial activity in China has largely recovered from government-imposed lockdowns between late-January and March. Steelmakers in China have been increasing production since March 2020. Most significantly, China's crude steel production recorded annual growth of 3.3% between March and July 2020, while production in India, Japan and Korea all recorded double-digit declines.

Consistent with the country's increasing crude steel production, China's pig iron production also recorded 3.1% annual growth between March and July 2020. However, despite China's prominent position in global pig iron production, production increases in China have not been able to offset weakness in the rest of the world so far.

As a result, hard coking prices in the spot market fell from around US\$160/t in March 2020 to the recent trough of US\$107/t in mid-August, and only partially recovered to US\$134/t in mid-September.

Thermal coal demand

Nationwide lockdowns in many countries have resulted in the closure, or reduced output, of "non-essential" industries in these countries, leading to a decline in power demand. On 3 April, Japan's Institute of Energy Economics estimated that in a hypothetical city in Japan of a population of 10 million (similar to the population of metropolitan Tokyo), electricity demand would fall by 39.30GWh per day, equivalent to around 25% of electricity demand of a city of this size.

Similar to coking coal prices, spot thermal coal prices also fell from around US\$70/t in March to a low of US\$50/t in early May, and only recovered to around US\$58/t by mid-September.

Coal production

Nationwide lockdowns in response to COVID-19 have also impacted coal production, initially affecting Chinese coal miners' ability to restart production after the Lunar New Year holiday in early-February. This was amplified by the closure of the Mongolia-China border between 10 February and 23 March to contain the spread of the COVID-19 outbreak in China. As a result of this deficit, China's seaborne coal imports increased sharply during this time.

In some other countries, strict lockdown measures meant that some coal miners, including in Columbia and South Africa, were directed by their governments to suspend or idle coal operations. Meanwhile, major miners in Kalimantan, Indonesia have independently reduced production on a company-by-company basis due to market conditions.

Environmental impacts – recent developments

In the 2019 WEO, the IEA highlighted the ongoing shift towards renewable energy sources and advancements in coal and gas fired power generation which would likely disrupt demand for thermal coal. Since the report was released in November, this trend has continued. According to a draft of South Korea's ninth basic electricity plan, the country plans to shut a total of 15.3GW of its coal fired capacity by 2034, of which 12.7GW will be switched to run on gas. In recent months the country's Energy Ministry has also scaled up efforts to curb air pollution by idling some of the country's coal fired power plants and reducing capacity at others.

The IEA also noted a range of factors that may impact on the ability of coal producers to access financing for investment. In recent months, a number of financial institutions have announced that they would no longer finance new coal power, including Sumitomo Mitsui Financial Group and Mizuho Financial Group in Japan, and Westpac Banking Corporation in Australia. These trends are expected to continue in the future as financial institutions re-assess climate risk and are influenced by the views of environmental groups and activist investors.

A coalition of 15 civic groups in Korea launched the *Korea Beyond Coal* campaign on 7 September, the first International Day of Clean Air for Blue Skies. The campaign groups demand the country achieve a complete coal phase-out by 2030 to fulfil its part of the Paris agreement goal of limiting global warming to 1.5°C.

Coal imports

Reflecting these developments, official customs statistics show that coal imports (i.e. from all countries) into Queensland's major Asian export markets, including China, India, Japan and Korea, have declined significantly since March. China's total coal imports were 152.8 Mt between March and August 2020, compared with 168.9 Mt recorded in the same period in the previous year, a decline of 9.5%. This is despite a recovery in the country's industrial production and an increase in steel production.

Coking Coal (Mt)	March to July 2019	March to July 2020	% change
India*	17.85	13.99	-21.6
Japan	29.59	26.11	-11.8
Korea	9.07	8.61	-5.1

Thermal Coal (Mt)	March to July 2019	March to July 2020	% change
India*	57.89	38.54	-33.4
Japan	44.26	43.27	-2.2
Korea	36.99	35.35	-4.4

* March to June

Both India and Japan recorded double-digit annual declines in coking coal imports between March and July 2020, while a less COVID-19 affected Korea recorded a much smaller drop in coking coal imports.

The national lockdown in India saw a sharp annual fall in the country's thermal coal imports between in the last four months of 2019-20.



Price impact

Due to these recent developments in coal markets, spot prices have been volatile since the release of the IEA WEO. Prices for both thermal and metallurgical coal increased in late-February due to a slow restart in China's domestic coal output and the temporary closure of the Mongolia-China border. However, as production restarted in China and the border was reopened, softer global demand resulted in a sharp fall in prices across all types of coal.

Since the recent peak in mid-March 2020 at around US\$164/t, the premium hard coking coal price in the spot market fell to around US\$107/t in mid-August 2020. Meanwhile, prices for 5,500 kcal/kg "net as received" thermal coal declined from around US\$55/t to around US\$37/t over the same period. These prices are well below the assumptions in the IEA's 2019 WEO.

The sharp decline in coal prices, particularly for thermal coal, has threatened the profitability of many coal miners around the world. Resources consultancy, Wood Mackenzie, estimate that almost 60% of the world's thermal coal and more than 30% of Australian thermal coal production was unprofitable at price levels recently observed for benchmark thermal coal, i.e. at US\$40/tonne for 5,500 kcal/kg thermal coal.

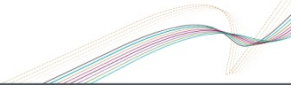
Lower prices and poor market conditions have prompted some Australian coal miners to reduce production to maintain profitability.

In late May, Peabody suspended operation for up to two months at its Wambo thermal coal mine in New South Wales. In early August, Glencore announced that the company's coal production had been downgraded from 132 Mt to 114 Mt as the company plans to reduce coal output in Australia for the rest of 2020.

TerraCom said it expected coal sales in 2019-20 to be 2.5-2.6 million tonnes, compared to its guidance of 3 million tonnes in February 2020. The company also said it would reduce operations at its Blair Athol thermal coal mine in Queensland, and target production of about 2 million tonnes in the next financial year.

Meanwhile, AMCI also announced that it was cutting jobs and production at its Carborough Downs metallurgical coal mine following an accident in late 2019. Two more incidents occurred at the mine in July 2020. A gas explosion at Anglo's Grosvenor mine in May 2020 led to the mine being closed for at least 12 months.

To the extent that some of these recent developments in global coal markets may only be short lived, any impact on the longer-term outlook is uncertain, particularly in the context of IEA's long-term projections out to 2040. Therefore, the analysis of long-term global demand in this report remains consistent with, and informed by, information available at the time of release of the 2019 WEO.



7.0 Conclusion

Queensland Treasury's analysis of the IEA's 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 over the longer term.

In particular, this analysis highlights that developments in China and India are likely to be the most significant factors impacting on future demand for both the State's metallurgical and thermal coal.

7.1 Metallurgical coal

Queensland Treasury's analysis of the WEO strongly suggests 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, to a lesser degree, India have been the main drivers of global steel production in the past two decades and the major markets for Queensland's metallurgical coal. Therefore, the outlook for the steel industries of these two countries is critical to the long-term demand for Queensland coking coal.

Looking beyond 2020, the potential for China to increasingly recycle steel scrap may lower the demand for metallurgical coal imports to China in the medium term.

Technological advancements also have seen the development of alternative steel making processes which do not require metallurgical coal, while increasing scarcity of high-quality coking coal means alternative approaches are likely to become more prominent in the long term.

However, as India's steel-making capacity expands, India has increasingly become a growth market for Queensland's metallurgical coal exports.

The scale of planned expansion of India's steel production capacity, together with the fact that a large quantity of India's metallurgical coal imports has already sourced from Queensland, means that Queensland would likely be in a prime position to benefit from this planned expansion.

Most importantly, the scale of India's expansion, if it eventuates, is expected to be large enough to offset, or largely offset, any potential reduction in demand for metallurgical coal from China.

This outlook is consistent with observations from the IEA when, in relation to its STEPS, the 2019 WEO states that *"Among exporters, Australia and Russia could take advantage of any new export opportunities."*

However, with limited metallurgical coal mining developments in Queensland after the Global Financial

Crisis, Queensland's coal industry may only be able to slightly expand its metallurgical coal production in the short to medium term.

7.2 Thermal coal

As outlined by the IEA, particularly under the SDS, it is widely expected that coal used for power generation is likely to decline over time.

Adoption of more advanced power generation technologies will also likely increase generation efficiency, weakening future demand for thermal coal, and allow a wider range of coal to be used in power generation.

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, including China, Japan, Korea and India.

While the IEA indicated that Australia is still likely to increase coal production under the STEPS, thermal coal exports from Queensland over the past decade have not expanded to the extent they have nationally.

Importantly, the substantial overhead costs required to develop large scale greenfield thermal coal projects under the weakening thermal coal trade outlook has impacted the viability of projects.

Both the IEA's projections and further analysis undertaken by Treasury highlight that long-term global demand for coal, particularly thermal coal, remains uncertain.

In particular, if global demand trends were to play out closer to those described under alternative scenarios such as the IEA's SDS or those in the IPCC's *Special Report on Global Warming of 1.5°C*, there could be implications for the State's coal industry, particularly in relation to the long-term outlook for thermal coal.

